Tucson Electric Power Company
Sahuarita-Nogales Transmission Line
Draft Environmental Impact Statement

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Office of Fossil Energy
U.S. Department of Energy
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Cooperating Agencies:

U.S. Department of the Interior Bureau of Land Management

U.S. Section of the International Boundary and
Water Commission, U.S. and Mexico

U.S. Department of Agriculture Forest Service

COVER SHEET

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Abstract: A DOE Presidential Permit is required before anyone can construct an electric transmission line across the U.S. border. On August 17, 2000, TEP applied to DOE/FE for a Presidential Permit to construct a double-circuit 345,000 volt (345 kV) electric transmission line that would begin south of Tucson, Arizona, in the vicinity of Sahuarita, cross the U.S.-Mexico border, and continue into the Sonoran region of northern Mexico to Santa Ana. TEP states that the proposed line would provide a redundant path for the energy that is currently transmitted over the existing 115-kV transmission line from Tucson to Nogales, Arizona. The local Nogales utility, Citizens Communications, has committed to the purchase of 100 MW of transmission capacity from TEP to allow for future load growth above Citizen’s current Santa Cruz County load of approximately 65 MW. TEP anticipates using the remaining 400 MW of capability for transport of energy between the United States and Mexico.

FE has determined that the issuance of a Presidential Permit for this project would constitute a major Federal action within the meaning of the *National Environmental Policy Act of 1969* as amended. The Federal Register *Notice of Intent to Prepare an EIS and to Conduct Public Scoping Meetings and Notice of Floodplain and Wetlands Involvement* was published on July 10, 2001 (66 FR 35950). Public scoping meetings were held by DOE on July 30, 2001, at the Rancho Resort in Sahuarita, AZ, and on July 31, 2001, at the Rio Rico Resort in Rio Rico, AZ.

FE has prepared this Draft EIS to address the environmental impacts of the proposed action and reasonable alternatives, including the “No Action” alternative. In addition, because the U.S. Forest Service, the Bureau of Land Management, and the U.S. International Boundary Water Commission (USIBWC) must act, and because their actions are interrelated, they have agreed to cooperate in preparing this Draft EIS. The Final EIS will be used by DOE and the cooperating agency officials to ensure that they have the information needed for purposes of informed decision-making. The decisions themselves will be issued subsequent to the Final EIS, in the form of a Record of Decision for each agency, or as a letter of concurrence in the case of the USIBWC.

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
1.1 Background 1-1
1.2 Purpose and Need 1-7
1.2.1 Applicant's Purpose and Need 1-7
1.2.2 Federal Agencies' Purpose and Need and Authorizing Actions 1-8
1.3 Public Participation 1-10
1.3.1 Issues Within Scope of the EIS 1-11
1.3.2 Issues out of Scope of the EIS 1-12

2.0 PROPOSED ACTION AND ALTERNATIVES 2-1
2.1 Alternatives 2-1
2.1.1 Western Corridor 2-2
2.1.2 Central Corridor 2-6
2.1.3 Crossover Corridor 2-7
2.1.4 Alternatives Considered But Eliminated from Further Analysis 2-8
2.1.5 No Action Alternative 2-12
2.2 Construction and Mitigation Activities Common to All Alternatives 2-12
2.2.1 Substation Upgrades and Additions and Fiber-Optic Regeneration Site 2-12
2.2.2 Transmission Line Structures and Wires 2-13
2.2.3 Transmission Line Construction 2-14
2.2.4 Operation and Maintenance 2-20
2.2.5 Standard Mitigation 2-21
2.3 Comparison of Alternatives 2-23

3.0 AFFECTED ENVIRONMENT 3-1
3.1 Land Use and Recreation 3-1
3.1.1 Land Use 3-1
3.1.2 Recreation 3-7
3.2 Visual Resources 3-14
3.2.1 Western Corridor 3-15
3.2.2 Central Corridor 3-22
3.2.3 Crossover Corridor 3-24
3.3 Biological Resources 3-26
3.3.1 Biodiversity 3-26
3.3.2 Vegetation and Wildlife 3-27
3.3.3 Special Interest Species 3-32
3.3.4 Migratory Birds and Raptors 3-44
3.3.5 Coronado National Forest Management Indicator Species 3-44
3.3.6 Invasive Species 3-47

3.4 Cultural Resources 3-48
3.4.1 Archaeological and Historical Sites 3-48
3.4.2 Native American Concerns 3-52
3.5 Socioeconomics 3-58
3.5.1 Population and Housing 3-58
3.5.2 Employment and Income 3-59
3.5.3 Community Services 3-60
3.5.4 Revenues for Forest-Based Activities 3-60
3.6 Geology and Soils 3-61
3.6.1 Geology 3-61
3.6.2 Soils 3-65
3.7 Water Resources 3-70
3.7.1 Floodplains, Wetlands, and Surface Water 3-70
3.7.2 Groundwater 3-76
3.8 Air Quality 3-78
3.8.1 Climate 3-78
3.8.2 Air Quality 3-79
3.9 Noise 3-83
3.9.1 Background 3-83
3.9.2 Western, Central, and Crossover Corridors 3-84
3.10 Human Health and Environment 3-86
3.10.1 Electric and Magnetic Fields 3-86
3.10.2 Corona Effects 3-88
3.11 Infrastructure 3-90
3.11.1 Utilities and Facilities 3-90
3.11.2 Waste Management 3-90
3.12 Transportation 3-92
3.12.1 Western Corridor 3-92
3.12.2 Central Corridor 3-95
3.12.3 Crossover Corridor 3-95
3.13 Minority and Low-Income Populations 3-96
3.13.1 Western, Central, and Crossover Corridors 3-97

4.0 ENVIRONMENTAL EFFECTS 4-1
4.1 Land Use and Recreation 4-1
4.1.1 Land Use 4-1
4.1.2 Recreation 4-5
4.2 Visual Resources 4-16
4.2.1 Western Corridor 4-19
4.2.2 Central Corridor 4-25
4.2.3 Crossover Corridor 4-31

4.2.4 Summary of Visual Impacts 4-34
4.2.5 No Action Alternative 4-34
4.3 Biological Resources 4-52
4.3.1 Biodiversity 4-52
4.3.2 Vegetation and Wildlife 4-52
4.3.3 Special Interest Species 4-55
4.3.4 Migratory Birds and Raptors 4-65
4.3.5 Coronado National Forest Management Indicator Species 4-66
4.3.6 Invasive Species 4-67
4.4 Cultural Resources 4-69
4.4.1 Archaeological and Historical Sites 4-69
4.4.2 Native American Concerns 4-71
4.5 Socioeconomics 4-72
4.5.1 Socioeconomic Impacts from the Western, Central, and Crossover Corridors 4-73
4.5.2 Socioeconomic Impacts from the No Action Alternative 4-75
4.6 Geology and Soils 4-76
4.6.1 Geology 4-76
4.6.2 Soils 4-79
4.7 Water Resources 4-81
4.7.1 Floodplains, Wetlands, and Surface Water 4-81
4.7.2 Groundwater 4-84
4.8 Air Quality 4-86
4.8.1 Emissions 4-86
4.8.2 Clean Air Act Conformity Requirements 4-87
4.8.3 PM_{10} Contributions from Transmission Line Construction in Mexico 4-94
4.9 Noise 4-95
4.9.1 Western Corridor 4-96
4.9.2 Central Corridor 4-98
4.9.3 Crossover Corridor 4-99
4.9.4 No Action Alternative 4-100
4.10 Human Health and Environment 4-101
4.10.1 Electric and Magnetic Fields 4-101
4.10.2 Corona Effects 4-108
4.11. Infrastructure 4-110
4.11.1 Utilities and Facilities 4-110
4.11.2 Waste Management 4-111
4.12 Transportation 4-113
4.12.1 Western Corridor 4-113
4.12.2 Central Corridor 4-116
4.12.3 Crossover Corridor 4-116

4.12.4 No Action Alternative....4-117
4.13 Environmental Justice....4-118
4.13.1 Western, Central, and Crossover Corridors....4-118
4.13.2 No Action Alternative....4-120

5.0 CUMULATIVE IMPACTS....5-1
5.1 Methodology....5-1
5.2 Reasonably Forseeable Action Identification....5-1
5.3 Cumulative Impacts Analysis....5-4

6.0 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS....6-1

7.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES....7-1

8.0 SHORT-TERM USE AND LONG-TERM PRODUCTIVITY....8-1

9.0 APPLICABLE ENVIRONMENTAL REGULATIONS, PERMITS, AND DOE ORDERS....9-1

10.0 LIST OF AGENCIES AND PERSONS CONTACTED....10-1

11.0 REFERENCES....11-1

12.0 LIST OF ACRONYMS & ABBREVIATIONS / UNIT CONVERSIONS / GLOSSARY....12-1

13.0 LIST OF PREPARERS....13-1

14.0 INDEX....14-1

LIST OF APPENDICES

APPENDIX A: CONSULTATION LETTERS....A-1

APPENDIX B: ELECTRIC AND MAGNETIC FIELDS BACKGROUND INFORMATION....B-1

APPENDIX C: FLOODPLAINS AND WETLANDS ASSESSMENT....C-1

APPENDIX D: DRAFT BIOLOGICAL ASSESSMENT, WESTERN CORRIDOR....D-1

APPENDIX E: DRAFT BIOLOGICAL ASSESSMENT, CENTRAL CORRIDOR....E-1

APPENDIX F: DRAFT BIOLOGICAL ASSESSMENT, CROSSOVER CORRIDOR....F-1

APPENDIX G: NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE TUCSON ELECTRIC POWER COMPANY SAHUARITA-NOGALES TRANSMISSION LINE DRAFT ENVIRONMENTAL IMPACT STATEMENT....G-1

LIST OF FIGURES

Figure 1.1–1	Monopole Transmission Line Structure Drawing and Photo	1-2
Figure 1.1–2	Lattice Tower Transmission Line Structure Drawing and Photo	1-3
Figure 1.1–3	Proposed Project Region Map	1-4
Figure 1.1–4	Proposed Project Study Corridors	1-5
Figure 2.1–1	Close-up of Alternative Study Corridors Near Sahuarita and Green Valley	2-3
Figure 2.1–2	Close-up of Alternative Study Corridors Near Amado	2-4
Figure 2.1–3	Close-up of Alternative Study Corridors Near Nogales	2-5
Figure 2.1–4	TEP Corridor Alternatives, Alternatives Eliminated From Further Analysis, and PNM Corridor Alternatives	2-9
Figure 2.2–1	Proposed Construction Equipment	2-16
Figure 3.1–1	Specially Designated Areas on the Coronado National Forest	3-3
Figure 3.1–2	Recreation Opportunity Spectrum Classes on the Coronado National Forest	3-9
Figure 3.2–1	Typical Desert Grasslands Vegetation in the Coronado National Forest	3-16
Figure 3.2–2	Scenic Attractiveness Classes for Tumacacori EMA	3-17
Figure 3.2–3	Travelways of Concern within and near Tumacacori EMA	3-19
Figure 3.2–4	Scenic Classes for Tumacacori EMA	3-20
Figure 3.2–5	Coronado National Forest Existing Scenic Integrity	3-21
Figure 3.2–6	El Paso Natural Gas Pipeline ROW	3-23
Figure 3.3–1	Biotic Communities in the Proposed Project Area	3-28
Figure 3.6–1	Geology of the Proposed Project Area	3-62
Figure 3.6–2	Geology of the Proposed Project Area on the Coronado National Forest	3-64
Figure 3.6–3	Exposed Bedrock Along the Western Corridor	3-65
Figure 3.6–4	Exposed Soil Along the Central Corridor	3-66
Figure 3.6–5	Soil Associations in the Proposed Project Area	3-67
Figure 3.7–1	Surface Waters Outside the Coronado National Forest	3-71
Figure 3.7–2	Surface Waters and Watersheds Within the Coronado National Forest	3-72
Figure 3.7–3	100-year Floodplain and Associated Surface Waters Crossed by the Corridor Alternatives	3-74
Figure 3.8–1	Wind Rose of Surface Winds at Tucson	3-80
Figure 3.8–2	Nogales PM_{10} Non-attainment Area and Tucson CO Maintenance Area	3-81
Figure 3.11–1	Existing Utility Infrastructure	3-91
Figure 3.12–1	Roads Within the Tumacacori EMA	3-94

Figure 3.13–1 Meaningfully Greater Minority Populations 3-98
Figure 3.13–2 Low-Income Populations....................3-99
Figure 3.13–3 Detail of Block Group Boundaries for Populated Areas 3-100
Figure 4.2–1 Western Corridor on the Coronado National Forest Visibility and Simulation Key Map....................4-20
Figure 4.2–2 Predicted Scenic Integrity of the Western Corridor....................4-22
Figure 4.2–3 Western and Crossover Corridors Outside the Coronado National Forest Visibility and Simulation Key Map....................4-24
Figure 4.2–4 Visual Sensitivity Map 4-26
Figure 4.2–5 Central Corridor on the Coronado National Forest Visibility and Simulation Key Map....................4-27
Figure 4.2–6 Predicted Scenic Integrity of the Central and Crossover Corridors 4-29
Figure 4.2–7 Central Corridor Outside the Coronado National Forest Visibility and Simulation Key Map....................4-30
Figure 4.2–8 Crossover Corridor on the Coronado National Forest Visibility and Simulation Key Map....................4-32
Figure 4.10–1 Electric Field Strength for Normal Operating Conditions, Optimized Phasing....................4-104
Figure 4.10–2 Magnetic Field Strength for Normal Operating Conditions, Optimized Phasing....................4-105
Figure 4.13–1 Meaningfully Significant Minority Populations....................4-122
Figure 4.13–2 Meaningfully Significant Low-Income Populations 4-123
Figure 4.13–3 Detail of Block Group Boundaries for Populated Areas 4-124
Figure 5.2–1 Trade Corridor/Roadway Development 5-3

LIST OF VISUAL SIMULATIONS

Visual Simulation 1: Western Corridor from Upper Thumb Picnic Area at Peña Blanca Lake Area 4-35
Visual Simulation 2: Western Corridor from Ruby Road west of the Calabasas Group Area 4-36
Visual Simulation 3: Western Corridor along Ruby Road north of Pajarita Wilderness........................4-37
Visual Simulation 4: Western Corridor and Castle Rock from Ruby Road...4-38
Visual Simulation 5: Western Corridor Crossing Ruby Road 4-39
Visual Simulation 6: Western Corridor from Ruby Road west of the Tumacacori Mountains 4-40
Visual Simulation 7: Western Corridor from Ruby Road west of the Tumacacori Mountains 4-41
Visual Simulation 8: Example of Terrain and Vegetation Shielding Along the Western Corridor........4-42
Visual Simulation 9: All Three Corridors on BLM Land..4-43
Visual Simulation 10: Western and Crossover Corridors Crossing Arivaca Road................................4-44
Visual Simulation 11: Central Corridor Crossing of Ruby Road 4-45
Visual Simulation 12: Central Corridor Crossing of Ruby Road 4-46
Visual Simulation 13: Central Corridor Crossing from Peck Canyon at I-19 4-47
Visual Simulation 14: Central Corridor Crossing Arivaca Road...4-48
Visual Simulation 15: Central Corridor Northwest of Tubac 4-49
Visual Simulation 16: Example of Partial Terrain Shielding Along Central Corridor 4-50
Visual Simulation 17: Central Corridor Near Piedra Drive in Tubac..4-51

CHAPTER 1
INTRODUCTION

Under Executive Order (EO) 10485 of September 3, 1953, as amended by EO 12038 of February 3, 1978, no one may construct, connect, operate, or maintain facilities at the U.S. international border for the transmission of electric energy between the United States and a foreign country without first obtaining a Presidential Permit from the U.S. Department of Energy (DOE). Tucson Electric Power Company (TEP) has applied for a Presidential Permit to construct, connect, operate, and maintain a double-circuit, 345,000-volt (345-kV) alternating current (AC) electric transmission line across the U.S.-Mexico border. DOE has determined that the issuance of this Presidential Permit to TEP for the proposed project would constitute a major Federal action that may have a significant impact on the environment within the meaning of the *National Environmental Policy Act* of 1969 (NEPA), 42 United States Code (U.S.C.) §§ 4321 et seq. For this reason, DOE has prepared this Draft Environmental Impact Statement (EIS) to evaluate potential environmental impacts from the proposed Federal action (granting a Presidential Permit for the proposed transmission facilities) and reasonable alternatives, including the No Action Alternative.

This EIS was prepared in accordance with Section 102(2)(c) of NEPA, Council on Environmental Quality (CEQ) regulations (40 *Code of Federal Regulations* [CFR] 1500-1508), and DOE NEPA Implementing Procedures (10 CFR 1021). DOE is the lead Federal Agency, as defined by 40 CFR 1501.5. The U.S. Department of Agriculture Forest Service (USFS), the Bureau of Land Management (BLM) of the U.S. Department of the Interior, and the U.S. Section of the International Boundary and Water Commission, U.S. and Mexico (USIBWC) are cooperating agencies. Each of these organizations will use the EIS for its own NEPA purposes, as described in Section 1.2.2, Federal Agencies' Purpose and Need and Authorizing Actions.

1.1 BACKGROUND

On August 17, 2000, TEP, a regulated public utility, filed an application with the DOE Office of Fossil Energy (DOE-FE) for a Presidential Permit. TEP proposes to construct a double-circuit 345-kV AC transmission line on a single set of support structures within an approximate 125-foot (ft) (38-meter [m]) wide right-of-way (ROW). The double-circuit transmission line would consist of twelve transmission line wires, or conductors, and two neutral ground wires that would provide both lightning protection and fiber optic communications, on a single set of support structures. The primary structures to be used are the self-weathering steel single poles, or monopoles, depicted in Figure 1.1–1. Dulled, galvanized steel lattice towers depicted in Figure 1.1–2 would be used in specific locations for engineering reasons or to minimize overall environmental impacts (for example, impacts to soils or potential archaeological sites) in accordance with Arizona Corporation Commission (ACC) Decision No. 64356 (ACC 2002) (as explained in Section 2.2.3).

Figure 1.1–3 shows the overall proposed project location, with the transmission line beginning south of Tucson, Arizona, crossing the U.S.-Mexico border, and continuing into the Sonoran region of northern Mexico to Santa Ana. As shown in Figure 1.1–4, the proposed double-circuit transmission line would originate at TEP's existing South Substation, which would be expanded. The South Substation is located approximately 15 miles (mi) (24 kilometers [km]) south of Tucson in the vicinity of Sahuarita, Arizona, and 1.4 mi (2.2 km) east of Interstate 19 (I-19) in Pima County, Arizona. TEP proposes to use these two circuits to interconnect with the Citizens Communications Company (Citizens) (formerly known as Citizens Utilities) system in the vicinity of Nogales, Arizona, by constructing a new substation, the Gateway Substation, on the west side of Nogales and decreasing the voltage of circuits from 345-kV to 115-kV. From the Gateway Substation, the proposed 345-kV line would continue across the U.S.-Mexico border for approximately 60 mi (96 km) and interconnect with the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico) at CFE's Santa Ana Substation.

The CFE electric system does not operate synchronously with the U.S. system, so during the 1990s TEP studied various possible electrical connection options with CFE, including a direct current line that would remove synchronization problems. However, the cost of such a connection proved that it was not feasible. This led TEP in 1998 to discuss with CFE the potential for an alternating, synchronous current connection with the Mexican system. In 1999 TEP and CFE undertook detailed studies to investigate the feasibility of such a link. Although the TEP and CFE systems do not operate synchronously, the studies undertaken by TEP and CFE contemplate that CFE would separate its Noreste region of its system from the balance of the Mexico electric grid. The U.S. and Mexico systems would be able to operate reliably with this connection at significant cost savings to both TEP and CFE (TEP 2003).

TEP has identified three alternative 0.25-mi (0.40-km) wide study corridors (0.13 mi [0.20 km] on either side of a centerline) as potentially suitable for the proposed project. In this EIS, these alternatives are identified as the Western Corridor, the Central Corridor, and the Eastern Corridor. The utility's Preferred Alternative is the Western Corridor, as previously announced by DOE (66 *Federal Register* [FR] 35950; July 10, 2001). DOE has eliminated the Eastern Corridor, originally proposed by TEP, from further analysis as a reasonable alternative in this EIS at TEP's request, as described in Section 2.1.4. An additional study corridor, the Crossover Corridor, was included for analysis in this EIS based on public and tribal input received during the public scoping period and tribal consultations.

There is an existing El Paso Natural Gas Company (EPNG) buried pipeline within the project area, and segments of each of TEP's three proposed corridors either cross the pipeline ROW, run immediately adjacent to the pipeline ROW, or are roughly parallel to the pipeline ROW within a distance of approximately 0.5 mi (0.8 km). This EIS uses the term "follows or crosses" to describe the relationship between each corridor and the EPNG pipeline ROW.

NEPA requires the identification of the agency's preferred alternative or alternatives in a Draft EIS if one or more exists, or, if one does not yet exist at the draft stage, in the Final EIS (40 CFR Part 1502.14[e]). On July 10, 2001, DOE reported that TEP's Preferred Alternative is the Western Corridor (66 FR 35950). In light of TEP's preference and the Arizona Corporation Commission's (ACC) decision to site TEP's proposed line along the Western Corridor, DOE has decided to identify the Western Corridor as DOE's preferred alternative at this time. DOE welcomes comments on this designation. The cooperating agencies have not designated their preferred alternatives at this draft stage of the EIS review, but each will do so in the Final EIS. Each agency is authorized to select its own preferred alternative.

Western Corridor. The Western Corridor, DOE's and TEP's Preferred Alternative, is the western-most alternative connecting Sahuarita to the U.S.-Mexico border. The Western Corridor extends for an estimated 65.7 mi (105 km), including an estimated 9.3 mi (15.0 km) that follows or crosses the EPNG pipeline ROW. The estimated length of the Western Corridor within the Coronado National Forest is 29.5 mi (47.5 km). The estimated length of the Western Corridor on lands managed by BLM is 1.25 mi (2.01 km).

Central Corridor. The Central Corridor overlaps the northern portion of the Western Corridor from Sahuarita for approximately 18 mi (29 km), then continues south parallel to the EPNG pipeline ROW, connecting Sahuarita to the U.S.-Mexico border. The Central Corridor extends for an estimated 57.1 mi (91.9 km), including an estimated 43.2 mi (69.5 km) that follows or crosses the EPNG pipeline ROW. The estimated length of the Central Corridor within the Coronado National Forest is 15.1 mi (24.8 km). The estimated length of the Central Corridor on lands managed by BLM is 1.25 mi (2.01 km).

Crossover Corridor. The Crossover Corridor overlaps the northern portion of the Western Corridor from Sahuarita into the Coronado National Forest, then turns east at Peck Canyon to meet up with the Central Corridor, and continues south to the U.S.-Mexico border. The Crossover Corridor extends for an estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border, including an estimated 17 mi (27.4 km) that follows or crosses the EPNG pipeline ROW. The estimated length of the Crossover Corridor within the Coronado National Forest is 29.3 mi (47.2 km). The estimated length of the Crossover Corridor on lands managed by BLM is 1.25 mi (2.01 km).

No Action Alternative. CEQ regulations require that an agency "include the alternative of no action" as one of the alternatives considered (40 CFR 1502.14[d]). In the context of this EIS, "no action" means that TEP's proposed transmission line is not built. For DOE and the cooperating agencies, "no action" would be achieved by any one of the Federal agencies declining to grant TEP its permission to build in its respective jurisdiction. Thus, in the case of DOE, "no action" means denying the Presidential Permit; for USFS, "no action" means denying the special use permit; for BLM, "no action" means denying access to BLM-managed Federal lands; and, for USIBWC, "no action" means denying permission to cross the international border. Each agency makes its own decision independently, so that it is possible that one or more agencies could grant permission for the proposal while others could deny permission. Thus, if any agency denies permission for the proposed transmission line, it would not be built.

1.2 PURPOSE AND NEED

Federal regulations implementing NEPA state:

"The statement [the EIS] shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action (40 CFR 1502.13)."

1.2.1 Applicant's Purpose and Need

TEP has provided the following purpose and need for the proposed project:

> TEP believes that the proposed project would have the potential to benefit both southern Arizona and northern Mexico with regard to the availability of electric power. TEP is responding to the need to improve transmission of electric power into the southern Arizona region and to assist Citizens (Communication Company) in meeting an ACC mandate that Citizens build a second transmission line to serve its customers in Santa Cruz County by December 31, 2003 (ACC Decision No. 62011).
>
> TEP signed a contractual agreement with Citizens to assist in responding to the ACC mandate. Following this, TEP and Citizens applied jointly to the ACC for a Certificate of Environmental Compatibility (CEC) on March 1, 2001 (TEP 2001). On January 15, 2002, the ACC granted a CEC to TEP and Citizens to construct the proposed project in the Western Corridor, in accordance with listed mitigation provisions (ACC Decision No. 64356, ACC 2002). TEP and Citizens will, if necessary, return to the ACC to request an extension of the original December 2003 in-service deadline. If TEP and Citizens do not meet the deadline, and the ACC does not grant an extension, TEP and Citizens would be in violation of an ACC order, and there may be monetary penalties associated with violating that order.
>
> While each circuit is thermally capable of transmitting 1,000 MW, the double circuit system has been designed and would be operated to transmit 500 MW total, for operational and reliability considerations (see Section 2.2.2). TEP reached agreement with Citizens to provide up to 100 MW of transmission capacity from Tucson to Nogales, Arizona. This would allow Citizens to improve reliability of electric service to its customers in Santa Cruz County. The proposed TEP 345-kV transmission line would provide a redundant path for the energy that is currently transmitted over the Citizens 115-kV transmission line from Tucson to Nogales, Arizona.

estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border, including an estimated 17 mi (27.4 km) that follows or crosses the EPNG pipeline ROW. The estimated length of the Crossover Corridor within the Coronado National Forest is 29.3 mi (47.2 km). The estimated length of the Crossover Corridor on lands managed by BLM is 1.25 mi (2.01 km).

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> TEP signed a contractual agreement with Citizens to assist in responding to the ACC mandate. Following this, TEP and Citizens applied jointly to the ACC for a Certificate of Environmental Compatibility (CEC) on March 1, 2001 (TEP 2001). On January 15, 2002, the ACC granted a CEC to TEP and Citizens to construct the proposed project in the Western Corridor, in accordance with listed mitigation provisions (ACC Decision No. 64356, ACC 2002). TEP and Citizens will, if necessary, return to the ACC to request an extension of the original December 2003 in-service deadline. If TEP and Citizens do not meet the deadline, and the ACC does not grant an extension, TEP and Citizens would be in violation of an ACC order, and there may be monetary penalties associated with violating that order.
>
> While each circuit is thermally capable of transmitting 1,000 MW, the double circuit system has been designed and would be operated to transmit 500 MW total, for operational and reliability considerations (see Section 2.2.2). TEP reached agreement with Citizens to provide up to 100 MW of transmission capacity from Tucson to Nogales, Arizona. This would allow Citizens to improve reliability of electric service to its customers in Santa Cruz County. The proposed TEP 345-kV transmission line would provide a redundant path for the energy that is currently transmitted over the Citizens 115-kV transmission line from Tucson to Nogales, Arizona.

Citizens committed to the purchase of 100 MW of transmission capacity from TEP to allow for future load growth above Citizen's current Santa Cruz County load of approximately 65 MW. Once TEP's proposed 345-kV transmission line is in-service, Citizens would be able to make some needed upgrades to its existing 115-kV transmission line that would allow it to achieve a capacity of 100 MW, thus allowing either line to serve Citizens' load for the foreseeable future.

TEP anticipates using the remaining 400 MW of capability for transport of energy between the United States and Mexico. Typically an electricity producer like TEP generates and sells its own electricity using its own transmission system. However, if DOE should decide to grant a Presidential Permit to TEP, it would include a condition in the permit requiring TEP to provide non-discriminatory open access transmission service on the subject international facilities. Open access is a regulatory policy which requires transmission owners to make their transmission facilities available for the transmission of electric energy by third parties. Therefore, while the TEP international facilities could be utilized for potential future electricity exports to Mexico, the source of those future electric energy exports might not necessarily be TEP.

TEP would initially use the two proposed fiber optic cables contained within the two neutral ground wires for supervision and operation of the transmission line and connected substations (TEP 2003).

1.2.2 Federal Agencies' Purpose and Need and Authorizing Actions

TEP needs approvals from DOE, USFS, BLM, USIBWC, and other Federal, state, and local agencies to implement various aspects of the proposed project. Because DOE, USFS, BLM, and USIBWC must all act in the early stages of project planning and, because their actions are interrelated, they have agreed to cooperate in preparing this EIS. The Final EIS will be used by DOE and cooperating agency officials to ensure that they have the information needed for purposes of informed decisionmaking. The decisions themselves are issued subsequent to the Final EIS, in the form of a Record of Decision (ROD) issued separately by each agency, or a letter of concurrence in the case of USIBWC.

DOE. The purpose and need for DOE action is to determine whether it is in the public interest to grant or deny a Presidential Permit to TEP for the construction, operation, maintenance, and connection of the proposed 345-kV transmission line that would cross the U.S. international border. DOE published a notice of receipt of the Application for a Presidential Permit in the *Federal Register* on September 20, 2000 (65 FR 56875). DOE's action is in response to the applicant's request for a Presidential Permit. Like all Federal agencies, DOE must comply with NEPA and, in this instance, has agreed to be the lead Federal agency for NEPA compliance.

In determining whether a proposed action is in the public interest, DOE considers the impact of the proposed project on the environment and on the reliability of the U.S. electric power supply system. DOE also must obtain the concurrence of the Departments of State and Defense before it may grant a Presidential Permit. If DOE determines that granting a Presidential Permit is in the public interest, the information contained in the EIS will provide a basis upon which DOE decides which alternative(s) and mitigation measures are appropriate for inclusion as conditions of the permit. In a process that is separate from NEPA, DOE will determine whether the proposed project will adversely impact the reliability of the U.S. electric system. Also, before authorizing exports to Mexico over the proposed 345-kV facilities, DOE must ensure that the export will not impair sufficiency of supply within the United States and will not impede, or tend to impede, the coordinated use of the regional transmission system. Issuance of a Presidential Permit only indicates that DOE has no objection to the project, but does not mandate that the project be completed.

USFS. USFS has provided its purpose and need as follows:

The purpose and need for USFS action is to determine whether the proposed 345-kV transmission line development is appropriate within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, and thus whether to issue a special use permit. If line development is appropriate, USFS would work with TEP to decide the site-specific location for the line and support structures, mitigation measures and best management practices to be implemented to reduce environmental effects, permit issuance terms and conditions, and pre- and post-construction reporting and monitoring.

USFS has received from TEP an application to cross certain Federal lands managed by USFS with a 345-kV transmission line. The NEPA analysis (EIS) must be adequate for use by the Forest Supervisor in issuing a special use permit for the project. The *Federal Land Policy and Management Act* of 1976 (FLPMA) is the appropriate authority for the authorization (FSM 2701.1-15[a][4]). The first step in the permit process was accomplished on April 20, 2000, when TEP submitted an application to USFS. A separate special-use permit would be required for any fiber optic line use that is not internal to TEP operations.

When an adequate analysis within the EIS is complete, USFS will issue a ROD disclosing its decision with regard to approval or denial of the special use permit application. The ROD will contain administrative appeal rights for exercise by those who believe the decision in the ROD is somehow in violation of law, regulation, or policy. USFS must complete the administrative review process prior to implementing the decision documented in the ROD.

A Coronado National Forest Land and Resource Management Plan (Forest Plan) (USFS 1986) amendment would be needed for any of the three action alternatives. The amendment process would have to be complete before implementation of the proposed project.

BLM. BLM has provided its purpose and need as follows:

The purpose and need for BLM action is to determine whether to approve an electrical transmission line ROW and a fiber optic ROW in accordance with the FLPMA. Because each of the corridor alternatives cross Federal lands managed by BLM, development of the proposed transmission line would require BLM approving two separate ROW grants, one for the transmission line and one for the fiber optics line. TEP applied to BLM on March 20, 2001, for approval to construct a double circuit 345-kV transmission line across 1.25 mi (2.01 km) of Federal lands approximately 5 mi (8 km) west of Sahuarita, and submitted its application to BLM for the proposed fiber optic facilities on April 14, 2003. The fiber optic permit application is for undefined use outside of TEP internal use, and would be renegotiated if the use changes. In processing the applications, BLM must consider land status, affected resources, resource values, environmental conditions, and the concerns of various interested parties. Complete guidance for implementing the NEPA process within BLM can be found in the BLM *Manual and Handbook 1790-1* (published October 25, 1988) and Departmental guidance (516 DM 1-7). BLM has an existing Resource Management Plan for all bureau properties that designates utility corridors and other uses. TEP's proposed alignment on BLM lands, which is the same for the Western, Central, and Crossover Corridors, is parallel to two existing TEP transmission line ROWs. TEP's proposed 125-ft (38-m) wide ROW is in an area not currently designated as a BLM utility corridor, but is within an area generally opened to ROW development on a case-by-case basis in the existing Phoenix Resource Management Plan (BLM 1988). A formal designation as a BLM utility corridor (which would require a Land Use Plan Amendment) is not necessary for approving a ROW for TEP. The lands crossed by the proposed project would need to be designated as a BLM utility corridor at a future date. Currently, there are no plans to take on the action of writing a Plan Amendment. The BLM parcels of land crossed by TEP's proposed alignment are currently identified as suitable for disposal (that is, lands that may be sold) through the state indemnity selection programs or state or private exchange.

In addition to the NEPA process, BLM is required to comply with the FLPMA, and must have the following items completed, which are underway concurrently with the EIS, before issuing a ROD:

- A detailed "Plan of Development" (TEP 2003) which outlines how the project will be constructed and the impacts to endangered species, cultural sites, and other affected management plans.
- An investigation, with recommendations for mitigation actions, relating to endangered species, cultural sites, and Resource Management Plans.

USIBWC. USIBWC has provided its purpose and need as follows:

The purpose and need for USIBWC action is to review plans for construction of the proposed project where it would cross the border between the United States and Mexico and assess whether the effects of the proposed project would be consistent with existing bilateral arrangements between the two countries or would obscure or otherwise impact the international border. Specific USIBWC concerns about the proposed project include evaluating whether there would be adverse impacts on the visibility and permanent placement of the international boundary monuments and markers, whether project-associated structures could limit access to the international boundary monuments and markers, whether the present drainage patterns to and from Mexico would be affected, and whether potential transboundary pollution problems associated with the proposed project are properly addressed to insure that none occur in either country. USIBWC will not approve any construction in the United States that increases, concentrates, or relocates overland drainage flows into either the United States or Mexico. Surface drainage must be handled so that there is no increase of volume, peak runoffs, or flow concentration across the border in either direction (USIBWC 2003). Prior to construction of the selected corridor, TEP would provide to USIBWC, for its approval, copies of any hydrological or hydraulic studies and site-specific drawings for work proposed in the vicinity of the U.S.-Mexico border. This would include review of any structures proposed to be constructed in any drainage courses that cross the border. USIBWC is a cooperating agency in preparation of this EIS, and typically will use information in an EIS in conjunction with review of project studies and plans to prepare a letter of concurrence, if appropriate, to the project proponents (in this case, TEP).

1.3 PUBLIC PARTICIPATION

Public participation in the EIS process includes two formal opportunities for input: (1) public scoping period, where interested or potentially affected agencies, organizations, tribes, and members of the public are invited to comment on the appropriate scope or content of the EIS, through comment submittal and public hearings; and (2) Draft EIS comment period, where interested or potentially affected agencies, tribes, organizations, and members of the public are invited to comment on the document and participate in public meetings. Comments received outside of these two formal comment periods are still considered, to the extent practicable. A summary of the public participation process to date for the TEP EIS, including the issues raised and the cooperating agencies' review of these issues, follows.

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The “Notice of Intent to Prepare an Environmental Impact Statement (EIS) and to Conduct Public Scoping Meetings and Notice of Floodplain and Wetlands Involvement” for the proposed project was published in the *Federal Register* (66 FR 35950) on July 10, 2001. Announcements were also placed in local newspapers. A factsheet translated into Spanish is provided on the proposed project website maintained for DOE (www.ttclient.com/TEP). Public scoping meetings were held by DOE on July 30, 2001, at the Rancho Resort in Sahuarita, Arizona, and on July 31, 2001, at the Rio Rico Resort in Rio Rico, Arizona. Both oral and written comments were invited and received at these meetings. A total of 65 individuals presented formal oral comments at the two public scoping meetings. Written scoping comments were also solicited in the announcements. The public comment period was initially to have closed on August 9, 2001, but, in response to requests from the public, was extended until August 31, 2001. From November 27 to 29, 2001, USFS, BLM, and USIBWC met with DOE to review all scoping comments received to date. As of November 27, 2001, approximately 200 people had submitted formal written scoping comments by letter, email, and postcard campaign. DOE and the cooperating agencies have continued to receive public comments up to the printing of this Draft EIS; the “interested party” mailing list for the project last totaled about 1,500 addresses. In addition to the public participation process, consultations are ongoing with Federal, state, and local resource management and regulatory agencies as well as interested tribal governments, as documented in Chapter 10 and Appendix A of this EIS. The Crossover Corridor was added for analysis in the EIS based on public and tribal input received during the public scoping period and tribal consultations.

The issues raised that are within the scope of the EIS are summarized first below; then, issues raised that are not within the scope of the EIS are discussed.

1.3.1 Issues Within Scope of the EIS

Three commentors made suggestions on combining portions of TEP’s proposed routes to make a new alternative. The Crossover Corridor, a combination of the northern portion of the Western Corridor and the southern portion of the Central Corridor, connected with a new segment through Peck Canyon, was added to this EIS as a reasonable alternative for analysis based on these comments and tribal consultations.

Other comments received that were addressed in the EIS are briefly summarized below:

Eleven commentors questioned TEP’s purpose and need for the project, and the role of the public in the decision-making process.

One hundred and eleven commentors raised issues regarding the biodiversity and visual beauty of the region. Particular areas highlighted included the Coronado National Forest, Pajarita Wilderness, Goodding Research Natural Area, Sycamore Canyon, Peña Blanca Lake Recreation Area, Juan Bautista de Anza Trail, and Chiltipene Botanical Area. Thirty-two commentors stated concerns about threatened and endangered species, invasive species, protection for wild raptors and birds of prey, and potential effects on tourism, hiking, photography, and birding in the area. Potential impacts to the Sonoran Desert Conservation Plan were also questioned.

Thirty-three commentors raised issues regarding effects on the local community, including the rural character of the area, socioeconomic issues, and historical and cultural resources. Concerns included the historic value of the Santa Cruz Valley, Tohono O’Odham Rancherias, historic mining properties, and Tubac Presidio State Historic Park.

Thirteen commentors raised issues regarding the potential impact of the proposed project on property values in the area.

Two commentors requested that environmental justice issues be examined in the EIS.

Twenty-four commentors questioned the potential effects on human health, including electric and magnetic field (EMF) effects, interference with specially designated flight airspace, the potential for sabotage by terrorists, and safety issues of co-locating a transmission line and a natural gas pipeline.

Fourteen commentors raised issues regarding the potential for erosion during construction, and floodplains and wetlands involvement, specifically the expansion of the South Substation within a floodplain.

1.3.2 Issues Out of Scope of the EIS

The following is a summary of issues raised by the public that are beyond the scope of the EIS.

Five commentors stated that the cumulative impacts of the proposed project and other potential future projects, such as a power plant proposed under development in Nogales, Arizona, by Maestros Group (Maestros 2003) or other power plants, should be evaluated. Consistent with CEQ guidance (CEQ 1997), cumulative impacts have been addressed in this EIS to the extent that the future projects are reasonably foreseeable, the potential resource area impacts overlap, and inclusion of the potential future projects would not be arbitrary. Neither the Arizona Department of Environmental Quality (ADEQ) nor the Pima County Department of Environmental Quality (PDEQ) has received any permit applications for new power plants in the project vicinity of southern Arizona (ADEQ 2003b, PDEQ 2003).

Three commentors suggested that Mexico may build power plants to sell electricity to the United States. DOE is not aware of any proposals by Mexico to build power plants to sell electricity to the United States in the area covered by this EIS. Thus, DOE considers this assertion to be speculative.

One commentor raised issues regarding the potential for development in southern Arizona along the central portion of the project due to increased availability of electricity. Whether or in what manner this proposed project may lead to additional development in southern Arizona is too speculative to be analyzed in this EIS.

Thirty-one commentors suggested additional alternatives to be considered in lieu of TEP’s proposed project. These alternatives included TEP building a power plant in Mexico or in Nogales, Arizona; exploring alternative sources of energy; and promoting energy conservation. These suggested alternatives would not fulfill TEP’s purpose and need, and are therefore not within the scope of this EIS.

Six commentors suggested that there might be negative effects on the reliability of the U.S. electricity grid due to the proposed connection to Mexico. While examining reliability of the U.S. electricity grid is part of DOE’s Presidential Permit application review process, such an examination does not involve a study of environmental impacts and does not require assessment in the EIS. Note that the reliability of local electricity service in Nogales, Arizona, was among the factors considered in screening alternatives.

Two commentors suggested coordinating routes and review processes with the Public Service of New Mexico’s (PNM’s) proposed transmission line project in the area. The NEPA process of the proposed PNM and TEP projects are being coordinated by DOE and cooperating agencies to the extent practicable. The consideration of impacts from the PNM proposal in this EIS is limited to potential cumulative impacts because the TEP and PNM proposals are at different stages of decisionmaking.

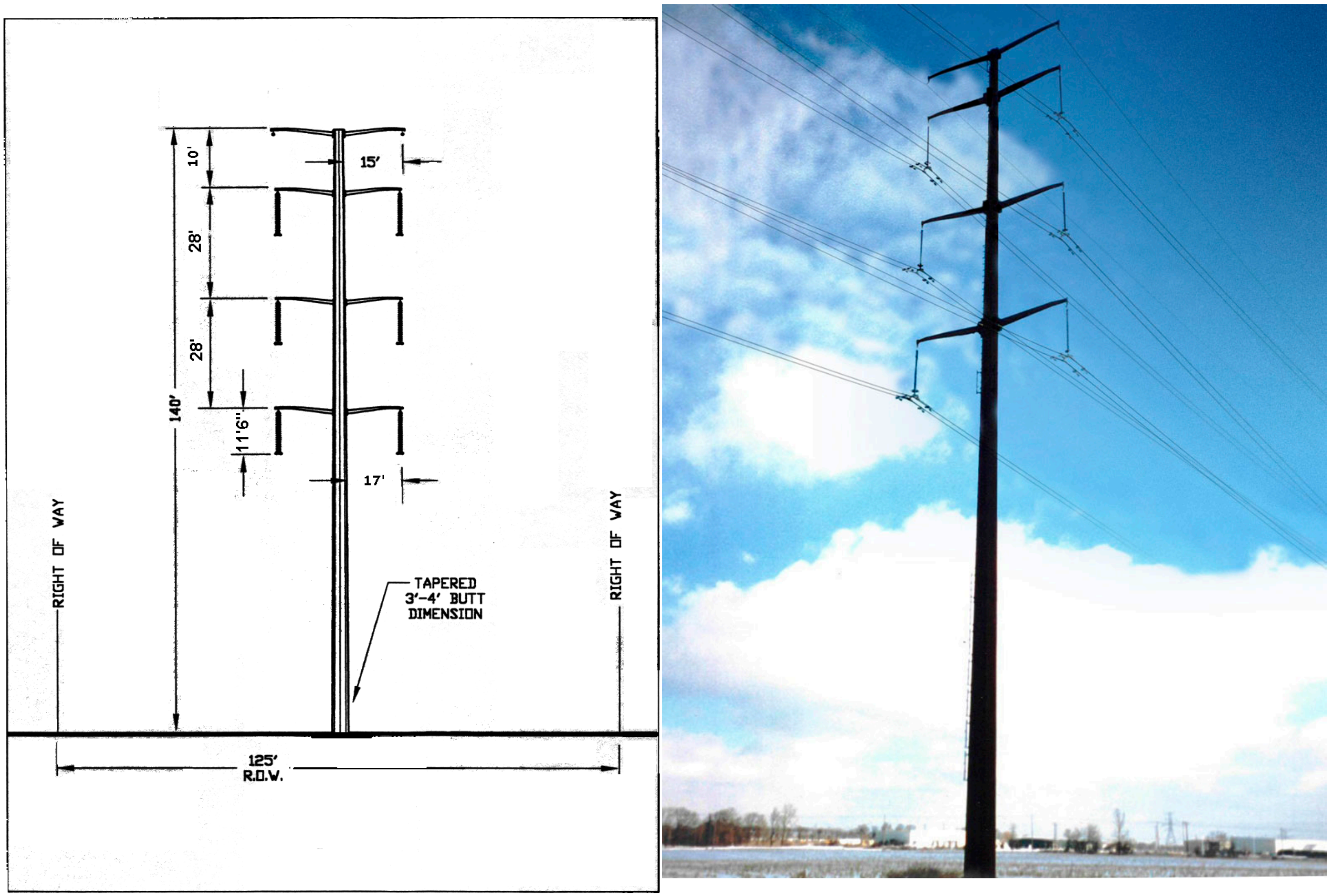
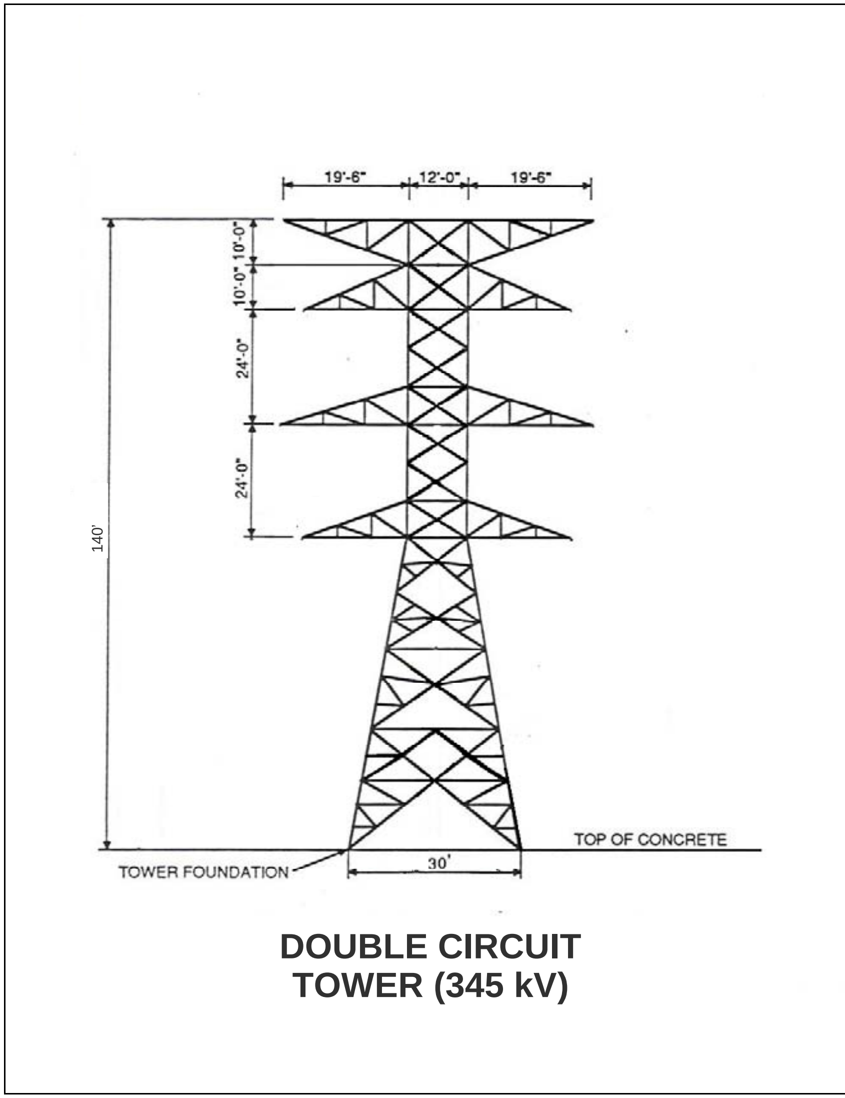


Figure 1.1–1. Monopole Transmission Line Structure Drawing and Photo.



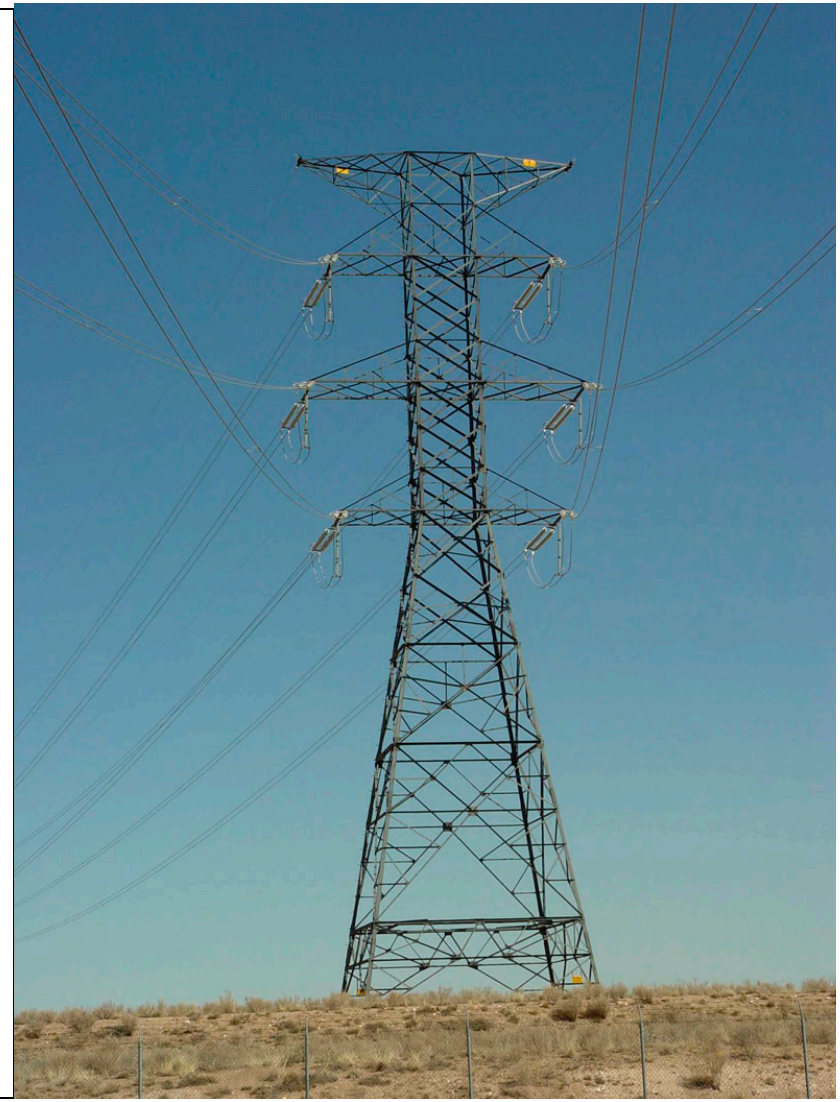


Figure 1.1–2. Lattice Tower Transmission Line Structure Drawing and Photo.

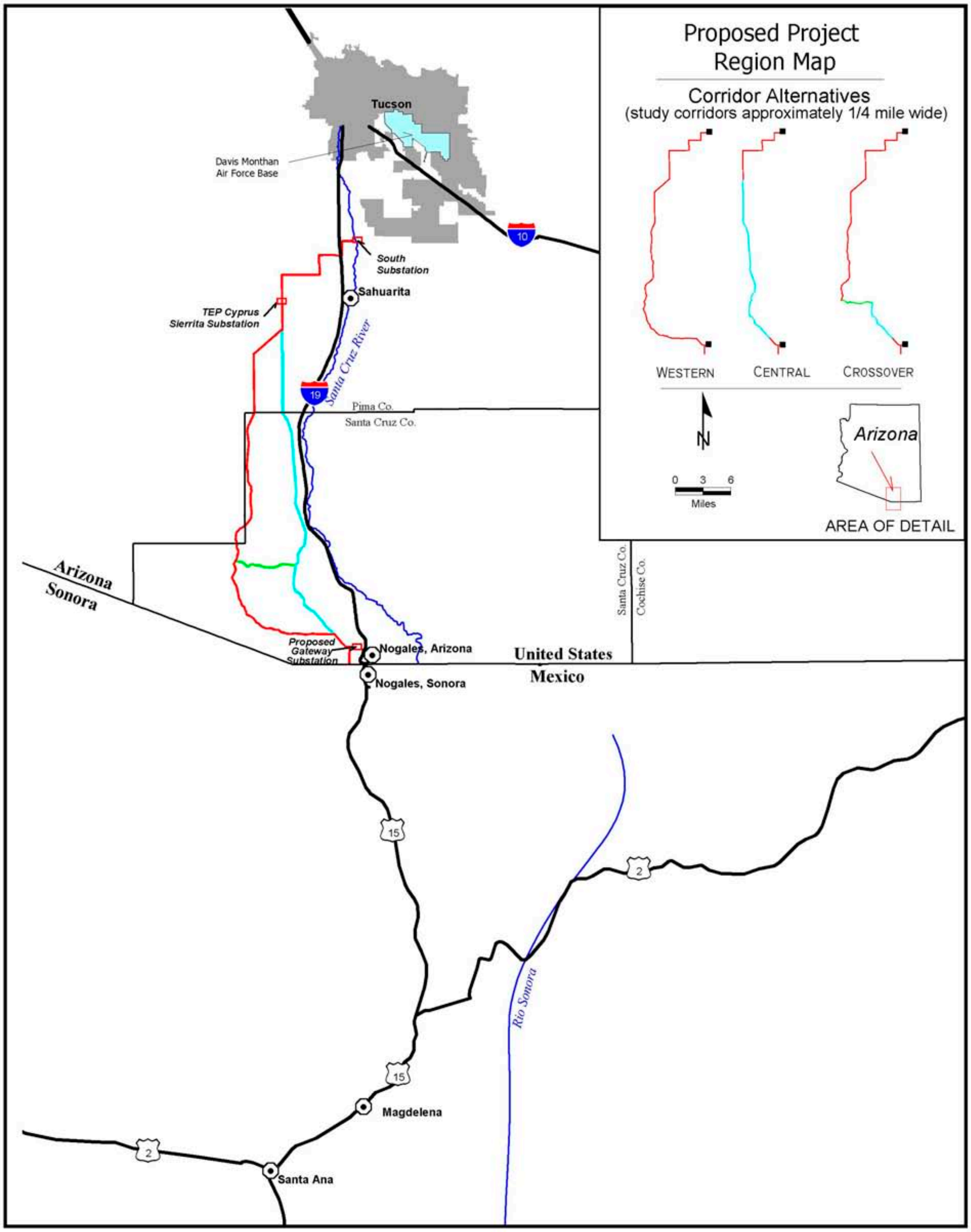


Figure 1.1–3. Proposed Project Region Map.

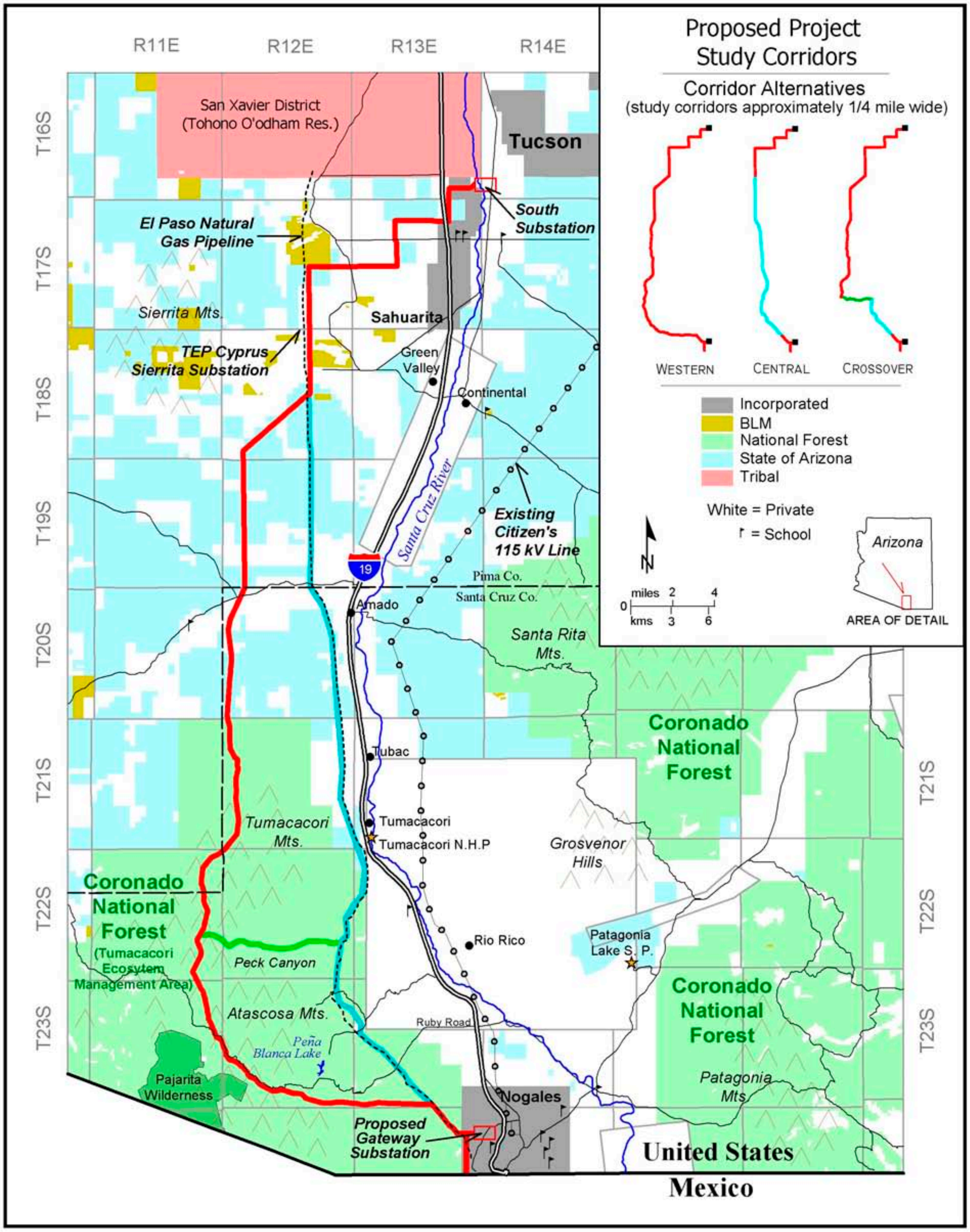


Figure 1.1–4. Proposed Project Study Corridors.

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This chapter discusses Tucson Electric Power Company's (TEP) proposed action and alternatives for building a 345-kV double circuit transmission line from Sahuarita to Nogales, Arizona, continuing to the U.S.-Mexico border. The proposed project includes construction of a new substation (Gateway Substation) in Nogales, expansion of the existing South Substation in Sahuarita, and construction of the associated transmission line. This chapter describes the process for identifying and evaluating alternatives, provides a detailed description of each alternative, including the No Action Alternative, and describes construction logistics. This chapter also presents a comparison of the expected impacts from alternatives based on the analysis in Chapter 4, and discusses measures to mitigate potential impacts.

2.1 ALTERNATIVES

The alternatives developed for the proposed project are alternative routes to interconnect TEP's South Substation with the proposed Gateway Substation. TEP's evaluation of interconnection schemes resulted in the development of three potentially viable corridors for transmission interconnection in southern Arizona. One of these, the Eastern Corridor, was eliminated from further analysis as a reasonable alternative in this Environmental Impact Statement (EIS), as explained in Section 2.1.4. An additional study corridor, the Crossover Corridor, was included for analysis in this EIS based on public and tribal input received during the public scoping period and tribal consultations. Thus, the three alternatives addressed in this EIS are the Western Corridor (the applicant's Preferred Alternative), the Central Corridor, and the Crossover Corridor.

To facilitate a thorough, specific evaluation of the existing potentially affected environment and of potential environmental impacts of the proposed project, TEP agreed to define a 0.25-mi (0.40-km) wide study corridor for each alternative, within which the 125-ft (38-m) transmission line right-of-way (ROW) would be sited. The precise siting of the transmission line ROW within the selected study corridor would be based on further engineering evaluation and mitigation of potential impacts on cultural, paleontological, visual, and ecological resources, including provisions of mitigation agreements with Federal, state, and local agencies as listed in Chapter 9, following the issuance of Records of Decision (RODs) by the lead and cooperating agencies.

TEP Corridor Identification Process. TEP has provided the following description of their corridor and substation location identification process:

> Commencing in 1995, TEP conducted a study to identify potential alternative routes from the U.S.-Mexico border to various tie points on TEP's utility grid. The first phase of this study was to develop an environmental screen to identify areas of concern and define those areas where the potential impacts may be minimal. TEP established a set of principles that was utilized to establish potential transmission line alignments. The principles were:
>
> - Stay within existing utility corridors where possible and to the extent practicable where doing so would not be detrimental to environmental and cultural factors.
> - Parallel existing infrastructures such as roads, trails and developed ROWs.
> - Follow existing legal or jurisdictional boundaries where possible. Boundaries considered were ownership or parcel boundaries; section, half section and quarter section lines, land grants, patented mining claims, and boundaries of cities, towns, or communities.
> - Avoid sensitive or regulatory areas where possible. Areas considered were known habitat of threatened or endangered species, floodplains and regulated water courses, wilderness or conservation areas, known cultural or historical sites, and visual resources.
> - Avoid the viewshed of the most concentrated residential areas.

TEP evaluated potential transmission line alignments on the following factors:

- The feasibility of construction and the cost. Included were environmental costs relating to the potential impacts and potential mitigation, the technical feasibility of constructing the transmission line, the construction costs, and the ability to acquire the necessary ROW.

- The ability to acquire all regulatory permits.

- The ability to meet TEP's purpose and need, including providing sufficient electric power reliability for Nogales, Arizona.

The routing of the transmission line was constrained by a need to connect to the existing South Substation at the northern end of the project.

For the proposed Gateway Substation, TEP initially considered the general area of the City of Nogales. TEP chose the area west of Interstate 19 (I-19) due to the dense development within the city and to avoid an unnecessary crossing of a major roadway (I-19). Topography limited the choices on the western side of I-19 to two locations. The first location (southern site) was located adjacent to a wash that would have been impacted by the grading necessary to level the site for construction. TEP selected the second site, the proposed Gateway Substation site, because grading activities would not impact any washes or associated natural resources.

Using these principles, TEP identified three alternative corridors, as described in Sections 2.1.1 and 2.1.2, and the Eastern Corridor described in Section 2.1.4. The three corridors overlap each other in certain segments. Refer to Figures 1.1–4 and 2.1–4 for an overview map of the three corridors. Figures 2.1–1, 2.1–2, and 2.1–3 show a close-up view of the Western, Central, and Crossover Corridors as they pass through Sahuarita and Green Valley, Amado, and near Nogales, respectively. Section 2.3 contains a comparison of the alternatives based on the analysis in Chapter 4.

The expansion to the existing South Substation, and the construction of the Gateway Substation (and fiber-optic regeneration site) would be the same for each of the three proposed corridors, as described in Section 2.2.1. The three 3-acre (1.2-ha) construction staging areas and the 80-acre (32-ha) temporary laydown yard would also be the same for each of the three proposed corridors, as described in Section 2.2.3, Construction Yard and Material Handling Sites. The proposed fiber-optic wires would contain at least 48 fibers each (TEP 2003).

2.1.1 Western Corridor

The Western Corridor, DOE's and TEP's Preferred Alternative, extends for an estimated 65.7 mi (105 km), from the South Substation to the U.S.-Mexico border, including 9.3 mi (15.0 km) that follows or crosses the El Paso Natural Gas Company (EPNG) pipeline ROW. The length of the Western Corridor within the Coronado National Forest is 29.5 mi (47.5 km), and an estimated 1.25 mi (2.01 km) on Bureau of Land Management (BLM) land. The Western Corridor would require an estimated 429 support structures (monopoles or lattice towers), including an estimated 191 within the Coronado National Forest and 8 on BLM land. Table 4.1–1 lists the estimated areas of land that would be displaced by structures and structure construction sites. TEP would use existing utility maintenance roads, ranch access roads, and, where no access currently exist, new access ways, as described in Section 4.12, Transportation. Approximately 20 mi (32 km) of new temporary roads would be built for construction of the Western Corridor on the Coronado National Forest (URS 2003a); spur roads off existing access roads to adjacent TEP transmission lines would provide project access on BLM land (see Figure 3.1–1, Existing Utility

Infrastructure). Transmission line tensioning and pulling and fiber-optic splicing sites would also temporarily disturb land, as described in Section 2.2.3, Transmission Line Construction. These sites would range from 0.5 to 1.5 acres (0.2 to 0.6 ha). There would be an estimated 12 sites outside of national forest lands occupying a total of 18 acres (7 ha), and an estimated 14 sites on the Coronado National Forest occupying a total of 10.5 acres (4.2 ha). The total new temporary area of disturbance on the Coronado National Forest during construction of the Western Corridor would be an estimated 197 acres (79.7 ha) (URS 2003a).

Following construction, TEP would close roads not required for project maintenance and would limit access to maintenance roads, in accordance with agreements with land owners or managers (for example, BLM or U.S. Department of Agriculture Forest Service [USFS]). On national forest land, the proposed project would not affect the existing road density because TEP is currently working with USFS to identify existing roads for closure, such that 1.0 mi (1.6 km) of existing road would be closed for every 1.0 mi (1.6 km) of proposed road to be used for project maintenance (see Section 4.12, Transportation). The maintenance access required by TEP would be limited to roads leading to selected structures, rather than a single cleared ROW leading to the U.S.-Mexico border. Transmission line tensioning and pulling sites, fiber-optic splicing sites, and construction yard areas would be cleared of construction-related facilities and materials within 6 months of the project becoming fully operational and the areas would be restored in accordance with agreements with land owners or managers.

The Western Corridor, together with the Central and Crossover Corridors, exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceeds westerly for 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). The corridors turn west across I-19 and continues through Pima County to the southwest, crossing an estimated 1.25 mi (2.01 km) of Federal lands managed by BLM parallel to two existing TEP transmission lines (138-kV and 345-kV). All corridors turn south and follow on the east side of the EPNG pipeline ROW for an estimated 5.8 mi (9.3 km), passing just east of the existing TEP Cyprus Sierrita Substation.

The Western and Crossover Corridors continue south past the Cyprus Sierrita Substation, then separate from the Central Corridor, continuing southwest and south and enter Santa Cruz County after approximately 10 mi (16 km). The Western and Crossover Corridors enter the Coronado National Forest 6.0 mi (9.7 km) south of the Santa Cruz County line. Where the Crossover Corridor turns east at Peck Canyon, the Western Corridor continues south along the west side of the Tumacacori and Atascosa Mountains, then meets and runs along the south side of Ruby Road as it turns gradually east, north of the Pajarita Wilderness. The Western Corridor continues south of Ruby Road then intersects the EPNG gas pipeline ROW and the Central and Crossover Corridors.

The Western Corridor, together with the Central and Crossover Corridors, continues through the national forest land, paralleling the EPNG pipeline ROW to the southeast for several miles to the Coronado National Forest boundary. The proposed corridors exit the national forest land onto private land and proceed 0.5 mi (0.8 km) east to the Gateway Substation. From the Gateway Substation, the proposed corridors return to the west through private land then turn south to parallel the Coronado National Forest boundary. The proposed corridors meet the U.S.-Mexico border approximately 3,300 ft (1,006 m) west of Arizona State Highway 189 in Nogales, Arizona.

2.1.2 Central Corridor

The Central Corridor extends for an estimated 57.1 mi (91.9 km), from the South Substation to the U.S.-Mexico border, including 43.2 mi (69.5 km) that follows or crosses the EPNG pipeline ROW. The estimated length of the Central Corridor within the Coronado National Forest is 15.1 mi (24.3 km), and 1.25 mi (2.01 km) on BLM land. The Central Corridor would require an estimated 373 support structures, including an estimated 102 within the Coronado National Forest and 8 on BLM land. Table 4.1–1 lists the estimated areas of land that would be displaced by structures and structure construction sites. TEP would use existing access where feasible as described for the Western Corridor. An estimated 13.8 mi (22.2 km) of temporary new roads would be built for construction of the Central Corridor on the Coronado National Forest (URS 2003a); spur roads off existing access roads to adjacent TEP transmission lines would provide project access on BLM land. Transmission line tensioning and pulling and fiber-optic splicing sites would also temporarily disturb land, as described in Section 2.2.3, Transmission Line Construction. These sites would range from 0.5 to 1.5 acres (0.2 to 0.6 ha). There would be an estimated 14 sites outside of national forest lands occupying a total of 21 acres (8.5 ha), and an estimated 7 sites on the Coronado National Forest occupying a total of 3.3 acres (1.3 ha). The total new temporary area of disturbance on the Coronado National Forest during construction of the Central Corridor would be an estimated 105 acres (42.5 ha) (URS 2003a).

Following construction, TEP would close new roads, construction areas, and existing roads not required for project maintenance, in accordance with agreements with land owners or managers, as described for the Western Corridor. Transmission line tensioning and pulling sites, fiber-optic splicing sites, and construction yard areas would be cleared within 6 months of the project becoming fully operational and the areas would be restored in accordance with agreements with land owners or managers.

The Central Corridor follows the same route as the Western and Crossover Corridors from the South Substation in Sahuarita to approximately 3 mi (4.8 km) south of the existing TEP Cyprus Sierrita Substation. Refer to Section 2.1.1, Western Corridor, for a description of this common segment. The Central Corridor separates from the Western and Crossover Corridors south of the TEP Cyprus Sierrita Substation, continuing to follow or cross the EPNG pipeline ROW to the south.

The Central Corridor approaches to within approximately 1.0 mi (1.6 km) west of I-19, passing Amado, Tubac, and Tumacacori. The Central Corridor continues approximately 2.0 mi (3.2 km) south of Tumacacori then enters the Coronado National Forest, following the EPNG pipeline ROW. The Central Corridor centerline is an estimated 0.5 mi (0.8 km) from the EPNG pipeline ROW for an estimated 1.9 mi (3.1 km) and avoids the USFS inventoried roadless area (IRA) as shown in Figure 3.1–1. The Central Corridor passes along the eastern edge of the Tumacacori and Atascosa Mountains, crosses Ruby Road, and reaches a point northwest of the Gateway Substation where it rejoins the Western Corridor (see Figure 1.1–4).

The Central Corridor is identical to the Western and Crossover Corridors from the point where they join in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 2.1.1, Western Corridor, for a description of this common segment.

2.1.3 Crossover Corridor

An additional study corridor, the Crossover Corridor, was included for analysis in this EIS based on public and tribal input received during the public scoping period and tribal consultations. The Crossover Corridor extends for an estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border. The estimated length of the Crossover Corridor within the Coronado National Forest is 29.3 mi (47.2 km) and 1.25 mi (2.01 km) on BLM land. The Crossover Corridor would follow or cross the EPNG pipeline for 17 mi (27.4 km). The Crossover Corridor would require an estimated 431 support structures, including 196 within the Coronado National Forest and 8 on BLM land. Table 4.1–1 lists the estimated areas of land that would be displaced by structures and structure construction sites. TEP would use existing access where feasible as described for the Western Corridor. An estimated 20.7 mi (33.3 km) of temporary new roads would be built for construction of the Crossover Corridor on the Coronado National Forest (URS 2003a); spur roads off existing access roads to adjacent TEP transmission lines would provide project access on BLM land. These sites and fiber-optic splicing sites would also temporarily disturb land, as described in Section 2.2.3, Transmission Line Construction. These sites would range from 0.5 to 1.5 acres (0.2 to 0.6 ha). There would be an estimated 12 sites outside of national forest lands occupying a total of 18 acres (7 ha), and an estimated 12 sites on the Coronado National Forest occupying a total of 7.6 acres (3.1 ha). The total new temporary area of disturbance on the Coronado National Forest during construction of the Crossover Corridor would be an estimated 238 acres (96.3 ha) (URS 2003a).

Following construction, TEP would close new roads, construction areas, and existing roads not required for project maintenance, in accordance with agreements with land owners or managers, as described for the Western Corridor. Transmission line tensioning and pulling sites, fiber-optic splicing sites, and construction yard areas would be cleared within 6 months of the project becoming fully operational and the areas would be restored in accordance with agreements with land owners or managers.

The Crossover Corridor is identical to the Western and Central Corridors from where it exits the TEP South Substation in Sahuarita to where it separates from the Western and Central Corridors in the Coronado National Forest. Refer to Section 2.1.2, Western Corridor, for a description of this common segment.

When the Crossover Corridor separates from the Western Corridor, it turns east through Peck Canyon for an estimated 7 mi (11.3 km). The Crossover Corridor joins the Central Corridor and the EPNG pipeline ROW upon exiting Peck Canyon on the east side of the Tumacacori Mountains. The Crossover Corridor is identical to the Western and Central Corridors from the point where they rejoin in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 2.1.1, Western Corridor, for a discussion of this common segment.

2.1.4 Alternatives Considered But Eliminated From Further Analysis

Based on TEP's alternative identification process, stakeholder input, and consideration by U.S. Department of Energy (DOE) and the cooperating agencies, the following alternatives, as shown in Figure 2.1–4 were eliminated from further analysis. Figure 2.1–4 also shows the Public Service Company of New Mexico's (PNM's) proposed transmission line corridors, for which PNM has applied to DOE for a Presidential Permit. The potential cumulative impacts of TEP's proposed project and PNM's proposed project are addressed in Chapter 5, Cumulative Impacts.

Eastern Corridor. The Eastern Corridor extends for an estimated 60.3 mi (97.0 km) from the South Substation to the international border, including an estimated 12.4 mi (20.0 km) within the Coronado National Forest. The Eastern Corridor exits the South Substation to the east for an estimated 6.0 mi (9.7 km), where it turns south along Wilmot Road and parallels the existing Citizens 115-kV transmission line (east of the community of Sahuarita and west of the community of Corona de Tucson). The Eastern Corridor continues south for another 6.5 mi (10 km) before reaching the turning point of the Citizens Communication Company (Citizens) existing transmission line alignment. At this point, the Eastern Corridor continues to parallel the Citizens transmission line southwest for an estimated 18.4 mi (29.6 km) to the vicinity of Amado-Montosa Road. Leaving the Citizens transmission line, the Eastern Corridor turns southwest for an estimated 2.9 mi (4.7 km) and crosses I-19. At this point, the Eastern Corridor joins TEP's Central Corridor and turns south along the existing EPNG pipeline ROW an estimated 1.0 mi (1.6 km) west of I-19 through Tubac and Tumacacori before entering the Coronado National Forest. Within the Coronado National Forest, the Eastern Corridor is identical to TEP's Central Corridor. The Eastern Corridor follows the EPNG pipeline ROW through the Tumacacori and Atascosa Mountains, and turns southeast an estimated 2.8 mi (4.5 km) north of Peña Blanca Lake. At a point northwest of the Gateway Substation, the Eastern Corridor rejoins the Western Corridor, which is also being considered for further analysis. From the point of intersection, the Eastern Corridor follows the Central and Western

Corridors to the Gateway Substation and the international border approximately 3,300 ft (1,006 m) west of Arizona State Highway 189 in Nogales, Arizona.

On July 3, 2002, TEP wrote a letter to DOE requesting that the Eastern Corridor alternative, originally proposed by TEP and included in the Notice of Intent (see Section 1.3, Public Participation), be removed from further analysis in the EIS (TEP 2002a). The following summarizes the reasons TEP gave for its request:

1. The route does not provide sufficient reliability for a second feed into Nogales, Arizona. Because the Eastern Corridor parallels the existing Citizens transmission line to Nogales, Arizona for approximately 20 mi (32 km), a single event such as a wildfire could cause the loss of both transmission lines, completely cutting off electricity transmission to Nogales, Arizona.

2. Encroachment along this route would necessitate many property condemnations to develop an adequate ROW. A combined ROW of at least 300 ft (91 m) would be required where the Eastern Corridor parallels the existing Citizens transmission line. Given the houses near the existing transmission line, approximately thirty or more parcels of land would be purchased and condemned.

3. Construction of the Eastern Corridor would require many lengthy outages of the existing Citizens transmission line, given its proximity, thereby cutting off transmission to Nogales during construction.

4. This route is more visually obtrusive than the Western or Central Corridors as expressed by residents of Green Valley, Tubac, and Tumacacori at DOE public scoping meetings and Arizona Corporation Commission (ACC) hearings for the proposed project.

TEP's decision not to pursue the Eastern Corridor alternative renders it infeasible, and DOE, in consultation with the cooperating agencies, has removed this alternative from further consideration in the EIS.

Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14) require Federal agencies to analyze only alternatives that are reasonable, that is, technically and economically practical and feasible. The rule of reason governs which alternatives the agency must discuss and the extent to which it must discuss them. Where a Federal Agency is the proprietor of a proposed project, it will consider the range of reasonable alternatives. However, where a proposed action is advanced by a non-Federal applicant, such as TEP, seeking a permit for a project, an agency ordinarily need not redefine the applicant's proposal or select alternatives that change the applicant's goals (*Citizens Against Burlington, Inc. v. Busey*, 938F.2d 190 [D.C. Cir.], *cert denied*, 502 U.S. 994 [1991]).

Because TEP has asserted that it does not want to pursue a given alternative route and DOE will not decide otherwise, it would be a waste of time and resources to evaluate an alternative that the applicant rejects. Accordingly, DOE has removed the Eastern Corridor from further analysis in the EIS. The applicant bears the risk that if it changes its mind in the future and again proposes the Eastern Corridor alternative, additional environmental review would be required.

I-19 Corridor. The I-19 Corridor leaves the South Substation westerly adjacent to the existing TEP 345-kV transmission line until it crosses I-19, where it turns south and continues approximately 46 mi (74 km) to the Mariposa Road exit in Nogales, Arizona, and then turns west to the Gateway Substation. The predominant considerations for eliminating this alternative from further analysis centered on the visual impacts through densely populated areas, and the potential impacts to cultural resources, given the proximity of a majority of the alternative route to the Santa Cruz River. Other considerations included safety and the interruption of I-19 traffic during construction.

East Central Corridor. The East Central Corridor follows the existing TEP 138-kV transmission line from the South Substation to the east and south until it reaches the Green Valley Substation at Whitehouse Canyon Road and the Old Nogales Highway, where it continues south along the railroad to the Pima County and Santa Cruz County boundary. At this point, it turns away from the railroad and proceeds to the southeast until it intersects the existing Citizens 115-kV transmission line at the turning point east of Amado. The alternative then proceeds southeasterly adjacent to the 115-kV line for an estimated 5 mi (8 km) before heading southeast toward Solero Canyon Road skirting the recreation area at Lake Patagonia an estimated 1.2 mi (1.9 km) west of the dam. The alternative proceeds south parallel to the eastern city limit of Nogales, until reaching State Route 82, where it turns and parallels the highway to the southwest for an estimated 2.5 mi (4.0 km) into Nogales. The predominant considerations for eliminating this alternative from further analysis were the impacts on the agricultural areas in the northern segments as the transmission lines would restrict aerial pollination and pest control, the close proximity to existing and proposed residential developments in the Sahuarita, Green Valley, Solero Ranch, and Nogales suburbs, and the hazard potential and height restriction adjacent to the Nogales International Airport.

Southeast Corridor. The Southeast Corridor leaves the South Substation to the east for an estimated 6.5 mi (10 km) before heading south along Wilmot Road, where it meets and parallels the existing Citizens 115-kV transmission line. The corridor follows this alignment for an estimated 5 mi (8 km) before both turn southwest for another 18.2 mi (29.3 km) then turn southeast. From this point, the corridor follows the East Central Corridor. This corridor was eliminated from further analysis for the same considerations as the East Central Corridor except that the impact to the agricultural areas was somewhat less and there were fewer residences in the Sahuarita and Green Valley area.

South 115-kV Connection. The South 115-kV Connection route provided an alternative within the southern portion of the study area. It could be a sub-route for any of the preceding routes from the point where the existing Citizens 115-kV transmission line turns southeast east of Amado. From the turning point, it goes approximately 5 mi (8 km) south by southeast and then turns south immediately adjacent to the 115-kV transmission line through low-density residential areas east of Tubac and Tumacacori. Further to the south, the route intersects the railroad and bears to the southeast as it enters Rio Rico. From this point, approximately 14.2 mi (22.8 km) north of Nogales, the route alternatively traverses residential development and riparian areas adjacent to the Santa Cruz River. This route was dismissed from further analysis because of the anticipated difficulty in acquiring adequate ROW within the Rio Rico and Nogales areas due to the potential impacts to the riparian areas and habitat, along with the visual impact to the areas east of Tubac and Tumacacori.

Construction of a Power Generating Station Near Nogales. This alternative would involve the construction of a new power generating facility within Santa Cruz County, in the proximity of Nogales and the I-19 corridor. This alternative was eliminated from further analysis because it would not fulfill TEP’s purpose and need of assisting Citizens in meeting ACC Order No. 62011 that includes a requirement to build a second transmission line to serve customers in Santa Cruz County by December 31, 2003.

Combining the Proposed 345-kV Transmission Line with Existing Lower Voltage Transmission Lines. This alternative would involve combining the proposed 345-kV transmission line with existing lower voltage transmission lines onto a single set of support structures to minimize the creation of new utility ROWs. The existing lower voltage transmission lines in the vicinity of TEP’s proposed project, as detailed in the existing infrastructure map shown in Figure 3.11-1, include TEP’s 46-kV and 138-kV transmission lines, Arizona Electric Power Company’s 230-kV transmission line, TRICO Electric Cooperative, Inc.’s 69-kV transmission line, and Citizens’ 115-kV transmission line. This alternative was eliminated from further analysis for the following reasons. The lower voltage transmission lines would be "underbuilt" beneath the 345-kV transmission lines, thus requiring the height of the proposed 345-kV structures to increase at least 30 ft (9.2 m), resulting in increased impacts to the viewshed. Combining different transmission lines onto a single set of support structures would mean that a problem with one structure would affect multiple transmission lines, thus potentially decreasing electrical reliability.

2.1.5 No Action Alternative

CEQ regulations require that an agency "include the alternative of no action" as one of the alternatives it considers (40 CFR 1502.14[d]). In the context of this EIS, "no action" means that TEP's proposed transmission line is not built. For DOE and the cooperating agencies, "no action" would be achieved by any one of the Federal agencies declining to grant TEP its permission to build in its respective jurisdiction. Thus, in the case of DOE, "no action" means denying the Presidential Permit; for USFS, "no action" means denying the special use permit; and, for BLM, "no action" means denying access to BLM-managed Federal lands. Each agency makes its own decision independently, so that it is possible that one or more agencies could grant permission for the proposal while another could deny permission. Thus, if any agency denied permission for the proposed transmission line, it would not be built. It may be possible that a transmission line would be built on private land and would not cross the U.S.-Mexico border. In that event, no approval by any Federal agency would be required.

2.2 CONSTRUCTION AND MITIGATION ACTIVITIES COMMON TO ALL ALTERNATIVES

2.2.1 Substation Upgrades and Additions and Fiber-Optic Regeneration Site

The expansion of the existing TEP South Substation, and construction of the Gateway Substation and fiber-optic regeneration site, would be the same for each proposed corridor. The South Substation in Sahuarita (see Figure 1.1–4) would be upgraded and expanded to provide interconnection between a new TEP 345-kV transmission line and the new Gateway Substation west of Nogales. The South Substation would be expanded by an estimated 1.3 acres (0.53 ha) to add a switching device that would connect to the proposed transmission line by moving the fenceline 100-ft (30-m) to the east.

The new Gateway Substation (see Figure 1.1–4) would include a 345-kV to 115-kV power transformer to provide power to the local area. The new Gateway Substation would be constructed within a developed industrial park north of Mariposa Road (State Route 189), an estimated 0.5 mi (0.8 km) east of the Coronado National Forest boundary (Northeast ¼ Section 12, Township 24 South, Range 13 East). The TEP portion of the site (the area that would be graded) is an estimated 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has purchased the substation site and preliminary construction activities have been completed.

Preparation of the new substation and substation expansion would require the following:

- Cut-and-fill grading to level the construction area to a smooth surface using existing soil
- Placement and compaction of soil brought in from offsite, as needed, to serve as a foundation for equipment
- Subsurface grounding grids (buried system of conductors to provide safety for workers)
- Grading to maintain drainage patterns
- Oil spill containment facilities
- Gravel-covered parking areas approximately 20 by 40 ft (6 by 12 m)
- Fences and gates

"underbuilt" beneath the 345-kV transmission lines, thus requiring the height of the proposed 345-kV structures to increase at least 30 ft (9.2 m), resulting in increased impacts to the viewshed. Combining different transmission lines onto a single set of support structures would mean that a problem with one structure would affect multiple transmission lines, thus potentially decreasing electrical reliability.

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The new Gateway Substation (see Figure 1.1–4) would include a 345-kV to 115-kV power transformer to provide power to the local area. The new Gateway Substation would be constructed within a developed industrial park north of Mariposa Road (State Route 189), an estimated 0.5 mi (0.8 km) east of the Coronado National Forest boundary (Northeast ¼ Section 12, Township 24 South, Range 13 East). The TEP portion of the site (the area that would be graded) is an estimated 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has purchased the substation site and preliminary construction activities have been completed.

Preparation of the new substation and substation expansion would require the following:

- Cut-and-fill grading to level the construction area to a smooth surface using existing soil
- Placement and compaction of soil brought in from offsite, as needed, to serve as a foundation for equipment
- Subsurface grounding grids (buried system of conductors to provide safety for workers)
- Grading to maintain drainage patterns
- Oil spill containment facilities
- Gravel-covered parking areas approximately 20 by 40 ft (6 by 12 m)
- Fences and gates

- Revegetation with native plants, leaving a 10-ft (3-m) clear zone around the outside perimeter of the fence for safety and security personnel
- Erosion control, such as placement of gravel within the fenced area

The maximum height of structures in the substations would be approximately 100 ft (30 m). The substation yard would be open-air and would include transformers, circuit breakers, disconnect switches, lightning/surge arresters, reactors (for voltage regulation), capacitors, bus (conductor) structures, and a microwave antenna. Each substation would have a new switchyard control shelter that would be a structure approximately 40 ft (12 m) wide by 60 ft (18 m) long, and approximately 20 ft (6 m) high, and it would be constructed of prefabricated material. Substation facilities would be enclosed by a chain-link fence with a locking gate with night lighting for security that would be shielded to prevent light from spilling offsite.

The substations would be designed and constructed to prevent and control accidental spills from affecting adjacent land uses and from reaching any waterbodies or courses in the vicinity of the switchyard. Containment structures would be constructed at the base of oil-filled equipment to contain spills. If a large volume of oil were to leak from a piece of electrical equipment, an alarm or a failure would occur notifying the operations center of the problem and a trained maintenance crew would be dispatched to the substation immediately to begin repairs and cleanup. Oil Spill Contingency plans and/or Spill Prevention Countermeasure and Control plans would be updated for the expansion of the existing substation. These plans explain clean-up and emergency notification procedures specific to each substation.

The ground level of the substation yard would be graded to direct the flow of water runoff. The yard would be covered with a layer of gravel (4 in [10 cm] or more thick) that would help inhibit erosion from stormwater runoff and discourage vegetation growth in the substation. Berms, or other barriers, also would be used around the perimeter of the yard (along the fence-line) to control runoff. Where needed, stormwater mitigation measures, such as retention ponds would be designed and constructed to contain runoff.

One fiber-optic regeneration site would be required. The precise location of this facility has not been determined. However, it would likely be located in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita on private land. The fiber-optic regeneration site would consist of an estimated 0.5-acre (0.2-ha) fenced yard, containing a 10 by 20 ft (3 by 6 m) concrete pad with an equipment house. The cleared area for the equipment house would be approximately 20 by 30 ft (6 by 9 m).

2.2.2 Transmission Line Structures and Wires

The proposed project would utilize primarily self-weathering steel single pole structures (monopoles), depicted in Figure 1.1–1. Dulled, galvanized steel lattice tower structures, depicted in Figure 1.1–2, would be used in specified locations for engineering reasons or to minimize overall environmental impacts (for example, impacts to soils or potential archaeological sites), as explained in Section 2.2.3 (ACC 2002). Monopoles occupy less acreage at the foundation than lattice towers, and monopoles generally allow a narrower ROW. The typical span between lattice tower structures is 1,000 to 1,200 ft (305 to 365 m), compared to 800 to 900 ft (244 to 274 m) between single pole structures, thus requiring fewer lattice tower structures to support a given distance of transmission line route. However, the overall height and breadth of the lattice towers would be greater for increased span lengths. For the proposed project, the distance between transmission line structures would be between 600 and 1,200 ft (183 and 365 m). Three slight variations of the monopole (the tangent structure, the turning structure, and the deadend structure) that are visually very similar to the monopole in Figure 1.1–1 would be used at various points along the route based on the turning angle of the transmission line and the elevation change between towers.

Likewise, a slight variation of the lattice tower structure (the turning structure) that is visually similar to Figure 1.1–2, would be used at various points along the route. The final footprint of each monopole is approximately 25 ft^2 (2.3 m^2) the final footprint of each lattice tower structure is approximately 3,600 ft^2 (334 m^2).

The monopoles would be a low reflectance steel material that self-weathers (oxidizes, or rusts) to form a protective surface coating resulting in a color similar to wooden utility poles. The lattice structures would be steel with a galvanized, dulled finish. Self-weathering monopoles require very little ongoing maintenance following construction, aside from initial inspections to ensure that all joints and surfaces are weathering properly. Self-weathering steel is not an option for lattice towers, as the joints on lattice towers could collect moisture that would interfere with the protective coating that prevents corrosion. Galvanized or painted finishes can be used on lattice towers to darken and reduce shine, but the galvanizing process shortens the life of the finish and painted towers require more access for ongoing maintenance. (Refer to Section 4.2 for a complete discussion of visual impacts and pole treatment options.)

The double-circuit structures would support two 345-kV, three-phase lines. Each circuit of a double-circuit transmission line consists of three phases; each phase consists of two sub-conductors (for a total of twelve transmission line wires). The circuits are each thermally capable of supplying 1,000 megawatts (MW), but the double circuit would be operated to transmit a total of 500 MW for operational and reliability considerations.

Under normal circumstances each circuit would carry 250 MW, but in an emergency situation where one circuit is out of service, the remaining circuit could carry the full 500 MW. Operation in this manner is in accordance with Western Electric Coordinating Council's reliability guidelines (WECC 2003). (The Western Electric Coordinating Council is one of ten electric reliability councils in North America composed of electric utilities that promote a reliable electric power system.)

The single pole structures would be approximately 140 ft (43 m) tall with four arms on each side approximately 28 ft (8.5 m) apart to support the conductors and the neutral ground wire. Lattice tower structures would be approximately 140 ft (43 m) tall and would have four arms extending on either side. The minimum height of the conductor above the existing grade would be 32 ft (9.8 m) for all outside temperature conditions. The neutral ground wire that provides for lightning protection and fiber-optic communications would be supported on the smaller of the four arms above the conductor arms. The proposed fiber-optic ground wires would contain at least 48 fibers each. Splicing sites would be required at certain points along the corridor (to be determined during final project design), and splicing boxes would be attached to the transmission line structures (TEP 2003).

2.2.3 Transmission Line Construction

Construction of the proposed transmission lines would include the following roughly sequential major activities performed by small crews progressing along the length of line:

- Surveying
- Staging area development
- Structure site clearing/access way establishment
- Foundation excavation
- Construction of tower base
- Structure assembly/erection

- Conductor stringing/tensioning
- ROW cleanup and restoration

The approximate number of personnel and type of equipment required for construction of the transmission lines are shown in Table 2.2–1. Figure 2.2–1 depicts some of the equipment required during construction. TEP anticipates an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. The project would be completed approximately 12 to 18 months after construction begins.

Table 2.2–1. Typical Personnel and Equipment for Transmission Line Construction.

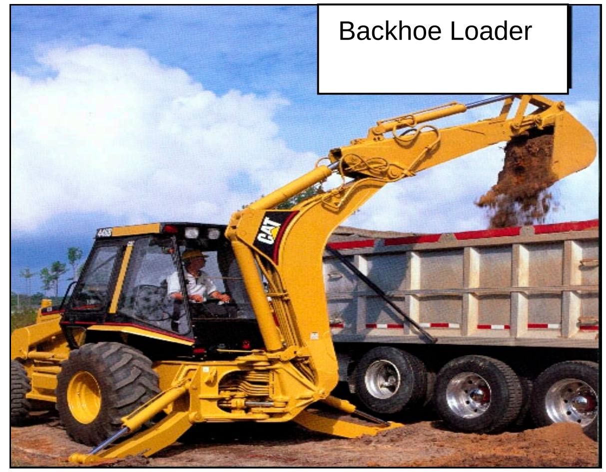
Activity	No. of Persons	Equipment
Clearing and grubbing	23	Flatbed truck, crawler bulldozer, jeep with auger, backhoe, side boom crane, equipment trailer, water spray truck
Foundation excavation/ construction	21	Flatbed truck, digger truck, loader, track air drill, tractor trailer, side boom crane, rough terrain crane, concrete truck
Structure erection	28	All terrain crane, tractor trailer, boom truck, concrete ready-mix truck, crew cab truck, line truck (bin body), lace boom crane
Conductor stringing	37	Crew cab flatbed, wire puller (truck mounted), crawler dozer, splicing buggy, wire tensioner (truck mounted), tractor and tandem axle reel trailer, pilot wire stringing truck, tractor trailer, truck mounted crane, aerial lift
Cleanup and road closures	9	Flatbed truck, crawler bulldozer, farm tractor with disc harrow

Source: TEP 2001.

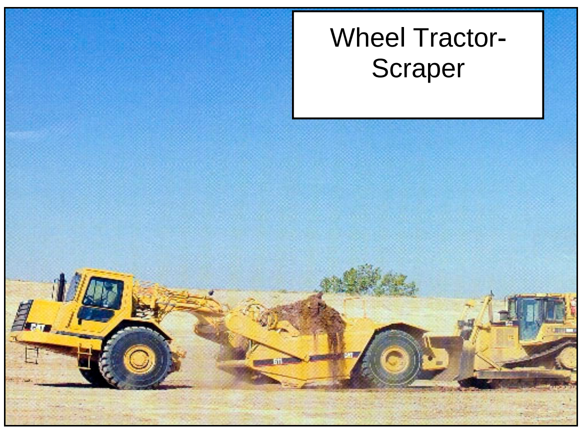
ROW Access. Access to the selected ROW for construction, operation, and maintenance of the proposed transmission lines would be on existing utility maintenance roads, ranch access roads and trails, and, where no access currently exists, new access ways. Construction access ways would be approximately 12 ft (3.7 m) wide to provide safe workspace for vehicle and construction equipment movement. Construction vehicle access would be along local roads, then along existing and new access roads as described in Sections 3.12 and 4.12. Siting of access roads would be coordinated with the affected property owners, USFS, U.S. Section of the International Boundary and Water Commission (USIBWC), and BLM to establish the most appropriate access to the structure sites. The Roads Analysis (RA) (URS 2003a) for the proposed project reflects TEP's consultations with USFS for siting and closing roads, including the criteria used by TEP to site proposed roads (see Section 4.13, Transportation). Practices to prevent the introduction or spread of invasive species (nonnative species transferred by human activity) would be established and followed in coordination with state and Federal agencies. Once access routes are selected, the vegetation within the access way would be removed, and vegetation along the edge of the access way would be pruned back to reduce damage during construction operations. Where the slopes are within appropriate limits for the safe operation of the construction equipment, no ground leveling would be done, in order to preserve the natural landform to near pre-construction conditions. Explosives blasting may be used as needed based on local geologic conditions.

Access by heavy construction equipment would be required to the site of each new structure. In the most sensitive or difficult terrain conditions, the access by construction workers may be by foot, and the materials and heavy equipment may be inserted by helicopter. Survey work would locate the transmission centerline, determine accurate profiles along the centerlines, and determine the exact location and rough profiles of access roads.

Water Truck



Backhoe Loader



Wheel Tractor Scraper

Dump Truck

Figure 2.2–1. Proposed Construction Equipment.

Excavator

Crane

Loader

Wheel Bulldozer

Figure 2.2–1. Proposed Construction Equipment (*continued*).

ROW and Structure Site Clearing and Grading. Preparation of the ROW would vary with ground cover and slope. In areas with a gentle slope and low vegetative cover, vegetation would be pruned to ground level. This method would keep the roots intact and maximize the restoration potential for areas not needed for ongoing maintenance access. This pruning would occur where such vegetation falls within the boundaries of a proposed access way. Cacti would be transplanted or held in designated holding areas along the edges of the access way for later use in revegetation. In areas with uneven terrain, construction crews would blade the ROW as necessary to ensure safe working conditions. All rocks and cut vegetation would be temporarily stockpiled along the ROW edges. This method of limiting the complete removal of vegetation improves the success of reclamation, increases habitat preservation, and decreases the potential for erosion.

The placement or scattering of the collected vegetative debris to create habitat or reduce surface erosion would be instituted where the collected vegetative debris would not be considered a potential fire danger. The areas near structure sites would be prepared by the "mobilization and environmental site preparation team" and delineated by flagging or degradable paint where appropriate.

Construction Yard and Material Handling Sites. Construction materials would be hauled to the construction yards from the local highways and then transported to structure sites using the methods previously described under ROW and Structure Site Cleaning and Grading. At each new structure site, an area would be disturbed by the movement of vehicles, assembly of structure elements, and other operations. The estimated area required for each monopole during construction is a 100 ft (30 m) radius circle, and each lattice tower would require an estimated 200 by 400 ft (61 by 122 m) area, more than twice the construction area required for monopoles.

Three temporary construction yards of no more than 3.0 acres (1.2 ha) each, and one temporary construction lay down yard of no more than 80 acres (32 ha) would be required. For each proposed corridor, the 3-acre (1.2-ha) yards would be located at the Gateway and South Substation sites, and near the Arivaca Road exit from I-19 in Amado. The 80-acre (32-ha) temporary construction lay down yard would also be located near the Arivaca Road/I-19 interchange in Amado. No construction yards would be located on national forest lands or lands managed by BLM. Temporary construction yards would serve as reporting locations for workers, parking space for vehicles, and storage for equipment and materials.

Foundation Excavation and Installation. The pole foundation would depend on the local geologic conditions. In areas of relatively intact bedrock near the ground surface, the poles would be supported on a rock bolted base, in which small holes (less than 6 in [15 cm] in diameter) are drilled into the bedrock and the tower is attached with large bolts. Areas with significant soil horizons would require direct embedment poles. This type of pole installation requires excavation of a shaft wider than the pole using a caisson-drilling rig, and then subsequent backfilling around the pole. In soils with large cobbles (rocks) or soils that tend to collapse, a large pit would be excavated and the pole would be placed in the pit. In such cases, a lean-concrete slurry may be required for backfill of the pit because soils with large cobbles are difficult to compact adequately (Terracon 2002). In extremely sandy areas, water or a gelling agent could be used to stabilize the soil before excavation.

Explosives blasting may be used in any of the three proposed corridors (including portions of each on the Coronado National Forest) as needed depending on geologic conditions. Typically, the depth to which a charge would be placed is approximately 3 ft (0.9 m) below ground level. The charge is limited to fracturing rock in a very localized area. Discharge of material is limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust dispersion. Once the fractured material is removed from the excavation, an additional 3 ft (0.9 m) would be drilled, charged, and blasted. This process would be continued until the desired depth is attained.

Spoil material (excavated soil) would be used for fill where suitable and the remainder would be spread at the tower site. Foundation excavation and installation may require a power auger or drill, crane, material truck, and ready-mix concrete trucks.

Structure Assembly/Erection. Erection crews would assemble the structures and, using a large crane, position them in foundation excavations or set them on the rock bolted base. In the event a structure location is not readily accessible by road, TEP would utilize helicopter construction techniques where feasible to install the structure. While tangent monopoles could be installed in sections by helicopter, the heavier angle and dead-end monopole structures exceed the weight capacities of even the largest helicopters. In the event that an angle or dead-end monopole structure would be needed in an inaccessible location, lattice towers would be used in place of the monopole because the lattice tower can be broken into several smaller sections light enough to helicopter to the site. Foundations for the tower could be hand dug using smaller equipment that could also be flown to the site by helicopter. When structures are brought in by helicopter, TEP could bring in equipment and personnel on a less improved road (narrower and requiring less construction disturbance to minimize steep grades and sharp turns). Note that TEP will use monopoles whenever possible. In situations where it is not possible to use monopoles, as discussed above, or where environmental impacts may be reduced due to the increased span between towers, then lattice towers would be constructed.

In accordance with ACC Decision No. 64356 (ACC 2002) requiring the use of lattice towers where their use would minimize overall environmental impacts, the primary criteria that TEP would use to identify locations for lattice towers would be whether the location is readily accessible by road. By using helicopter access to bring in structures where access by road is not available, and using lattice towers where necessary to make helicopter delivery feasible, TEP would minimize the need for new access roads or improvements to existing access roads. This would limit the area of disturbance and reduce potential impacts to a number of environmental resources (for example, soils, biological, cultural, and visual resources). In areas that are readily accessible by road, TEP would generally not use lattice towers as they disturb a larger area (see Section 2.2.2) and require increased ongoing maintenance access. TEP may use lattice towers at locations such as road crossings where their use would allow a longer span between structures. This would allow the structures to be placed farther away from the road, out of the immediate foreground for travelers on the road.

An estimated 20 to 25 structures would be brought in by helicopter for the Peck Canyon portion of the Crossover Corridor because of its topography and inaccessibility, but no structures are currently planned to be brought in by helicopter for the other alternatives (TEP 2003).

Shield Wire and Conductor Stringing. Reels of conductor and overhead shield wire would be delivered to wire-handling sites (ranging from approximately 0.5 to 1.5 acres [0.2 to 0.6 ha]) spaced about every 6 to 8 mi (10 to 13 km) along the ROW. Level locations would be selected so little or no earth moving would be required. These sites may have to be cleared of vegetation and would be disturbed by the movement of vehicles and by other activities. The conductors and shield wires would then be pulled into place from these locations. Stringing and tensioning sites and fiber-optic splicing sites would be selected to avoid environmentally sensitive resources, in coordination with land owners and managers. TEP has identified such potential sites on the Coronado National Forest in consultation with USFS (URS 2003a).

Helicopters would be used to install conductors on the support structures once in place. The process of pulling in conductors involves first pulling in small diameter ropes and placing the ropes in the stringing blocks (all done from the air), which are attached at the ends of the support arms and insulators. Once the small diameter ropes are pulled in at each conductor or phase location, the rest of the process is conducted from the ground at each end of the section to be strung. Use of helicopter for this operation would eliminate the need to cross terrain with vehicles to pull in the ropes between each structure, reducing impacts to the terrain between the pulling sites. The shield or fiber-optic ground wire would be installed in the same manner as described for the conductors.

Likewise, in the U.S.-Mexico border area, TEP expects that the transmission line would be strung by helicopter. All construction activities would be coordinated with the appropriate agencies on each side of the border. At a minimum, TEP expects the U.S. Border Patrol to be included. TEP anticipates that this effort would be coordinated with the Mexican proponent for the project and does not anticipate any ground disturbing activities within the reserved strip of land (a total of 120 ft [36.6 m]) along the international border (see Section 3.1.1, Land Use). The preliminary design of the project has the last U.S. pole on top of a hill and the first pole on the Mexico side also on top of a hill to adequately span the border (TEP 2003).

ROW Cleanup and Restoration. After construction and reclamation are complete, access to the permanent ROW would be on access roads approximately 12 ft (3.7 m) wide, in locations as specified in Sections 3.12 and 4.12, Transportation. TEP would restore access and construction areas not required for maintenance in accordance with agreements with land owners and managers. All construction areas not needed for normal maintenance would be graded to their original contour or to blend with adjacent landforms. Waste construction materials and rubbish from all construction areas would be collected, hauled away, and disposed of at approved sites, such as the Pima County Sahuarita Landfill. All areas to be revegetated would be reseeded with state-certified native seed mix to minimize erosion. Any damaged gates and fences would be repaired. To restrict access to maintenance roads, TEP would place barriers, boulders, fences, or locked gates across the maintenance roads as needed to meet the requirements of USFS, BLM, or private landowners.

Safety Program. TEP would require the transmission line contractor to prepare and conduct a safety program (subject to TEP's approval) in compliance with all applicable Federal, state, and local safety standards. The safety program would include, but not be limited to, procedures for accident prevention, use of protective equipment, medical care of injured employees, safety education, fire protection, and general health and safety of employees and the public. TEP would also establish provisions for taking appropriate actions in the event the contractor fails to comply with the approved safety program.

2.2.4 Operation and Maintenance

Use of the land in the ROW by the landowners would be permitted for any purpose that does not create a safety hazard or interfere with the rights of TEP. The day-to-day operation of the transmission line would be directed by system dispatchers in a power control center in Tucson. These dispatchers use communication facilities to operate circuit breakers that control the transfer of power through the lines. These circuit breakers also operate automatically to ensure safety in the event of a system incident such as a structure failure or a conductor failure.

An Annual Plan of Operations, that would be included as part of a USFS Special Use Permit, and a Plan of Development for BLM land, would require regular inspections for access control measures, drainage control, etc. TEP's preventative maintenance program for transmission lines would include routine aerial and ground patrols. Aerial patrols would be conducted twice a year, or upon operation of safety equipment that takes the transmission line out of service. Ground patrols would be conducted as necessary to detect equipment needing repair or replacement. Maintenance may include repairing damaged conductors and replacing damaged and broken insulators. Transmission lines are sometimes damaged by storms, floods, vandalism, or accidents and require immediate repair. Emergency repair would involve prompt movement of crews to repair damage and replace any unrepairable equipment. If access roads are damaged as a result of the transmission line repair activities, TEP would repair them as required.

Various practices would be utilized by TEP, in accordance with recommendations in this EIS, to prevent the introduction or spread of noxious weeds (invasive species which displace native species). Because of the arid nature of the proposed project area, very minor and infrequent measures would be necessary to control vegetation. TEP would not use any types of herbicides during the construction or long-term maintenance of the proposed transmission line ROW. TEP would continue their standard practice of using herbicides at substations as needed (TEP 2002b).

2.2.5 Standard Mitigation

TEP's Standard Mitigation Practices are documented in TEP's Environmental Protection Provisions application to the ACC (TEP 2001). Additional mitigation, if required, would be in agreements, permits, or ROW grants from land owners or managers (for example, in the Plan of Development agreement with BLM), in stipulations by the ACC, and in the U.S. Fish and Wildlife Service (USFWS) Biological Opinion, subsequent to ROD issuance. Table 2.2–2 presents the mitigation practices included in the proposed action.

Table 2.2–2. TEP Mitigation Practices Included in the Proposed Action.

1. All construction vehicle movement would be restricted to the ROW, designated access, contractor-acquired access, or public roads. No widening or upgrading of existing access roads would be undertaken in the area of construction and operation, except for repairs necessary to make roads passable as specified in the Roads Analysis (URS 2003a).
2. Structures would be placed to avoid sensitive features such as riparian areas, water courses, and cultural resource sites, or to allow electric wire conductors to clearly span the features within limits of standard structure design. This would minimize the amount of disturbance to the sensitive features.
3. Construction activities would be limited to the pole construction areas, staging areas, laydown area, and access described in this EIS, with activity restricted to and confined within those limits. TEP would develop a system of colored identification flags or survey markers to identify restricted areas such as wildlife zones, archaeological sites, or ROW boundaries. TEP would arrange mandatory preconstruction seminars and training sessions to acquaint field personnel with these provisions. No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate limits of survey or construction activity.
4. In construction areas where recontouring is not required, vegetation would be left in place wherever possible and original contour would be maintained to avoid excessive root damage and allow for resprouting.
5. In construction areas (e.g., construction yards, tower sites, spur roads from existing access roads) where ground disturbance is substantial or where recontouring is required, surface restoration would occur as required by the landowner or land management agency. The methods of restoration normally would consist of returning disturbed areas to their natural contour or to blend with adjacent landforms, reseeding (if required), installing cross drains for erosion control, placing water bars in the road, or filling ditches. These instances would be reviewed on a case-by-case basis to limit access into the area and visual disturbance.
6. Watering facilities and other range improvements would be repaired or replaced, if they are damaged or destroyed by construction activities, to their condition prior to disturbance as agreed to by the parties involved.
7. Towers and/or ground wire would be marked with highly visible devices, such as colored balls or lights, if required by governmental agencies (e.g., Federal Aviation Administration, U.S. Air Force). Consultations with these agencies regarding required visual markers for each corridor are ongoing, as documented in Appendix A. It is currently anticipated that no visual markers such as colored balls or lights would be required for the proposed project.
8. Prior to construction, all supervisory construction personnel would be instructed on the protection of cultural, paleontological, and ecological resources, including mitigation measures required by Federal, state, and local agencies. To assist in this effort, the construction contract would address (a) Federal and state laws regarding antiquities, fossils, plants and wildlife, including collection and removal; and (b) the importance of these resources and the purpose and necessity of protecting them.

Table 2.2–2. TEP Mitigation Practices Included in the Proposed Action (*continued*).

9. Cultural resources would continue to be considered during post-EIS phases of project implementation. This would involve intensive surveys by TEP and/or contractors to inventory and evaluate cultural resources within the selected corridor and any appurtenant impact zones beyond the corridor, such as access roads and construction equipment yards. In consultation with appropriate land managing agencies such as USFS and BLM, and the State Historic Preservation Officer (SHPO), specific mitigation measures would be developed and implemented for National Register of Historic Places (NRHP)-eligible resources to mitigate any identified adverse impacts. These may include project modifications to avoid adverse impacts, monitoring of construction activities, and data recovery studies. Native American groups, tribes, and communities would be consulted to determine whether there are effective or practical ways of addressing impacts on traditional cultural properties and archaeological sites.
10. TEP would respond to and resolve individual complaints of radio or television interference generated by the transmission line.
11. TEP would apply mitigation needed to eliminate problems of induced currents and voltages onto conductive objects sharing an ROW to the mutual satisfaction of the parties involved.
12. All construction and maintenance activities would be conducted in a manner that would minimize disturbance to vegetation, soils, drainage channels, and intermittent or perennial streambanks in accordance with the Coronado National Forest annual maintenance plan, BLM requirements, and all state, county, and local requirements. TEP would follow Best Management Practices (BMPs) for the construction of the entire length of the selected corridor. In addition, all construction activities would include dust-control measures. All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line, in accordance with USFS or BLM.
13. All requirements of those entities having jurisdiction over air quality matters would be adhered to and any permits needed for construction activities would be obtained.
14. Fences and gates would be repaired or replaced to their original condition prior to project disturbance as required by the landowner or the land management agency if they are damaged or destroyed by construction activities. Temporary gates would be installed only with the permission of the landowner or the land managing agency.
15. No non-biodegradable debris would be deposited anywhere in the project vicinity. Slash and other biodegradable debris would be left in place or disposed of in accordance with agency and/or landowner requirements.
16. If required, mitigation measures developed during the consultation period under Section 7 of the *Endangered Species Act* (ESA) would be adhered to as specified in the Biological Opinion of the USFWS. Also, TEP would adhere to mitigation developed in conjunction with state and tribal authorities.
17. Regulated materials would not be released onto the ground or into streams or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials would be sent to a disposal facility authorized to accept these materials, such as the Pima County Sahuarita Landfill.
18. The ROW would be aligned to the extent practicable to reduce impact on the residences and inhabitants nearby.
19. Special status species or other species of concern would continue to be considered during post-EIS phases of project implementation in accordance with management policies set forth by the appropriate land managing agency. This may entail TEP conducting surveys for plant and wildlife species of concern along the proposed transmission line route and associated facilities (i.e., access and spur roads, staging areas) as agreed upon by USFS, BLM, USFWS, Arizona State Game and Fish Department, and TEP. In cases where such species are identified, appropriate action would be taken to avoid adverse impacts on the species and its habitat and may include altering the placement of roads or towers as practicable, monitoring construction activities or seasonal restrictions such as not constructing during breeding seasons. The project would be designed and constructed in accordance with raptor protection guidelines, as referenced in Section 4.3, Biological Resources.
20. The alignment of any new access roads would be designed to minimize overall impacts, including ground disturbance and visual impacts.

Table 2.2–2. TEP Mitigation Practices Included in the Proposed Action (*continued*).

21. As smoke is a conductor of electric current, when a fire is in the vicinity of the proposed 345-kV transmission lines, firefighters would monitor for possible fire starts outside the fire perimeter. Firefighters would remain at a distance that would not leave them vulnerable to the electric current or shock.
22. Practices such as cleaning of construction equipment, to prevent the introduction of spread of invasive species, would be developed and followed in accordance with applicable requirements.

2.3 COMPARISON OF ALTERNATIVES

Table 2.3–1 presents a comparison of the alternatives based on the analysis in Chapter 4.

The resource areas evaluated for potential impacts are:

- Land use
- Recreation
- Visual resources
- Biological resources
- Cultural resources
- Socioeconomics
- Geology and soils
- Water resources
- Air quality
- Noise
- Human health and safety
- Infrastructure
- Transportation
- Minority and low-income populations (environmental justice)
- Cumulative impacts

The following discussion emphasizes the environmental implications of choosing among alternatives, organized by resource area. Where impacts are similar among the Western, Central, and Crossover Corridors, these alternatives are referred to collectively as the action alternatives (as compared to the No Action Alternative). Both temporary impacts during construction (approximately 12 to 18 months) and long-term impacts during operation of the project are considered. This discussion is followed by Table 2.3–1, which provides a more quantitative look at the differences among alternatives. In general, the No Action Alternative has the least impact on the environment as it does not involve ground disturbing activities or introduction of a transmission line into the visual landscape. Each action alternative impacts different resources in different ways, as described below.

Land Use. The Central Corridor is shorter than the Western and Crossover Corridors. The Western and Crossover Corridors each have a longer segment on the Coronado National Forest than the Central Corridor. All three corridors are identical with respect to BLM land and cross the U.S.-Mexico border in the same location.

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Land Use. The Central Corridor is shorter than the Western and Crossover Corridors. The Western and Crossover Corridors each have a longer segment on the Coronado National Forest than the Central Corridor. All three corridors are identical with respect to BLM land and cross the U.S.-Mexico border in the same location.

Temporary land use impacts would occur as a result of support structure construction areas, staging areas, and temporary access roads that would be re-vegetated in accordance with agreements with land owners or managers and closed following construction. Besides physically changing the use of the land either temporarily or permanently, land use changes can impact all other resource areas as described below. Monopoles, which would be the primary support structure used by TEP, require a smaller area of disturbance (25 ft^2 [2.3 m^2]) than lattice tower structures (3,600 ft^2 [334 m^2]), and lattice towers require more ongoing access for maintenance. The temporary area of new disturbance on the Coronado National Forest would be greatest for the Crossover Corridor, followed by the Western Corridor and the Central Corridor. The total land area occupied by the final footprint of the towers for the entire corridor is less than 0.3 acres (0.12 ha) for each action alternative. In addition, access roads would be required to some support structures.

A Forest Plan amendment would be required to implement any of the three proposed corridors on national forest land. Because the Central Corridor has the longest segment that follows or crosses an existing EPNG pipeline ROW, fewer new access roads would be required than for the other alternatives, although considerable upgrade would be required for some existing pipeline ROW access roads. On BLM land, the project is adjacent to existing transmission lines within a utility corridor. Outside the Coronado National Forest, each proposed corridor is compatible with current land use and land use plans.

Recreation. Activities in the project area include hiking, biking, birding, photography, rock climbing, horseback riding and off-road vehicle use. These activities are mostly concentrated within portions of the Coronado National Forest, and along the east side of the Tumacacori Mountains where the Central Corridor follows outside of the Coronado National Forest boundary. Off-road vehicle use occurs more broadly throughout the project area. The primary impact to these activities would be a change in the visual setting where recreation occurs. None of the three corridors are visible from Peña Blanca Lake on the Coronado National Forest, a popular location for recreation.

In addition, DOE, in consultation with USFS performed a USFS Recreation Opportunity Spectrum (ROS) analysis for the proposed project on national forest land evaluating the project's impact on seven setting indicators (characteristics) established by USFS that contribute to a recreation experience. USFS provided the following language in summary of this analysis:

> The Central Corridor would minimize the total mileage on national forest land and would impact three setting indicators (Remoteness, Naturalness, and Facilities and Site Management) in an inconsistent[1] or unacceptable[2] way. The Western and Crossover Corridors would impact the same three setting indicators on national forest land as the Central Corridor. The Crossover Corridor is the only alternative with major impacts to a Semi-Primitive Non-Motorized area (approximately 3 mi [5 km] through the Peck Canyon inventoried roadless area [IRA]). The Western and Crossover Corridors would have higher total mileage on national forest lands than the Central Corridor. Accordingly, the Western and Crossover Corridors would have greater overall impacts than the Central Corridor to ROS settings on the Coronado National Forest.

Visual. Visual impacts would occur from the introduction of steel support structures, access roads, and transmission line wires into the landscape. Structures would be primarily 140-ft (43-m) high self-weathering monopoles, similar in color to wood utility poles. With the exception of a reduction in

[1] As defined in the ROS, inconsistent means conditions that are not generally compatible with the norm, but may be necessary under some circumstances to meet management objectives.

[2] As defined in the ROS, unacceptable means conditions that, under any circumstance, do not fall within the maintenance of a given class. Where unacceptable conditions are unavoidable, a change in the ROS setting will often result, which must be handled appropriately in the USFS NEPA planning process.

existing High Scenic Integrity (degree of intactness and wholeness of the landscape) associated with the Western and Crossover Corridors near the Pima and Santa Cruz County line, the existing Moderate to Low Scenic Integrity would not be reduced for the area crossed by each corridor outside of the Coronado National Forest, including the BLM land. The Central Corridor has the longest length outside of the Coronado National Forest, and would be intermittently visible to more residents than the other corridors given its closer proximity to the towns of Amado, Tubac, and Tumacacori.

On the Coronado National Forest, per analysis using the USFS Scenery Management System (SMS), the area of land that would have reduced Scenic Integrity as a result of construction and operation of the Western or Crossover Corridors is approximately double the area of reduced Scenic Integrity for the Central Corridor. The Western Corridor would be in wide-open view from a longer stretch of Concern Level 1 (primary) travelways on and nearby the Coronado National Forest than the Central or Crossover Corridors would be. While siting the Western Corridor transmission line immediately adjacent to portions of Ruby Road would have a maximum visual impact along Ruby Road, it would protect the viewshed to the south (towards the Pajarita Wilderness) for the public (including photographers) and would eliminate the need for highly visible access roads in this portion of the Western Corridor.

The Central Corridor would minimize the total mileage on national forest land resulting in reduced Scenic Integrity of approximately 9,668 acres (3,912 ha) on national forest land. The Western and Crossover Corridors would have higher total mileage on national forest lands than the Central Corridor, and the Western and Crossover Corridors would result in approximately 18,511 to 18,736 acres (7,491 to 7,582 ha) of reduced Scenic Integrity on national forest lands. Accordingly, the Western and Crossover Corridors would have greater overall visual impact on the Coronado National Forest than the Central Corridor.

Biological Resources. There is a potential for impacting habitat of existing native plant communities located within the ROW and new access road areas during construction. Clearing would be limited to areas required for access roads and structures. Because the proposed project would be in an arid area, where vegetation recovers very slowly, disturbances due to construction could have long-term impacts.

The Western Corridor has the highest potential for adverse effects to special status species. None of the proposed corridors cross any federally designated Critical Habitat for any threatened or endangered species. The corridors include the current range and habitat types for 7 to 10 species listed under the ESA. The federally listed endangered Pima pineapple cactus is known to occur in each of the three proposed corridors. Additional species-specific surveys would be conducted for the selected corridor before construction activities begin. DOE has initiated consultation under Section 7 (a)(2) of the ESA with the U.S. Fish and Wildlife Service (USFWS). The formal consultation process between DOE, USFS, BLM, and USFWS will begin when DOE tenders its biological assessment of the alternatives to USFWS.

Cultural Resources. Consultation under Section 106 of the NHPA with the State Historic Preservation Officer (SHPO) and Native American communities/tribes/nations has been initiated and is ongoing. Multiple prehistoric and historic archaeological sites have been identified within each corridor, though a large percentage of each corridor has not been surveyed. A low density of cultural resource sites would be expected along most of the Western and Crossover Corridors; a higher density of cultural resource sites would be expected along the Central Corridor segment near the Santa Cruz River. Although there may be a greater number of cultural resource sites in the Central Corridor, the majority of these have already been disturbed by construction of the existing EPNG pipeline. The impacts would be based on the area of land disturbance, and on the overall impact to the landscape. A Cultural Resource survey of the proposed ROW prior to construction would mitigate impacts.

DOE initiated government-to-government consultation with the tribal governments of the 12 Native American communities/tribes/nations that are likely to have traditional concerns in the area:

- Ak-Chin Indian Community
- Fort Sill Apache Tribe
- Gila River Indian Community
- Hopi Tribe
- Mescalero Apache Tribe
- Pascua Yaqui Tribe
- Salt River Pima-Maricopa Indian Community
- San Carlos Apache Tribe
- Tohono O'Odham Nation
- White Mountain Apache Tribe
- Yavapai Apache Nation
- Pueblo of Zuni

Consultation has included information-sharing meetings with DOE and its representatives, and site visits arranged at the tribes' requests. (Note that the initial tribal consultations were for the Western, Central, and Eastern Corridors, originally proposed by TEP; refer to the following paragraph for a description of introduction of the Crossover Corridor in tribal consultations.) Representatives of several tribes have stated that they are opposed to the project, but they would prefer that the project be constructed along the Central Corridor, if it is to be built at all. Tribal consultations are ongoing. No specific traditional cultural properties (TCPs) have been identified along either the Western or the Central Corridors to date by the above consulted tribes.

DOE representatives have presented the Crossover Corridor, developed in response to public and tribal input during scoping, to tribal representatives from the Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa and Ak-Chin Indian Communities as well as the Intertribal Council of Arizona. Noting that the Crossover Corridor is in largely undisturbed territory, tribal representatives have stated that the project be constructed along the Central Corridor, but tribal consultations are ongoing.

Socioeconomics. The construction costs of each of the three action alternatives are roughly similar, approximately $70 million plus or minus $7 million. The construction of any of the three proposed corridors would create approximately 30 direct (construction) jobs, and approximately 31 indirect (service-related) jobs, which would benefit Santa Cruz and Pima Counties. No influx of population or stress to community services would be expected from project construction. No socioeconomic impacts would be expected from project operation because most jobs created would be filled by current residents.

During the public scoping process for the Draft Environmental Impact Statement (EIS), several commentors expressed concern that existence of the proposed transmission line would negatively impact real property values. In this context, any decrease in property values would be perception-based impact, that is, an impact that does not depend on actual physical environmental impacts resulting directly from the proposed project, but rather upon the subjective perceptions of prospective purchasers in the real estate market at any given time. Courts have long recognized that such subjective, psychological factors are not readily translatable into quantifiable impacts. See, for example, *Hanly v. Kleindienst*, 471 F.2d 823, 833 n.10 (2d Cir. 1972), *cert. denied*, 412 U.S. 908, (1973). People do not act consistently in accordance with negative perceptions, and one person's negative perception might be another's positive. Also, perceptions of value may change over time, and perceptions of value are affected by a host of other factors that have nothing to do with the proposed project. Accordingly, any connection between public perception of a risk to property values and future behavior would be uncertain or speculative at best, and therefore would not inform decision making.

There have been studies of the impact of transmission lines and property values in other geographic areas. See, for example, discussion of these studies in the *Environmental Impact Statement for Schultz-Hanford Area Transmission Line Project* (DOE 2002). Based on these studies, DOE can conclude only that, at worst, it is possible that there might be a small negative economic impact of short duration to some properties from the project, and that the impact on value would be highly variable, individualized, and unpredictable. The studies at most conclude that other factors, such as general location, size of property, and supply and demand factors, are far more important criteria in determining the value of residential real estate.

Accordingly, while DOE recognizes that a given property owner's value could be affected by the project, DOE has not attempted to quantify theoretical public perceptions of property values should the proposed project be built.

Geology and Soils. The construction of any of the three proposed corridors would not impact geologic resource availability or mine tailing piles west of Interstate 19 in the northern portion of the project. Slope stability analysis for potential tower locations in mountainous areas would prevent slope failure. Low to moderate seismic risk would be considered in structure design. Direct embedment pole construction techniques (requiring excavation) would be used in unconsolidated soils, while rock bolted bases would be used in areas of relatively intact bedrock near the ground surface. Best Management Practices (BMPs) to minimize soil and water impacts would be developed in coordination with USFS, BLM, and ADEQ before construction, and would be implemented for the entire corridor selected.

All three proposed corridors cross small areas of soils considered to be prime farmland when irrigated.

Water Resources. No adverse impacts to surface water or groundwater resources from any of the three action alternatives or the no action alternative. Each of the three proposed corridors would span across a number of drainages and washes, and TEP would avoid placing structures in and near these areas where feasible.

The South Substation expansion and some corridor access roads would be within the Santa Cruz River or other 100-year floodplain and could result in an increase in flood elevation, leading to an increase in downstream flood loss and a long-term negative impact on lives and property. The Western and Crossover Corridors would have the greatest potential to impact floodplains in the project area. Impacts resulting from pole placement and construction of laydown areas would be negligible.

There may be small areas of wetlands within the proposed corridors that are associated with manmade stockponds and impoundments. TEP would site the transmission line to avoid such areas. None of the corridors cross any eligible or designated Wild and Scenic Rivers.

Restrictions on refueling locations would protect groundwater from contamination from fuel, lubricants and other fluids during construction. BMPs would be implemented along the length of the line for erosion control.

Air Quality. There are no significant differences in air quality impacts from any of the three action alternatives or the no action alternative. Temporary, localized fugitive dust emission impacts from construction activities would occur. Impacts from operation and maintenance activities would be limited to dust from occasional access by TEP. A conformity review of the proposed project (required under Section 176[c] of the *Clean Air Act*) was conducted in accordance with U.S. Environmental Protection Agency (EPA) and DOE guidance. The review shows that construction project emissions of PM_{10}

(particulate matter with an aerodynamic diameter less than or equal to 10 microns) and CO (carbon monoxide) for each alternative are below regulatory thresholds and would not constitute a regionally significant action.

Noise. There are no significant differences in noise impacts from any of the three action alternatives or the no action alternative. Noise levels would increase above background during construction of any action alternative. Temporary construction noise increases would primarily impact residents in Sahuarita and Nogales for all three corridors, and also Amado, Tubac, and Tumacacori for the Central Corridor. Temporary construction noise would also impact recreationalists, especially in more remote areas of the Western and Crossover Corridors. Long-term noise from the corona effect on transmission lines would generally be lost in background noise. Gateway and South Substations operational noise would be near background levels for the nearest receptors.

Human Health and Environment. Long term electric and magnetic field (EMF) exposure at the nearest residences, schools, and commercial establishments would be well below average daily exposure to maximum magnetic fields (0.8 milligauss) from some common household appliances. There would be no health effects from this exposure. Though each proposed corridor passes primarily through undeveloped land, the Central Corridor would have the highest number of houses in close proximity to the transmission line. The project would be designed to minimize EMF and prevent electrical field effects. A minimum distance of 100 ft (30 m) would be maintained between any of the proposed transmission line structures and the edge of the existing EPNG pipeline ROW.

Infrastructure. There are no significant differences in infrastructure impacts from any of the three action alternatives. The proposed project would increase electric transmission facilities to Nogales, Arizona and Mexico, but would not otherwise affect existing infrastructure. Minimal municipal solid waste generated during construction and operation would be taken to appropriate landfill facilities. No hazardous waste would be generated from substation operation.

Transportation. Project access would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Because the Central Corridor has the longest segment following the EPNG pipeline ROW, fewer temporary new access roads would be required than for the other alternatives, although considerable upgrade would be required for existing pipeline ROW access roads. Access to the proposed project on BLM land would be the same for all three action alternatives, on existing access from Mission Road to TEP's current transmission lines, with new spur roads to the proposed project. Short-term traffic disruptions on major roads such as I-19 or Ruby Road could occur during construction.

On the Coronado National Forest, the Crossover Corridor passes through an IRA, although no roads would be constructed or reconstructed in an IRA for any of the action alternatives. (Helicopters would be used to insert structures as needed for the Crossover Corridor.) TEP would build more miles of temporary new roads for the Western or Crossover Corridors than for the Central Corridor. In addition, more areas on existing roads would require minor repairs for the Western and Crossover Corridors than for the Central Corridor. By siting the Western Corridor immediately adjacent to Ruby Road for approximately 4 mi (6 km), the need for new project access and ongoing maintenance access for this segment would be reduced. There would be no net increase in roads in the Coronado National Forest.

Environmental Justice. Neither the three action alternatives nor the No Action Alternative would cause disproportionately high and adverse impacts to the minority or low-income populations. No means were identified for minority or low-income populations to be disproportionately affected from any of the resource areas.

Cumulative Impacts. This EIS includes analysis of cumulative impacts, as required under NEPA, that could occur as a result of the potential impacts of TEP's proposed project when added to impacts from other past, present, and reasonably foreseeable future actions. The potential effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project. The region of influence (ROI) varies for each resource area, primarily depending on the distance a potential effect can reach.

The following actions have been evaluated as reasonably foreseeable and are included in the analysis of cumulative impacts: other transmission line projects in the project area, industrial development, trade corridor/roadway development, other activities under special use permits on the Coronado National Forest, and more generally defined possible actions in the project area such as residential development, increased operations of the U.S. Border Patrol, ongoing activity of undocumented immigrants near the U.S.-Mexico border, and local initiatives to protect biological resources such as the Sonoran Desert Conservation Plan.

The cumulative impacts from the combination of TEP's proposed project and other past, present, and reasonably foreseeable actions could affect land use (including recreation), visual resources, biological resources, cultural resources, socioeconomic resources, geology and soils, water resources, air quality, noise, human health and environment, and transportation. These potential cumulative impacts are primarily related to long-term development of land that is currently undisturbed or used for other activities such as ranching and recreation. In the short term, if multiple projects are under construction simultaneously, an increased amount of land could be used temporarily for construction lay down yards and staging areas, and an increased amount of airborne dust could be generated. The cumulative change in land use could affect natural habitats, special status species, and cultural resources, and could lead to an increase in soil erosion and local water use. The cumulative impacts to human health and safety could be an increase in background EMF exposure to residents in the immediate vicinity of overlapping transmission line projects. No long-term cumulative human health impacts are expected to occur. No means were identified for minority or low-income populations to be disproportionately affected, and TEP's proposed project would not contribute cumulatively to any environmental justice impacts.

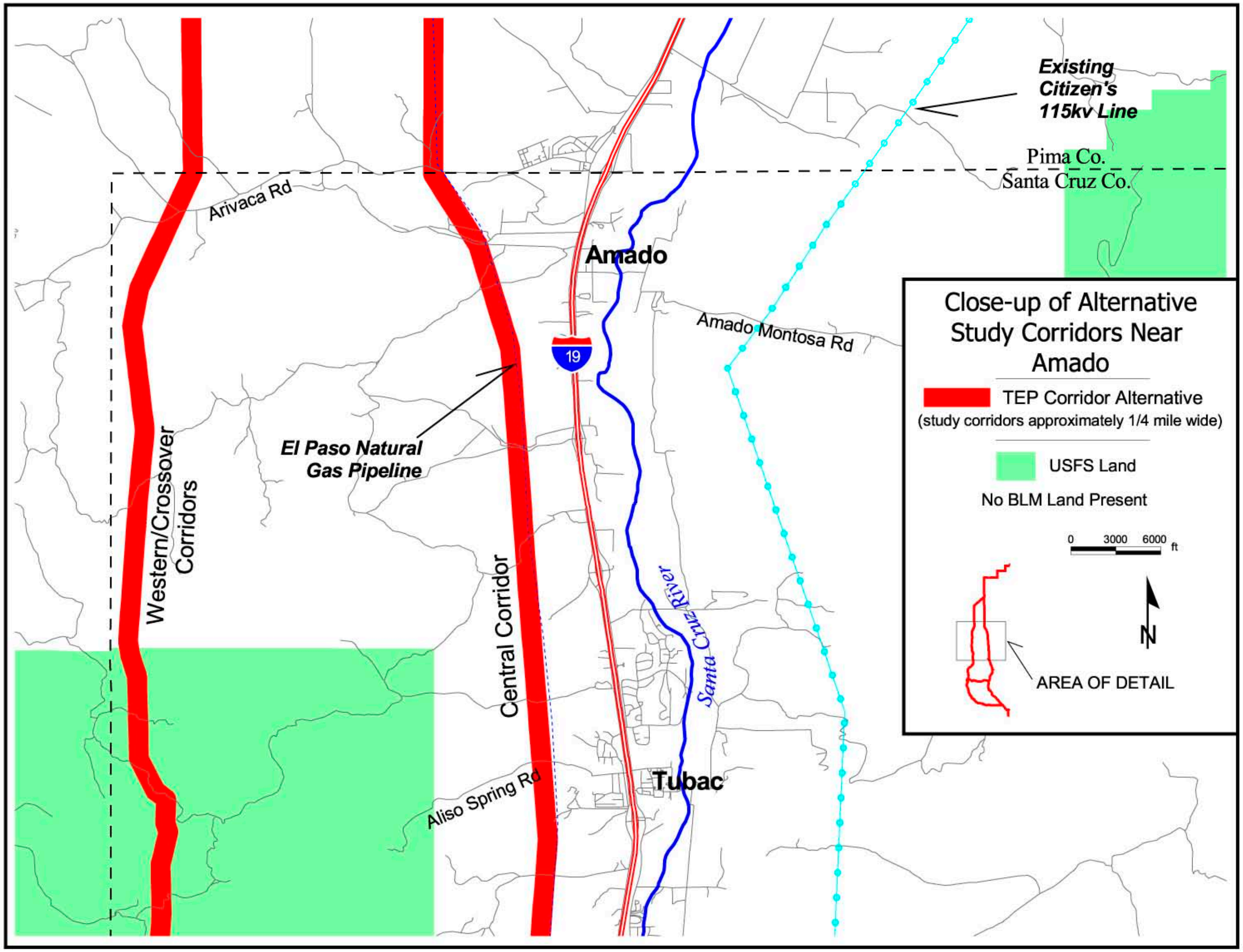

Figure 2.1–2. Close-up of Alternative Study Corridors Near Amado.

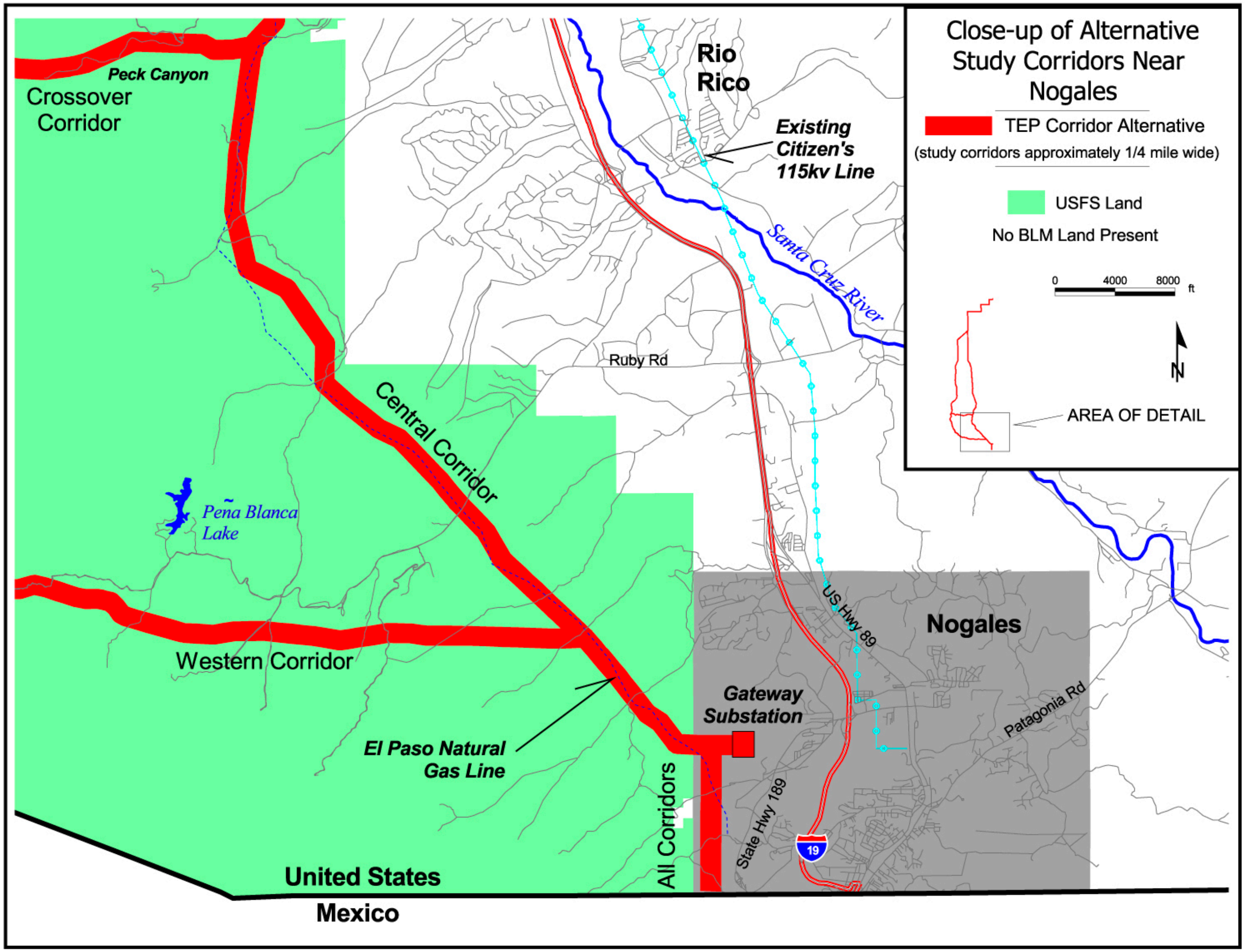

Figure 2.1–3. Close-up of Alternative Study Corridors Near Nogales.

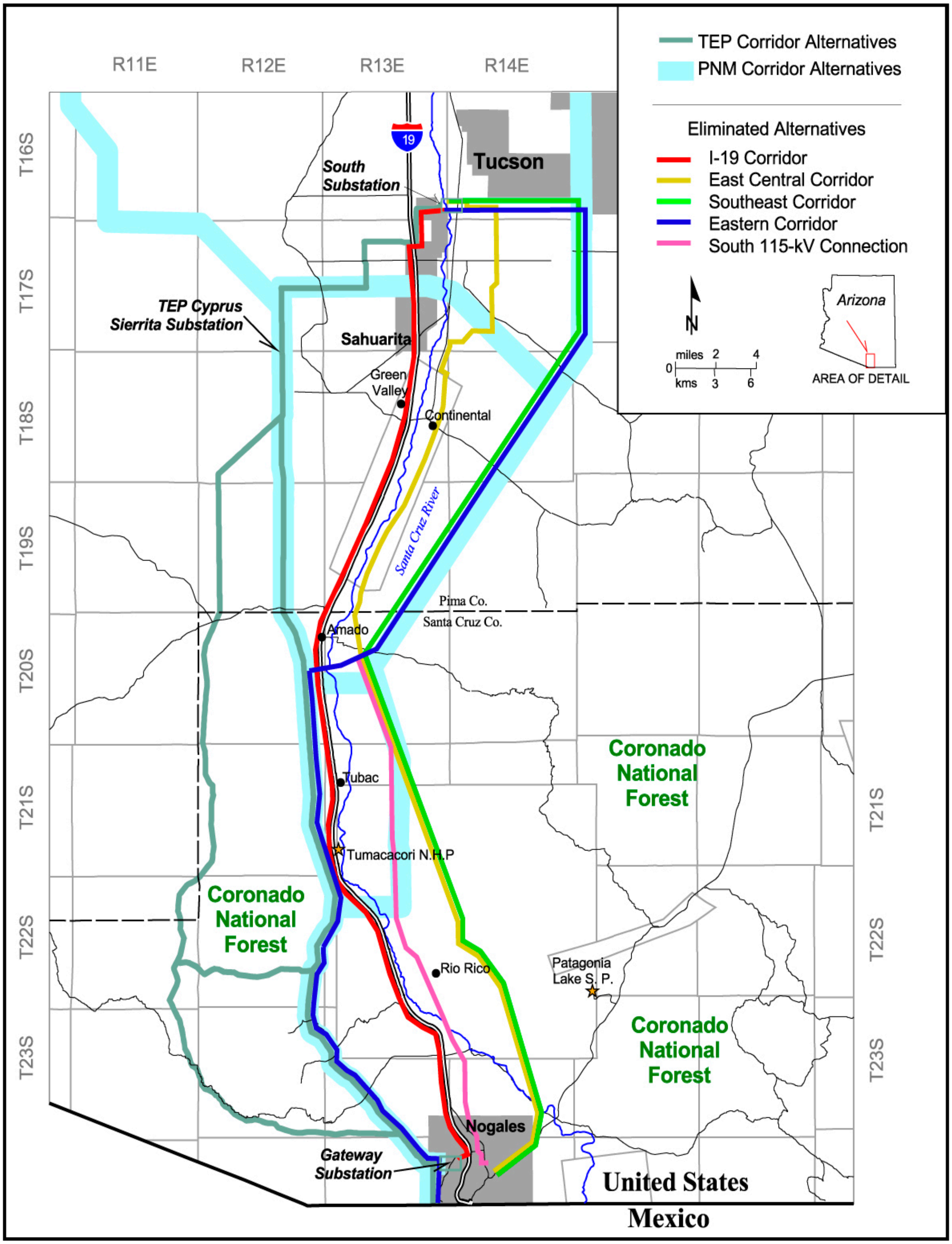

Figure 2.1–4. TEP Corridor Alternatives, Alternatives Eliminated From Further Analysis, and PNM Corridor Alternatives.

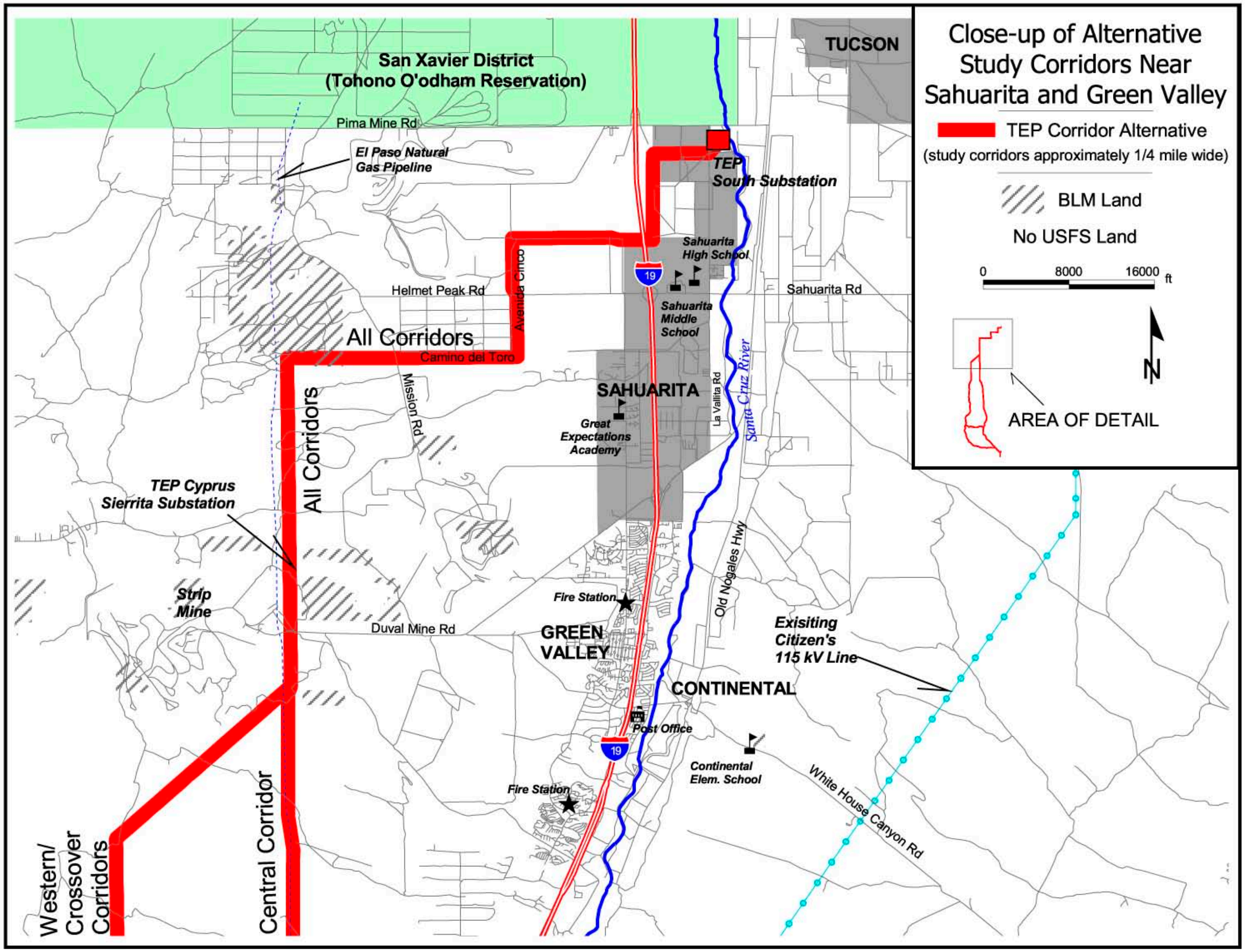

Figure 2.1–1. Close-up of Alternative Study Corridors Near Sahuarita and Green Valley.

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Land Use				No impacts to existing land use. Current land use trends would continue. Residential and commercial developments would continue to be concentrated along Interstate 19 with some residences located in more remote areas that primarily contain ranches and undeveloped land.
Length	Estimated 65.7 mi (106 km)	Estimated 57.1 mi (91.9 km)	Estimated 65.2 mi (105 km)	
Length on CNF	Estimated 29.5 mi (47.5 km)	Estimated 15.1 mi (24.3 km)	Estimated 29.3 mi (47.2 km)	
Length on BLM	Estimated 1.25 mi (2.01 km)	Estimated 1.25 mi (2.01 km)	Estimated 1.25 mi (2.01 km)	
	Note that the Western and Crossover Corridors are identical outside of the Coronado National Forest (CNF).		Note that the Western and Crossover Corridors are identical outside of the CNF.	
Corridor length that follows or crosses the El Paso Natural Gas Company (EPNG) pipeline	Estimated 9.3 mi (15 km)	Estimated 43 mi (69 km)	Estimated 17 mi (27 km)	
Number of support structures (poles and towers):				
Total	Estimated 429	Estimated 373	Estimated 431	
On CNF	Estimated 191	Estimated 102	Estimated 196	
On BLM	Estimated 8	Estimated 8	Estimated 8	
Permanent area occupied by transmission line structures:				
Total	0.25 acres (0.10 ha)	0.21 acres (0.08 ha)	0.25 acres (0.10 ha)	
On CNF	0.11 acres (0.04 ha)	0.06 acres (0.02 ha)	0.11 acres (0.04 ha)	
On BLM	0.005 acres. (0.002 ha)	0.005 acres (0.002 ha)	0.005 acres (0.002 ha)	
Permanent area occupied by substations and fiber-optic regeneration station	19.8 acres (8 ha)	19.8 acres (8 ha)	19.8 acres (8 ha)	
(continues)				

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Land Use *(continued)*				
On the CNF: New permanent disturbance	Estimated 29 acres (12 ha)	Estimated 23 acres (9.3 ha)	Estimated 36 acres (15 ha)	
New temporary disturbance	Estimated 197 acres (79.7 ha)	Estimated 105 acres (42.5 ha)	Estimated 238 acres (96.3 ha)	
	The Western Corridor passes primarily through undeveloped land with few residences (five houses approximately 1,000 ft [305 m] from the centerline west of Sahuarita).	In addition to the residences near the Western Corridor, the Central Corridor centerline passes approximately 1,000 ft [305 m] from eight residences in the vicinity of Tubac, more than the Western or Crossover Corridors. The Central Corridor has the shortest segment on the CNF.	The Crossover Corridor passes primarily through undeveloped land with few residences (same as the Western Corridor, five houses approximately 1,000 ft [305 m] from the centerline west of Sahuarita). The Crossover Corridor passes through an inventoried roadless area (IRA) within Peck Canyon. TEP plans to use helicopter access in this area, and would not build or upgrade any roads in the IRA.	
Compatibility with land use plans	A *Coronado National Forest Land and Resource Management Plan* (Forest Plan) amendment would be required to implement any of the three corridors on the CNF. Outside of national forest land, all corridors are compatible with current land use and land use plans. TEP does not anticipate any ground disturbance in the reserved lands (120 ft [36.6 m] total) along the U.S.-Mexico border.			

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Recreation	Recreation activities in the vicinity of the proposed project would primarily be impacted by a change in the visual setting of the recreation.			No change in impacts to existing recreational resources. Current recreation activities including hiking, biking, birding, photography, rock climbing, horseback riding, and off-road vehicle use would be expected to continue.
CNF Recreation Opportunity Spectrum (ROS) Areas Crossed	Total 29.5 mi (47.5km) In order from most to least developed: Roaded Natural 1.7 mi (2.7 km) Roaded Modified 7.0 mi (11 km) Semi-Primitive Motorized 21 mi (34 km) Semi-Primitive Non-Motorized none, but passes within 0.25 mi of an area	Total 15.1. mi (24.3 km) In order from most to least developed: Roaded Natural 1.1 mi (1.8 km) Roaded Modified none Semi-Primitive Motorized 14 mi (23 km) Semi-Primitive Non-Motorized none, but passes within 0.25 mi of an area	Total 29.3 mi (47.2 km) In order from most to least developed: Roaded Natural 1.2 mi (1.9 km) Roaded Modified none Semi-Primitive Motorized 25 mi (41 km) Semi-Primitive Non-Motorized 3.3 mi (5.3 km)	
ROS Area Classification	For each ROS area classification USFS has established the limits of acceptable change to certain setting indicators, classifying the changes as "fully compatible or normal," "inconsistent," or "unacceptable." The setting indicators within each area would be impacted as follows: For Access, Social Encounters, Visitor Impacts, and Visitor Management, all alternatives would be compatible with all ROS area classifications. For Facilities and Site Management, most of the length of all three corridors would be unacceptable with all ROS area classifications. For Naturalness and Remoteness, impacts would be as follows:			
(continues)	The Western Corridor would have an unacceptable impact on Naturalness where it runs adjacent to Ruby Road for approximately 4 mi (6 km) southwest of the Atascosa Mountains. Most of the Western Corridor would be inconsistent with Remoteness. The length of the Western Corridor on the CNF (29.5 mi [47.5 km], similar to the Crossover Corridor) affects the extent of potential recreation impacts on the CNF.	The Central Corridor would have an unacceptable impact on Naturalness where it crosses Ruby Road, in the same location as the Crossover Corridor. Most of the Central Corridor would be inconsistent with Remoteness. The length of the Central Corridor on the CNF (15.1 mi [24.3 km], approximately half the length of the other alternatives on the CNF) affects the extent of potential recreation impacts on the CNF.	The Crossover Corridor would have an unacceptable impact on Naturalness within Peck Canyon and where it crosses Ruby Road, in the same location as the Central Corridor. The Crossover Corridor would also have a higher impact on Remoteness than the other alternatives, as approximately 3 mi (5 km) of the Crossover Corridor at Peck Canyon would have unacceptable impacts on Remoteness. The length of the Crossover Corridor on the CNF (29.3 mi [47.2 km], similar to the Western Corridor) affects the extent of potential recreation impacts on the CNF.	

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Recreation *(continued)* Impacts outside the CNF	Potential impacts on recreation activities would be similar to those within the CNF but would be lower given less recreational use of the Western Corridor outside the CNF.	Potential impacts on recreation activities would be similar to those within the CNF, as the Central Corridor crosses recreational trails where it parallels just outside the CNF boundary for approximately 7 mi (11 km) east of the Tumacacori Mountains.	Potential impacts on recreation activities would be similar to those within the CNF but would be lower given less recreational use of the Crossover Corridor outside the CNF.	
Visual Resources	Visual impacts would occur from the introduction of steel support structures, access roads, and transmission line wires into the landscape. Structures would be primarily 140-ft (43-m) high self-weathering monopoles, similar in color to wood utility poles.			The existing landscape and Scenic Integrity would continue, subject to visual impacts from any potential development in the project area.
Outside the CNF	The Western Corridor passes through areas of existing development near Sahuarita and Nogales, and is shielded from Interstate 19 (I-19) outside these areas by mine tailing piles and natural terrain, passing through primarily undeveloped land. With the exception of a reduction in Scenic Integrity from High to Moderate/Low near the Pima and Santa Cruz county line, the existing Moderate to Low Scenic Integrity would not change.	The Central Corridor passes through areas of existing development near Sahuarita and Nogales, and passes a number of towns along I-19 including Amado, Tubac, and Tumacacori. The Central Corridor would be visible from more residences than Western although some potential views would be blocked by terrain. The existing Moderate to Low Scenic Integrity would not change.	The Crossover Corridor passes through areas of existing development near Sahuarita and Nogales, and is shielded from I-19 outside these areas by mine tailing piles and natural terrain, passing through primarily undeveloped land. With the exception of a reduction in Scenic Integrity from High to Moderate/Low near the Pima and Santa Cruz county line, the existing Moderate to Low Scenic Integrity would not change. (same as Western Corridor)	
Substations	The South Substation expansion would have minimal visual impact given that similar equipment already exists onsite. There would be little visual change introduced by construction of the new Gateway Substation because of existing industrial development in the area.			
On the CNF	Crosses approximately 30 mi (48 km) of mostly Scenic Class 1 and 2 areas, of high public value, and would be most visible from roadways in an approximately 4-mi (6-km) stretch in the immediate foreground of Ruby Road southwest of the Atascosa Mountains.	Crosses approximately 15 mi (24 km) of mostly Scenic Class 2 areas, of high public value but below Scenic Class 1. The primary visual impact of the Central Corridor when viewed from roadways would be at the crossing of Ruby Road, with two structures in the foreground.	Crosses approximately 30 mi (48 km) of mostly Scenic Class 1 and 2 areas, of high public value. The primary visual impact of the Crossover Corridor when viewed from roadways would be at the crossing of Ruby Road, with two structures in the foreground.	
(continues)				

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Visual Resources *(continued)* On the CNF *(continued)*	Is mostly blocked by terrain from I-19 and the eastern portion of Ruby Road.	Is mostly blocked by terrain from I-19, and is only visible from Ruby Road at the crossing area.	Is mostly blocked by terrain from I-19, and is only visible from Ruby Road at the crossing area.	
	The existing Scenic Integrity of Peña Blanca Lake Recreation Area and the Pajarita Wilderness would not change.			
Scenic Integrity Changes On the CNF	From: High/Very High To: Moderate/Low 13, 870 acres (5,613 ha)	From: Very High To: Moderate/Low 8,992 acres (3,639 ha)	From: Very High To: Moderate/Low 18, 060 acres (7,307 ha)	
	From: High To: Very Low 4,641 acres (1,878 ha)	From: High To: Very Low 676 acres (274 ha)	From: High To: Very Low 676 acres (274 ha)	
Total Reduced Scenic Integrity On the CNF	18,511 acres (7,491 ha)	9,668 acres (3,912 ha)	18,736 acres (7,582 ha)	
Biological Resources	Because the proposed project would be in an arid area, where vegetation recovers very slowly, disturbances due to construction could have long-term impacts.			No impacts to biological resources associated with the project.
Vegetation communities potentially disturbed: Arizona Upland/Sonoran Desertscrub	Entire Corridor 119 acres (48 ha) CNF 0 acres BLM 0 acres Other Land Ownership 119 acres (48 ha)	Entire Corridor 119 acres (48 ha) CNF 0 acres BLM 0 acres Other Land Ownership 119 acres (48 ha)	Entire Corridor 119 acres (48 ha) CNF 0 acres BLM 0 acres Other Land Ownership 119 acres (48 ha)	
Semidesert grassland	Entire Corridor 165 acres (67 ha) CNF 102 acres (41 ha) BLM 8 acres (3.2 ha) Other Land Ownership 55 acres (22 ha)	Entire Corridor 109 acres (44 ha) CNF 67 acres (27 ha) BLM 8 acres (3.2 ha) Other Land Ownership 34 acres (14 ha)	Entire Corridor 97 acres (39 ha) CNF 66 acres (27 ha) BLM 8 acres (3.2 ha) Other Land Ownership 23 acres (9.3 ha)	
Madrean Evergreen Woodland	Entire Corridor 95 acres (38 ha) CNF 95 acres (38 ha) BLM 0 acres Other Land Ownership 0 acres	Entire Corridor 38 acres (15 ha) CNF 38 acres (15 ha) BLM 0 acres Other Land Ownership 0 acres	Entire Corridor 72 acres (29 ha) CNF 72 acres (29 ha) BLM 0 acres Other Land Ownership 0 acres	
(continues)				

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Biological Resources *(continued)*				
Sonoran Riparian Deciduous Forest	Entire Corridor 0.14 acres (0.06 ha) CNF 0 acres BLM 0 acres Other Land Ownership 0 acres	Entire Corridor 0 acres CNF 0 acres BLM 0 acres Other Land Ownership 0 acres	Entire Corridor 0 acres CNF 0 acres BLM 0 acres Other Land Ownership 0 acres	
Special status species	Both within and outside the CNF, there is a potential to impact habitat during construction of existing native plant communities located within the ROW and areas of new access roads. Biological Assessments (BAs) on federally listed species and reports on USFS Management Indicator Species (MIS) and Migratory Bird Treaty Act (MBTA) species were completed to evaluate impacts to species and their habitats and identify potential adverse effects for special status species that occur, or may occur, within each corridor. The corridors do not cross any federally designated critical habitats for any listed threatened or endangered species. The federally listed endangered Pima pineapple cactus is known to occur in each corridor. Additional species-specific surveys are recommended in some cases.			
Potential Adverse Effects to:	Includes habitat for the following 10 federally listed species: cactus ferruginous pygmy-owl, Chiricahua leopard frog, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, Mexican spotted owl, Pima pineapple cactus, Sonora chub, and southwestern willow flycatcher. 74 special status species	Includes habitat for the following 7 federally listed species: cactus ferruginous pygmy-owl, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, Mexican spotted owl, and Pima pineapple cactus. 62 special status species	Includes habitat for the following 9 federally listed species: cactus ferruginous pygmy-owl, Chiricahua leopard frog, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, Mexican spotted owl, Pima pineapple cactus, and southwestern willow flycatcher. 67 special status species	
Socioeconomics	Socioeconomic impacts would be similar for all corridors. The proposed project would result in the creation of approximately 30 direct (construction) jobs, and approximately 31 indirect (service-related) jobs during construction. No influx of population or stress to community services would be expected because most of the jobs created would be filled by current residents. No adverse socioeconomic impacts would be expected from project operation.			No socioeconomic impacts associated with the project. Current socio- economic trends would continue.

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Cultural Resources	Potential for land disturbance or loss of cultural resources due to land disturbances (pole locations and access roads). Cultural resource survey of proposed ROW prior to construction would mitigate impacts.			No archaeological and historical sites would be disturbed under this alternative. No additional archaeological surveys or Native American consultation would be undertaken in a systematic study of these areas in the foreseeable future. USFS and BLM would still allow access to public lands, which could result in the discovery and/or the destruction of cultural sites.
	Low density of cultural resource sites expected along a majority of the route.	Higher density of cultural resource sites expected along the Central Corridor segment near the Santa Cruz River.	Low density of cultural resource sites expected along a majority of the route. (same as Western Corridor)	
Native American Consultations	Indian tribal representatives have expressed opposition to all three proposed corridors, but have not (to date) named specific locations of any traditional cultural properties (TCPs) or sacred sites.			
	Several tribes (Tohono O'Odham Nation, Gila River Indian Community, Ak-Chin Indian Community, Salt River Pima Maricopa Indian Community and the Pascua Yaqui Tribe) have stated that they value the landscape through which the Western Corridor passes and have expressed opposition to this corridor.	Several tribes (Ak-Chin Indian Community, Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa Indian Community and the Pascua Yaqui Tribe) stated that they would prefer that the project be constructed along the Central Corridor, if it was built at all. They view the Central Corridor as an already-disturbed area. None of the tribes wished to express approval of the project overall when stating this preference. Similar statements favoring the Central Corridor, if any is to be built, were made in January 2003 meetings and a site visit with Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa and Ak-Chin Indian Communities.	Passes through portions of the landscape (where common with the Western Corridor) that have been identified as valued by several tribes. Official tribal concerns have not been stated regarding the unique portion of the Crossover Corridor.	

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

<table>
<tr><th>Resource</th><th>Western Corridor
(TEP's Preferred Alternative)</th><th>Central
Corridor</th><th>Crossover
Corridor</th><th>No Action Alternative</th></tr>
<tr><td rowspan="5">Geology and Soils

New roads on unconsolidated alluvium
On the CNF

Prime farmland soils</td><td colspan="3">No impact to geologic resource availability or mine tailings areas expected. The placement of poles and access roads would require some disturbance and removal of near-surface material. (See Land Use for estimates of areas disturbed).

Structures on relatively intact shallow bedrock would be installed by rock bolting. Foundations for structures on unconsolidated alluvium probably would require direct embedment poles, requiring excavation of a large pit. Construction in alluvium containing large cobbles would require use of lean-concrete slurry for backfill of the pit because soils with large cobbles are difficult to compact adequately.

Potential for ground failure exists in mountainous areas. Slope stability analysis for potential tower locations in mountainous areas would prevent slope failure. Low to moderate seismic risk would be considered in structure design.</td><td rowspan="5">No geologic or soils impacts associated with the project.</td></tr>
<tr><td>There are limited areas of alluvium where direct embedment poles would be required, but steep terrain in the southern portion of the corridor increases potential for ground failure.</td><td>There are extensive areas of cobbly alluvium where direct embedment poles would be required, but relatively low relief reduces potential for ground failure.</td><td>There are limited areas of alluvium where direct embedment poles would be required, but rock bolting probably would be feasible in the unique portion of the Crossover Corridor. However, steep terrain in this section increases potential for ground failure.</td></tr>
<tr><td colspan="3">Road construction on unconsolidated alluvium could cause soil erosion and compaction.</td></tr>
<tr><td>Estimated 9 miles (15 km) of roads on unconsolidated alluvium.</td><td>Estimated 12 miles (19 km) of roads on unconsolidated alluvium.</td><td>Estimated 10 miles (16 km) of roads on unconsolidated alluvium.</td></tr>
<tr><td colspan="3">All three proposed corridors cross soils considered to be prime farmland when irrigated. These soils would be spanned where feasible, and the total prime farmland soil converted to pole foundations would be less than 0.25 acres (0.1 ha).</td></tr>
<tr><td rowspan="2">Water Resources

Floodplain Area Disturbed

(continues)</td><td colspan="3">No adverse impacts to groundwater or limited surface water resources. Construction activity that takes place within a jurisdictional water requires a Section 404 Permit from the U.S. Army Corps of Engineers (USACE); TEP would complete consultation with USACE for an applicability determination upon final selection of an alternative.
For all alternatives, an estimated 1 acre-foot (1,233.5 cubic meter) of groundwater would be used during construction.</td><td rowspan="2">No water resource impacts associated with the project. Current water resource patterns would continue.</td></tr>
<tr><td>Estimated 1.97 acres (0.80 ha) of 100-year floodplain, including the expansion of the South Substation, pole construction and laydown areas, and access roads.</td><td>Estimated 1.58 acres (0.64 ha) of 100-year floodplain, including the expansion of the South Substation, pole construction and laydown areas, and access roads.</td><td>Estimated 1.97 acres (0.80 ha) of 100-year floodplain including, the expansion of the South Substation, pole construction and laydown areas, and access roads. (same as Western Corridor).</td></tr>
</table>

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Water Resources *(continued)*				
Large washes crossed	15	14	15	
Structures within a wash	1 in Sopori Wash, outside the normal flow line.	1 in Sopori Wash, outside the normal flow line.	1 in Sopori Wash, outside the normal flow line. Also 2 in the bottom of Peck Canyon	
Air Quality				No impacts to air resources associated with the project. Current air quality trends would continue. Nogales, Arizona, within the proposed project vicinity, is not in attainment with the EPA's National Ambient Air Quality Standard (NAAQS) for PM_{10}.
Construction	Temporary, localized fugitive dust emission impacts from construction activities would occur. A conformity review of the proposed project (required under Section 176[c] of the *Clean Air Act*) was conducted in accordance with EPA and DOE guidance. The review shows that the maximum year of construction project emissions of PM_{10} and CO for each alternative would be below the regulatory thresholds and below the regionally significant action level for carbon monoxide (CO). Specific results are as follows:			
PM_{10} in Nogales Non-attainment area	62.1 tons per year (tpy) (56.5 metric tpy[mtpy])	72.7 tpy (66.2 mtpy)	72.7 tpy (66.2 mtpy)	No PM_{10} emissions associated with the proposed project.
PM_{10} regulatory threshold	100 tpy (91 mtpy)	100 tpy (91 mtpy)	100 tpy (91 mtpy)	
PM_{10} regionally significant action level	None	None	None	
CO in Tucson Maintenance area	24.2 tpy (21.9 mtpy)	24.2 tpy (21.9 mtpy)	24.2 tpy (21.9 mtpy)	No CO emissions associated with the proposed project.
CO regulatory threshold	100 tpy (91 mtpy)	100 tpy (91 mtpy)	100 tpy (91 mtpy)	
(continues)				

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Air Quality *(continued)*				
CO regionally significant action level	11,866 tpy (10,765 mtpy)	11,866 tpy (10,765 mtpy)	11,866 tpy (10,765 mtpy)	
Operation	Impacts from operation and maintenance activities would be limited to dust from occasional access by TEP. Corona effects would generate less than 1 part per billion of ozone.			
Noise Construction	The primary effect of noise would be annoyance to the residents nearest to the ROW (see Land Use above) during construction and would be short-term.			No noise impacts would be associated with the project. Current noise patterns would continue, with background noise levels ranging from 30 to 60 decibels, depending on proximity to development and roads.
	Temporary construction noise increases would primarily impact residents in Sahuarita and Nogales and recreationalists.	Temporary construction noise increases would primarily impact residents in Sahuarita, Amado, Tubac, Tumacacori, and Nogales, and recreationalists.	Temporary construction noise increases would primarily impact residents in Sahuarita and Nogales and recreationalists (same as Western Corridor).	
Operation	Long-term noise from corona effect on transmission lines would generally be lost in background noise (ranging from 30 to 60 decibels, depending on proximity to residential areas and roads). Gateway and South Substations operational noise would be near background levels for the nearest receptors. (There are no residences within 0.5 mi [0.8 km] of either substation).			
Infrastructure	The proposed project would increase electric transmission facilities, but would not otherwise affect existing infrastructure. Minimal municipal solid waste generated during construction and operation would be taken to appropriate landfill facilities. No hazardous waste would be generated from substation operation. Powerline reliability would increase.			No change to existing infrastructure. The unreliability of electricity in Nogales, Arizona would continue unless other transmission lines or power plants are built in the Nogales area.
Human Health and Environment	EMF exposure at the nearest residences, schools, and commercial establishments would be well below 0.8 milligauss, the average daily exposure to maximum magnetic fields from some common household appliances. EMF exposure at the nearest residences (listed previously under Land Use) would be less than 10 percent of EMF exposure from common household appliances, and would decrease further at the nearest schools and commercial establishments. No health effects would be expected from this exposure. Corona effects (audible noise, radio and television interference, visible light, and photochemical reactions) would be minimal and would be mitigated using proper line design.			No EMF effects associated with the project. EMF exposure from existing transmission lines and household appliances would continue.
Environmental Justice	No disproportionately high and adverse impact to the minority or low-income populations.			Existing conditions would continue.

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Transportation	Short-term traffic disruptions on major roads such as Ruby Road could occur during construction. Where no access currently exists, new access ways would be required in coordination with land owners and managers, as follows:			Current traffic patterns and growth of wildcat (unauthorized) roads on the CNF would be expected to continue.
New roads (estimated)	Not determined. Existing roads would be used for construction and maintenance access to the extent possible.	Same as Western, except that fewer new access roads would be required because a longer segment follows an existing utility (gas pipeline) ROW.	Same as Western.	
On CNF	20 mi (32 km)	14 mi (22 km)	21 mi (33 km)	
On BLM	0.9 mi (1.4 km)	Same as Western.	Same as Western.	
Road Repairs and Upgrades	Spot repairs would be made to existing roads as needed.	Same as Western, except that extensive upgrades to existing pipeline access roads would be required.	Same as Western.	
On CNF	An estimated 95 locations on existing roads would require minor repairs or improvements.	An estimated 15 locations on existing roads would require minor repairs or improvements.	An estimated 98 locations on existing roads would require minor repairs or improvements.	
Helicopter Use	Helicopters would be used for stringing conductors, but are not expected to be used to bring in structures.	Same as Western.	Helicopters would be used for stringing conductors and to bring an estimated 20 to 25 structures to the Peck Canyon area.	
Traffic	Short-term traffic disruptions could occur during construction, particularly where a corridor crosses a major road such as Arivaca Road.			
Permanent Changes to Road System	Roads not required for long-term maintenance would be closed in coordination with land managers and owners.	Same as Western.	Same as Western.	
On CNF	No net increase in road density. Roads not required for long-term maintenance would be closed, and the sites would be restored. For every mile of new road required for operation and maintenance of the project, TEP would close a mile of existing road. Roads required to remain open for project maintenance would be administratively closed, with restricted access.	Same as Western.	Same as Western.	
(continues)				

Table 2.3–1. Summary Comparison of Potential Environmental Effects of Alternatives *(continued)*.

Resource	Western Corridor (TEP's Preferred Alternative)	Central Corridor	Crossover Corridor	No Action Alternative
Transportation *(continued)*				
On BLM	0.9 mi (1.4 km) of additional roads	Same as Western	Same as Western	

BA = Biological Assessment
BLM = Bureau of Land Management
CO = Carbon monoxide
CNF = Coronado National Forest
EMF = Electric and magnetic field
EPNG = El Paso Natural Gas Company
EPA = U.S. Environmental Protection Agency
ESA = *Endangered Species Act*
IRA = inventoried roadless area
MBTA = *Migratory Bird Treaty Act*
MIS = Management Indicator Species
PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns
ROS = Recreation Opportunity Spectrum
ROW = right-of-way
TCP = Traditional Cultural Property
TEP = Tucson Electric Power Company
USFS = U.S. Forest Service

This chapter describes the existing natural resources and the environmental characteristics of the proposed Tucson Electric Power Company (TEP) transmission corridors. The information and data presented in this chapter provide a baseline description of the environment against which the various alternatives from Chapter 2 are evaluated in Chapter 4. The information presented in this chapter serves as the reference point to compare the potential changes to the environment, both positive and negative.

This chapter presents information on land use and recreation, visual resources, biological resources, cultural resources, socioeconomics, geology and soils, water resources, air quality, noise, human health and environment, infrastructure, transportation, and minority and low-income populations.

3.1 LAND USE AND RECREATION

This section discusses the existing land use resources in the vicinity of the proposed project. The discussion includes land use planning, current land use, land ownership, and recreational resources.

3.1.1 Land Use

The following discussion of land use planning, current land use, and land ownership applies to all three proposed corridors. Information specific to the Western, Central, and Crossover Corridors is described separately following the general discussion.

Figure 1.1–4 shows the land ownership or management in the vicinity of the proposed project. The land ownership in the northern portion of all three corridors is primarily private and state trust land, with 1.25 mi (2.01 km) of the proposed corridors on Federal lands managed by the Bureau of Land Management (BLM). The southern portion of all three corridors includes public lands administered by the U.S. Department of Agriculture Forest Service (USFS). The proposed corridors do not cross any Indian reservations or lands reserved under treaty rights by Native American nations, tribes, or communities. The San Xavier District of the Tohono O’Odham Nation is located approximately 1 mi (1.6 km) north of the proposed corridors as they exit the South Substation.

TEP has not finalized the placement of the 125-ft (38-m) right-of-way (ROW) within the 0.25 mi (0.40 km)-wide study corridors. The precise siting of the ROW would involve input from cultural, biological, and visual specialists, after each agency has issued a Record of Decision (ROD), to identify and minimize impacts to each area of land to be disturbed.

Northern Portion. The northern portion of the three proposed corridors, including the South Substation, is located in Pima County. Pima County land development and conservation is guided by policies of the Pima County Comprehensive Plan, implemented by the County Zoning Code within unincorporated areas. The Board of Supervisors adopted the current 2001 Pima County Comprehensive Plan on December 18, 2001, in accordance with the requirements of the Growing Smarter Plus legislation, the preliminary Sonoran Desert Conservation Plan, and requirements provided for in the county Zoning Code (Pima 2003). Within the town of Sahuarita, the Planning Commission oversees a comprehensive long-term General Plan and associated zoning regulations.

All three corridors cross the same Federal lands managed by the BLM, an estimated 1.25 mi (2.01 km) of lands located 1.3 mi (2.1 km) north of the existing TEP Cyprus Sierrita Substation (see Figure 1.1–4, Township 17 South, Range 12 East). These lands are designated as disposal lands under the current Resource Management Plan (BLM 1988).

Coronado National Forest. Each of the three proposed corridors cross the Tumacacori Ecosystem Management Area (EMA), as shown in Figure 3.1–1, which consists of all of the Coronado National Forest land west of Interstate 19 (I-19) adjacent to the U.S.-Mexico border (approximately 203,800 acres [82,475 ha]). The USFS manages this land for sustained multiple use of forest and rangeland resources including timber, grazing, recreation, and mining (USFS 2001a). The specific direction for managing the Coronado National Forest is contained in the *Coronado National Forest Land and Resource Management Plan* and amendments (Forest Plan), originally approved August 4, 1986 (USFS 1986). The plan provides for integrated multiple use and sustained yield of goods and services from the forest in a way that maximizes long-term net public benefits in an environmentally sound manner.

- The section of the Western Corridor that joins the 50-ft (15-m) El Paso Natural Gas Company (EPNG) pipeline ROW and exits the Coronado National Forest approximately 2 mi (3.2 km) to the southeast, is within an existing Forest Transportation System and Utilities Corridor. USFS advises that the rest of the Western Corridor on the Coronado National Forest, an estimated 27.5 mi (44.3 km), would require a Forest Plan amendment in order to implement the alternative.

- The Central Corridor is not within the Forest Transportation System and Utilities Corridor where the Central Corridor deviates from the EPNG pipeline ROW to avoid an inventoried roadless area (IRA) for approximately 2 mi (3.2 km). USFS advises that a Forest Plan amendment would be needed before implementation of this alternative.

- The Crossover Corridor is not within an existing Forest Transportation System and Utilities Corridor, except where it follows or crosses the EPNG pipeline ROW. USFS advises that the rest of the Crossover Corridor on the Coronado National Forest, an estimated 20 mi (32 km), would require a Forest Plan amendment in order to implement this alternative.

See Section 1.2.2 for more details on the Forest Plan amendment process.

IRAs on national forest lands provide protection for all natural resources, including water, soil, flora, fauna, and air quality, and protect visual resources while providing a potential for unroaded recreation experiences. IRAs encompass approximately 52,788 acres (21,363 ha) within the Tumacacori EMA and are shown in Figure 3.1–1. The Western Corridor is located less than 1 mi (1.6 km) west and south of an IRA, and the Central Corridor passes within 0.25 mi (0.40 km) of an IRA. The Crossover Corridor passes through approximately 3 mi (4.5 km) of an IRA as it goes through Peck Canyon.

The *Roadless Area Conservation Final Rule*, to protect IRAs within the National Forest System, was delayed from adoption on January 20, 2001, after the Bush Administration requested all agencies delay all new laws and regulations not yet in effect by 60 days to give the Administration time for review (NRDC 2003). The *Roadless Area Conservation Final Rule* was then adopted effective March 13, 2001 (36 CFR Part 294). In seeking to overturn the new rule, states and industries filed six lawsuits challenging the new rule. In May 2001, a Federal judge issued an injunction, preventing the law from taking effect. In December 2002, a Federal appeals court lifted the stay on the implementation of the *Roadless Area Conservation Rule* (EMS 2002). Under the final rule, development within the IRAs, primarily related to commercial timber harvest, is limited, although the USFS Chief may allow limited development following appropriate environmental analysis and disclosure. The *Forest Service Roadless Area Conservation Final Environmental Impact Statement* (USFS 2000), which was completed in November 2000, evaluated the proposed USFS regulations to protect IRAs.

TEP has stipulated that the structure locations, construction areas, and proposed access roads for the Western and Central Corridors would not enter into IRAs. In addition, TEP has stipulated that the structure locations, construction areas, and proposed access roads for all three corridors would not enter the following specially designated areas within the Tumacacori EMA (as shown in Figure 3.1–1): Pajarita Wilderness, Chiltipene Botanical Area, and Peña Blanca Lake Recreation Area (TEP 2003). The Pajarita Wilderness is a congressionally designated area comprised of approximately 7,400 acres (3,000 ha), including Sycamore Canyon and Goodding Research Natural Area, designated for its pristine nature and wilderness values, and utilized for recreation. The Chiltipene Botanical Area is an estimated 2,840 acre (1,150 ha) reserve established for the protection and study of Chiltepin wild chilies (*Capiscum annum* var. *glabriusculum*). Peña Blanca Lake Recreation Area is used for year-round water recreation.

Current land use within the Tumacacori EMA includes diverse and dispersed recreational uses, which are described in Section 3.1.2, Recreation. The U.S. Border Patrol conducts routine surveillance in the vicinity of the U.S.-Mexico border, specifically focused on the area south of Ruby Road between the Pajarita Wilderness and Nogales, mostly within the Tumacacori EMA. U.S. Border Patrol activities generally involve accessing the ridgetops to get an open view of the area. A large portion of the Tumacacori EMA (an estimated 164,000 acres [66,400 ha]) is classified by USFS as able to support livestock grazing, and some is currently under permit for livestock grazing. A majority of this capable rangeland is in satisfactory condition (a USFS measure of the health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community) (USFS 2001b).

- The Western Corridor passes almost entirely through satisfactory rangeland within the Tumacacori EMA.

- The Central and Crossover Corridors pass through a combination of satisfactory and unsatisfactory rangeland within the Tumacacori EMA.

There are an estimated 320 mi (515 km) of USFS system roads within the Tumacacori EMA, both paved and unpaved. There are also numerous unofficial travelways used by recreational and other users of the area, known as wildcat roads, as described in Transportation Section 3.12 and the Roads Analysis (RA)(URS 2003a) for the proposed project. There are approximately 31 vehicular access points to the EMA. The current configuration of the road system serves as a “limiter” to the EMA in accordance with the Forest Plan. Ruby Road is the primary access point to the EMA, as shown in Figure 3.1–1.

Nogales Border Area. The proposed crossing of the U.S.-Mexico border would be the same for all three corridors. In the City of Nogales, where the proposed corridors connect to the proposed Gateway Substation and continue to the U.S.-Mexico border, the City of Nogales Planning and Zoning Department oversees land use. On June 25, 1897, a Presidential Proclamation was signed by President William McKinley to keep lands free from obstruction as protection against smuggling of goods between the United States and Mexico. The proclamation reserved a strip of land 60 ft (18 m) wide, parallel with and adjacent to the U.S.-Mexico border, extending 1 mi (1.6 km) east and 1 mi (1.6 km) west of Monument No. 122 within the City of Nogales, Arizona. Following a recommendation that additional lands be reserved along the boundary, President Theodore Roosevelt signed a Presidential Proclamation on May 27, 1907, reserving a 60 ft (18 m)-wide strip of land parallel with and adjacent to the U.S.-Mexico border on all lands that were not already patented (that is, Indian Reservations, National Parks, Monuments, etc.) to the United States to ensure the integrity of the 60-ft (18-m) strip of reserved land. Similar lands are also designated by Mexico along its side of the land border. The 60-ft (18-m) strip of reserved land is continuous along the United States side of the border from Nogales, Arizona westward to the Colorado River, including the area of the proposed project border crossing (USIBWC 2003). The preservation of the reserved land's integrity is a requirement for TEP to cross the U.S.-Mexico border. TEP has committed that it would avoid construction of project structures within the 60 ft (18 m)-wide reserved lands along the U.S.-Mexico border. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border (TEP 2003).

3.1.1.1 *Western Corridor*

The Western Corridor, TEP's Preferred Alternative, extends for an estimated 65.7 mi (105 km), from the South Substation to the U.S.-Mexico border, including 9.3 mi (15.0 km) that follows or crosses the EPNG pipeline ROW, as shown in Figure 1.1–4. The length of the Western Corridor within the Coronado National Forest is 29.5 mi (47.5 km).

The Western Corridor, together with the Central and Crossover Corridors, exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceeds westerly for an estimated 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). Land use in this area is a mix of undeveloped land and ranch land. The corridor turns west across I-19 and continues through Pima County to the southwest, intersecting the existing EPNG pipeline ROW. This area contains industrial properties, a low density residential area (0.2 to 0.4 residents per acre), ranch land, rural undeveloped land, and multiple expansive mine tailings piles from past and ongoing mining operations. On BLM lands, the proposed project would follow parallel to two existing TEP transmission lines (138-kV and 345-kV). The Western Corridor centerline passes approximately 0.19 mi (0.3 km) from a small group of homes along South Avenida Cinco, south of Sahuarita Road, and also approximately 0.19 mi (0.3 km) from a nearby house on West Camino del Toro. The Western Corridor turns south to parallel the EPNG pipeline ROW for an estimated 5.8 mi (9.3 km) and passes near the existing TEP Cyprus Sierrita Substation.

The Western Corridor continues south past the Cyprus Sierrita Substation then separates from the Central Corridor, continuing southwest and south and enters Santa Cruz County after approximately 10 mi (16 km), passing through primarily undeveloped land, with portions of ranch land and commercial and industrial areas. The Western Corridor enters the Coronado National Forest 6.0 mi (9.7 km) south of the Santa Cruz County line. The national forest land consists of natural vegetation set in rolling hills with steep sloped canyons. Paralleling the Pima and Santa Cruz County lines on the national forest land, the Western Corridor passes south along the west side of the Tumacacori and Atascosa Mountains, then meets and runs along the south side of Ruby Road as it turns gradually east at the Pajarita Wilderness. The Western Corridor centerline passes within approximately 1 mi (2 km) of the Pajarita Wilderness, including Goodding Research Natural Area and Sycamore Canyon. The Western Corridor centerline is approximately 2 mi (3 km) from the Chiltipene Botanical Area, and is an estimated 1.5 mi (2.5 km) south of the Peña Blanca Lake Recreation Area. The Western Corridor separates from Ruby Road west of Castle Rock, continuing south of Ruby Road until the Western Corridor intersects the Central and Crossover Corridors.

The Western Corridor, together with the Central and Crossover Corridors, continues through the national forest land, following or crossing the EPNG pipeline ROW to the southeast for several miles to the Coronado National Forest boundary. The proposed corridors exit the national forest land onto private land containing some commercial and residential development and proceed 0.5 mi (0.8 km) east to the Gateway Substation. From the Gateway Substation, the proposed corridors return to the west through private land then turn south to parallel the Coronado National Forest boundary through an area containing primarily warehouses associated with trucking operations. The proposed corridors pass within 0.35 mi (0.6 km) of a warehouse and apartments on North Mariposa Ranch Road off Arizona State Highway 189. The proposed corridors meet the U.S.-Mexico border approximately 3,300 ft (1,006 m) west of Arizona State Highway 189 in Nogales, Arizona.

3.1.1.2 *Central Corridor*

The Central Corridor extends for an estimated 57.1 mi (91.9 km), from the South Substation to the international border, including 43.2 mi (69.5 km) that follows or crosses the EPNG pipeline ROW, as shown in Figure 1.1–4. The estimated length of the Central Corridor within the Coronado National Forest is 15.1 mi (24.3 km). The Central Corridor follows the same route as the Western Corridor from the South Substation in Sahuarita to an estimated 3 mi (5 km) south of the existing TEP Cyprus Sierrita Substation. Refer to Section 3.1.1.1, Western Corridor, for a discussion of the current land use in this common segment.

The Central Corridor separates from the Western and Crossover Corridors and continues to follow the existing EPNG pipeline ROW to the south. This section passes primarily through grazing areas and land that is undeveloped.

The Central Corridor continues south following or crossing the EPNG pipeline ROW, approaching to within approximately 1.0 mi (1.6 km) west of I-19, passing Amado, Tubac, and Tumacacori. The areas in the vicinity of these towns contain housing developments and some commercial establishments. The Central Corridor centerline passes approximately 0.19 mi (0.3 km) from a house northwest of Tubac (south of Agua Linda Road), and approximately 0.1 mi (0.2 km) from approximately three houses north of Aliso Springs Road in Tubac. The Central Corridor continues approximately 2.0 mi (3.2 km) south of Tumacacori through undeveloped land, and then enters the Coronado National Forest, adjacent to the EPNG pipeline ROW. The Central Corridor centerline diverges from the EPNG pipeline ROW for an estimated 1.9 mi (3.1 km) to avoid the IRA, passes along the eastern edge of the Tumacacori and Atascosa Mountains, and then crosses Ruby Road and reaches a point northwest of the Gateway Substation where it rejoins the Western Corridor.

The Central Corridor centerline passes approximately 6 mi (10 km) east of the Pajarita Wilderness, including Goodding Research Natural Area and Sycamore Canyon. The Central Corridor centerline is approximately 1.0 mi (1.6 km) from the Chiltipene Botanical Area, and is approximately 3.0 mi (4.8 km) northeast of the Peña Blanca Lake Recreation Area.

The Central Corridor is identical to the Western Corridor from the point where they join in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 3.1.1.1, Western Corridor, for the current land use along this common segment.

3.1.1.3 *Crossover Corridor*

The Crossover Corridor extends for an estimated 65.2 mi (105 km), from the South Substation to the U.S.-Mexico border, including an estimated 17 mi (27 km) along the EPNG pipeline ROW, as shown in Figure 1.1–4. The estimated length of the Crossover Corridor within the Coronado National Forest is 29.3 mi (47.2 km). The Crossover Corridor is identical to the Western Corridor from where it exits the TEP South Substation in Sahuarita to where it separates from the Western Corridor in the Coronado National Forest. Refer to Section 3.1.1.1, Western Corridor, for a description of land use within this area.

The Crossover Corridor separates from the Western Corridor and turns east through Peck Canyon for an estimated 7 mi (11.3 km). Current land use within Peck Canyon is primarily for recreational use, as described in Section 3.1.2. The Crossover Corridor joins the Central Corridor and the EPNG pipeline ROW upon exiting Peck Canyon on the east side of the Tumacacori Mountains. The distances from the Crossover Corridor to the specially designated areas within the Tumacacori EMA, as shown in Figure 3.1–1, are the same as the distances for the Central Corridor, except the Crossover Corridor is an estimated 3.0 mi (4.8 km) south of the Chiltipene Botanical Area. The Crossover Corridor is identical to the Central Corridor from the point where they rejoin in the Coronado National Forest to the Gateway Substation and the U.S.-Mexico border. Refer to Section 3.1.1.2, Central Corridor, for a discussion of the current land use along this common segment.

3.1.2 Recreation

The following discussion of existing recreational resources applies to all three proposed corridors. A discussion of information specific to the Western, Central, and Crossover Corridors on the Coronado National Forest is presented separately. This allows the USFS Recreation Opportunity Spectrum (ROS) tool for recreation planning and management to be used (USFS 1990).

There are no state parks, national parks, or national monuments in any of the proposed corridors. The nearest state park is the Tubac Presidio State Historic Park, located off I-19 in Tubac, approximately 6.0 mi (9.7 km) east of the Western and Crossover Corridors, and an estimated 1.5 mi (2.4 km) east of the Central Corridor, as shown in Figure 1.1–4. This park occupies 10 acres (4 ha) and is a day use only facility featuring remnants of a Spanish military fort and other historic and archaeological resources. It is further discussed in Section 3.4, Cultural Resources. There are no designated Wild and Scenic Rivers within the project vicinity. USFS determined a 5-mi (8-km) segment of Sycamore Canyon mostly within the Pajarita Wilderness to be preliminarily eligible for designation as a Wild and Scenic River (USFS 1993), although no designation has been made to date. This potentially eligible segment of Sycamore Canyon is outside the three proposed corridors, although the Western Corridor crosses Sycamore Creek north of the potentially eligible segment (see Figure 3.7–2).

Recreation activities in the vicinity of the proposed project outside the Tumacacori EMA are generally similar to those within the Tumacacori EMA, as described in the following sections. These include hiking, biking, birding, photography, rock climbing, horseback riding, and off-highway vehicle use. Birding is recognized as a frequent recreation activity in the proposed project vicinity. A number of trails leading onto the national forest land east of the Tumacacori Mountains are used for recreation. The southeastern Arizona Bird Observatory has identified 25 birding hotspots in southeastern Arizona. The two nearest to the proposed project are San Xavier del Bac Mission, approximately 10 mi (16 km) north of the South Substation, and the Buenos Aires National Wildlife Refuge, approximately 25 mi (40 km) west of the Western and Crossover Corridors, and approximately 30 mi (48 km) west of the Central Corridor (SABO 2001).

The setting in which recreation activities take place in the Coronado National Forest is analyzed using the ROS. By recognizing that people desire specific settings for recreational activities, the ROS provides a framework for understanding the characteristics that contribute to specific recreational settings. In applying the ROS, USFS classifies national forest land into one of seven major classes: (1) Urban, (2) Rural, (3) Roaded Natural, (4) Roaded Modified, (5) Semi-Primitive Motorized, (6) Semi-Primitive Non-Motorized, and (7) Primitive. Based on these classifications, the ROS identifies seven characteristics that contribute to the experiences provided by a recreational area and indicate the limits of acceptable change to each characteristic within a recreational class. These characteristics, or setting indicators, are shown in the following text box (USFS 1990).

Recreation Opportunity Spectrum Setting Indicators

Access: The type and mode of travel, such as trails or roads, with more difficulty designed into travel as one moves towards the Primitive end of the spectrum.

Remoteness: The extent to which individuals perceive themselves as removed from the sights and sounds of human activity, such as transmission lines, with primitive areas being farther removed from indications of human activity.

Social Encounters: The number and type of other recreationalists met along travelways, or camped within sight or sound of others, such as a group of hikers, with fewer interactions towards the Primitive end of the spectrum.

Visitor Management: The degree to which visitors are regulated and the level of information and services provided for visitor enjoyment, such as interpretive signs, with little or no regulation and on-site information towards the Primitive end of the spectrum.

Facilities and Site Management: The level of site development, such as foot bridges across washes, with little or no user comfort and site protection facilities towards the Primitive end of the spectrum.

Naturalness: The degree of human alterations such as trail clearings in the landscape versus undisturbed nature, with settings that are visually more natural towards the Primitive end of the spectrum. Naturalness is indicated by the Scenery Management System (SMS) Scenic Integrity Level.

Visitor Impacts: The degree of visitor use impacts on the environment, such as alterations to wildlife habitat, with little or no impacts towards the Primitive end of the spectrum.

The Tumacacori EMA is one of 12 Sky Island Mountains of national forest land within southeastern Arizona. Sky Island Mountains is a term used to denote mountain ranges that are isolated from each other by intervening valleys of grassland or desert (USFS 1999). USFS has classified all areas of the Tumacacori EMA as either Rural, Roaded Natural, Roaded Modified, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, or Primitive, as shown in Figure 3.1–2. Within the Tumacacori EMA, the ROS class Semi-Primitive Motorized comprises the greatest total area, an estimated 128,519 acres (52,010 ha), out of a total of 203,799 acres (82,475 ha).

Certain setting indicators such as remoteness, access, and social encounters are impacted by operations of U.S. Border Patrol in the project vicinity. For instance, an otherwise remote area may be a common location for U.S. Border Patrol vehicle activity. Therefore, to ensure a complete ROS analysis, a general treatment of U.S. Border Patrol operations is included in this section, although these operations are not classified as a recreational activity.

3.1.2.1 *Western Corridor*

The Western Corridor includes approximately 30.0 mi (48.2 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. As described in this section, the entire length of the Western Corridor on national forest lands provides opportunities for recreation, which is currently utilized to varying degrees, including hiking, hunting, birding, photography, rock climbing, biking, horseback riding, all-terrain vehicle use, camping, picnicking, fishing, metals claim prospecting, and scenic driving on Ruby Road.

The Western Corridor crosses two areas of Semi-Primitive Motorized land (west of the Tumacacori Mountains and near Nogales) for a total of an estimated 21.3 mi (34.3 km). Along Ruby Road, the

Western Corridor crosses Roaded Modified land for approximately 7 mi (11 km) and Roaded Natural land for an estimated 1.7 mi (2.7 km). The Western Corridor passes within 0.25 mi (0.40 km) of Semi-Primitive Non-Motorized land on the west side of the Tumacacori Mountains. The number of recreational users is highest in the Roaded Natural areas, decreases beyond Peña Blanca Lake in the Roaded Modified areas, and is lowest in the Semi-Primitive Motorized areas along the western side of the Atascosa and Tumacacori Mountains. However, as described below, attributes such as the remoteness of certain areas provide a unique, highly valued experience for visitors that venture into such areas. For each ROS classified area, the current setting indicators and recreational uses are described below.

Western Corridor Roaded Natural Area. The destination of a majority of visitors to the Tumacacori EMA is Peña Blanca Lake Recreation Area, accessed by traveling west on Ruby Road to the west end of the Roaded Natural area. Roaded Natural settings are road corridors where people drive to enjoy the scenery and are often on their way to a developed site such as a picnic area. Activities at Peña Blanca Lake Recreation Area include year-round picnicking and fishing. A large percentage of the visitors to this location are from Sonora, Mexico. The resort at Peña Blanca Lake was closed in 1997, resulting in a decreased number of visitors in recent years compared to when the resort was operating. The nearby Calabasas Group Area offers camping and picnicking and is used several times a year (USFS 2002a).

Full access is provided to this area for low-clearance vehicles by the paved section of Ruby Road connecting to I-19. The remoteness of this area is limited by human activities such as other automobiles at the Peña Blanca Lake parking area and along Ruby Road. Social encounters, both on Ruby Road and at the developed lake area, are moderate to high on weekends, with encounters between multiple parties likely. Social encounters tend to decrease during the week. There are rustic facilities and evidence of site management, such as paved parking areas, picnic tables, and an electric distribution line that parallels Ruby Road east of Peña Blanca Lake. The existing naturalness of the lake area is moderate, rated per the ROS in terms of Scenic Integrity. Outside of the lake area, the existing naturalness or scenic integrity is high, as the landscape appears intact. Visitor management is slight but noticeable, with simple natural signs identifying locations such as Upper Thumb Picnic Area. Visitor impacts to the area consist of soil impacts from automobiles on roads and parking areas, and disturbances in vegetation due to footpaths.

Western Corridor Roaded Modified Area. West of Peña Blanca Lake, the area surrounding this unpaved portion of Ruby Road is classified as Roaded Modified. On the Coronado National Forest, Roaded Modified is similar to the Semi-Primitive Motorized setting, but with easier access (better roads). A large majority of visitors that go beyond Peña Blanca Lake travel on Ruby Road to destinations such as Sycamore Canyon, within the Pajarita Wilderness, and California Gulch. Activities in this area include sightseeing, birding, hiking, and rock climbing. Several smaller roads that intersect Ruby Road, such as Bear Valley Ranch Road, offer opportunities for all-terrain vehicle use. The Roaded Modified area also attracts a few herpetologists (people studying reptiles and amphibians) (USFS 2002a).

Ruby Road provides dirt road access to this Roaded Modified Area. Four-wheel drive vehicles are sometimes needed for travel on this road, depending on road and weather conditions, but generally the road does not limit access. This area is more remote than along Ruby Road east of Peña Blanca Lake, as the only evidence of human activity is the dirt road and occasional foot trails. Social encounters in this area are limited, with occasional encounters between parties likely to occur. The operations of U.S. Border Patrol agents in this area increase the likelihood of having at least a few social encounters during a visit. The only evidence of facilities or site management is the maintenance of Ruby Road. The naturalness of this area along Ruby Road is high, with human alterations limited to Ruby Road, several side roads, and foot trails. Limited road signs are the primary indication of visitor management, which is generally low in this area. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Western Corridor Semi-Primitive Motorized Area. Upon turning north from Ruby Road, the Western Corridor runs west of the Atascosa and Tumacacori Mountains through Semi-Primitive Motorized land to the northern boundary of the Tumacacori EMA. It also runs through Semi-Primitive Motorized land south and east of Ruby Road. Semi-Primitive Motorized settings are areas with primitive roads (that is, high clearance and four wheel drive) and trails. About 30 percent of the use of this area is by backcountry hunters. Hunting season is from August to February and includes deer, mountain lion, and quail hunting. Some all-terrain vehicles are used in this area, and the area is used daily by range permittees. The remaining recreational use includes hikers, horseback riders, and others who come to enjoy the scenery and find solitude (USFS 2002a). In addition, the U.S. Border Patrol conducts routine surveillance in this area, often accessing the ridgetops to get an open view of the area.

Access to this area is limited to roads assigned for use by high-clearance vehicles, on which traffic is normally minor, consisting of administrative, permitted, or dispersed recreation uses. This results in significantly lower visitor numbers than along Ruby Road (USFS 2002a). This area is more remote than along Ruby Road, as the only evidence of human activity are dirt roads and occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. There is a decrease in U.S. Border Patrol activity as distance from the U.S.-Mexico border increases. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations limited to dirt roads and foot trails. Visitor management is very low in this area, limited to a few road signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Western Corridor Semi-Primitive Non-Motorized Area. The Western Corridor and/or its potential new access roads pass within 0.25 mi (0.40 km) of a Semi-Primitive Non-Motorized Area. Semi-Primitive Non-Motorized settings are areas without roads that people use for a wide variety of activities, but primarily for dispersed recreation uses. Access to this area is limited to trails, used occasionally by recreationalists such as hikers and hunters. This area is more remote than the Semi-Primitive Motorized areas, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are likely to be reduced given the limited access. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.2 *Central Corridor*

The Central Corridor includes an estimated 15.1 mi (24.3 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. The Central Corridor crosses Semi-Primitive Motorized land for an estimated 14 mi (23 km), and crosses Roaded Natural land for an estimated 1.1 mi (1.8 km) upon crossing Ruby Road and then runs through Semi-Primitive Motorized land to the Coronado National Forest boundary. The Central Corridor passes briefly within 0.25 mi (0.40 km) of a Semi-Primitive Non-Motorized Area north of Ruby Road. A number of roads leading onto the national forest land east of the Tumacacori Mountains are used for recreation such as hiking, birding, photography, biking, horseback riding, and all-terrain vehicle use. Rock Corral Canyon Road, popular for biking, is crossed by the Central Corridor an estimated 1.0 mi (1.6 km) outside (east) of where the road enters the national forest. Beyond these roads, there is limited use of the national forest land east of the Tumacacori Mountains, especially compared to the use along Ruby Road and at Peña Blanca Lake farther to the south (USFS 2002a). For each ROS classified area, the current setting indicators and recreational uses along the Central Corridor are described below.

Central Corridor Roaded Natural Area. The Roaded Natural Area crossed by the Central Corridor is a 1.0 mi (1.6 km) strip of land at the crossing of Ruby Road. Full access is provided to this area for low-clearance vehicles by the paved section of Ruby Road leading from I-19, and by dirt access roads to the EPNG pipeline ROW. The remoteness of this area is limited by the automobiles on Ruby Road. Social encounters on Ruby Road are moderate to high, increasing on weekends, with encounters between multiple parties likely. The rustic facilities and evidence of site management are the Ruby Road and signs along the road, and an electrical distribution line on wooden poles paralleling Ruby Road. The existing naturalness is high, as the landscape appears intact. Visitor management is slight but noticeable, with simple natural signs identifying locations such as the national forest boundary. Visitor impacts to the area consist of soil impacts from automobiles on side roads, and disturbances in vegetation due to footpaths.

Central Corridor Semi-Primitive Motorized Areas. Access to the Semi-Primitive Motorized Area comprising most of the Central Corridor is limited to primitive roads assigned for use by high clearance and four wheel drive vehicles, on which traffic is normally minor, consisting of administrative, permitted, or dispersed recreation uses. Many of these roads also provide access to the existing EPNG pipeline ROW within the Central Corridor. The remoteness of this area is limited by the overlooking views of the Santa Cruz Valley and I-19 that is within 1.0 mi (1.6 km) of the Central Corridor where it enters the national forest land, and a maximum of approximately 5.0 mi (8.0 km) from the Central Corridor. Social encounters in this area are limited, with the likelihood of having a few social encounters increasing on the weekends. There is a decrease in U.S. Border Patrol activity as the distance from the U.S.-Mexico border increases. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations only apparent along the EPNG pipeline ROW, and limited dirt roads and foot trails. Visitor management is very low in this area, limited to a few signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Central Corridor Semi-Primitive Non-Motorized Area. The Central Corridor and/or its potential new access roads pass briefly within 0.25 mi (0.40 km) of a Semi-Primitive Non-Motorized Area. Semi-Primitive Non-Motorized settings are areas without roads that people use for a wide variety of activities, but primarily for dispersed recreation uses. Access to this area is limited to trails, used occasionally by recreationalists such as hikers. This area is more remote than the Semi-Primitive Motorized areas, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are reduced given the limited access. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.1.2.3 *Crossover Corridor*

The Crossover Corridor includes an estimated 29.7 mi (47.8 km) within the Coronado National Forest, as shown by the 0.25 mi (0.40 km)-wide study corridor in Figure 3.1–2. The Crossover Corridor crosses Semi-Primitive Motorized land for an estimated 25.2 mi (40.6 km) on the east and west sides of the Tumacacori Mountains and south and east of Ruby Road, Semi-Primitive Non-Motorized land for an estimated 3.3 mi (5.3 km) within Peck Canyon, and Roaded Natural land for an estimated 1.1 mi (1.8 km) upon crossing Ruby Road. On the west side of the Tumacacori Mountains (in the segment common with the Western Corridor), recreational use consists of backcountry hunters, hikers, horseback riders and others who come to enjoy the scenery and find solitude. The U.S. Border Patrol conducts routine surveillance in this area, often accessing the ridgetops to get an open view of the area. Within Peck Canyon, recreation is more limited, but offers a favorite setting for some hikers, birders, hunters, horseback riders, and all-terrain vehicle users (USFS 2002a). On the east side of the Tumacacori

Mountains, a number of trails and roads (for high clearance and four wheel drive vehicles) offer recreation, as described above for the Central Corridor. For each ROS classified area, the current setting indicators and recreational uses along the Crossover Corridor are described below.

Crossover Corridor Roaded Natural Area. The Roaded Natural Area crossed by the Crossover Corridor is a 1.0 mi (1.6 km) strip of land at the crossing of Ruby Road. This segment is common with the Central Corridor Roaded Natural Area, and the ROS setting indicators are the same as previously described for this area.

Crossover Corridor Semi-Primitive Motorized Areas. Access to the Semi-Primitive Motorized Areas on the west and east sides of the Tumacacori Mountains is limited to primitive roads assigned for use by high clearance and four wheel drive vehicles, on which traffic is normally minor. Many of the roads on the east side of the Tumacacori Mountains also provide access to the existing EPNG pipeline ROW within the Crossover Corridor. The area west of the Tumacacori Mountains is very remote, given the distance to major roads such as Ruby Road and Arivaca Road. Sights and sounds of human activity are limited or non-existent. On the east side of the Tumacacori Mountains, the remoteness is limited by the overlooking views of the Santa Cruz Valley and I-19, as described for the Central Corridor. West of the Tumacacori Mountains, social encounters are very limited, with a high likelihood of not having any social encounters on some days, whereas social encounters would be more likely east of the Tumacacori Mountains. U.S. Border Patrol activities along the Crossover Corridor are limited given the distance from the U.S.-Mexico border. The only evidence of facilities or site management is the maintenance of dirt roads and trails. The naturalness is very high, with human alterations only apparent along the EPNG pipeline ROW. Visitor management is very low in this area, limited to a few signs. Visitor impacts to the area consist of soil impacts from automobiles and all-terrain vehicles on roads, and occasional footpaths disturbing vegetation.

Crossover Corridor Semi-Primitive Non-Motorized Area. The Crossover Corridor and its potential new access roads pass through Semi-Primitive Non-Motorized land in Peck Canyon. Within Peck Canyon, recreation is limited, but offers a favorite setting for some hikers, birders, hunters, horseback riders, and all-terrain vehicle users (USFS 2002a). Access to this area is on a trail that goes several miles into Peck Canyon from the east side. There are also remnants of a trail from a water pipe that used to supply water to the town of Ruby located several miles west of the proposed project. This area is more remote than the Semi-Primitive Motorized areas east of the Tumacacori Mountains, as the only evidence of human activity is occasional foot trails. Social encounters in this area are very limited, with a high likelihood of not having any social encounters on some days. U.S. Border Patrol activities in this area are likely to be reduced given the limited access and distance to the U.S.-Mexico border. The only evidence of facilities or site management is the maintenance of trails. The naturalness is very high, with human alterations limited to trails. Visitor management is virtually non-existent, and visitor impacts to the area consist of soil impacts and vegetation disturbances from footpaths.

3.2 VISUAL RESOURCES

This section discusses the existing visual resources in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line proposed project. The discussion includes a description of the terminology and concepts used to characterize visual resources for the entire length of the proposed project, including Bureau of Land Management (BLM), national forest, state, and private land. The terminology and concepts are consistent with the U.S. Department of Agriculture Forest Service (USFS) Scenery Management System (SMS) used by USFS for the inventory and analysis of aesthetic values of national forest lands, as outlined in *Landscape Aesthetics: A Handbook for Scenery Management* (USFS 1995).

The SMS is a tool for integrating benefits, values, desires, and preferences regarding aesthetics and scenery for all levels of land management planning. The SMS recognizes that high-quality scenery, especially scenery with natural-appearing landscapes, enhances people's lives and benefits society. By establishing a terminology for managing scenery, USFS has developed a systematic approach for determining the relative value and importance of scenery that can be applied in concept for the entire proposed project. The visual resource attributes outlined by the SMS include the following:

- **Landscape Character** – a description of the overall visual and cultural impression of landscape attributes and the physical appearance and cultural context of a landscape that gives it an identity and "sense of place."

- **Scenic Attractiveness** – ratings based on the SMS scale of Distinctive (A), Typical or Common (B), and Undistinguished (C) that indicate the uniqueness of landscapes in the region or human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation patterns.

- **Concern Levels and Landscape Visibility** – ratings based on the SMS scale for Concern Levels, indicating the degree of public importance placed on the landscape viewed from travelways and use areas, and the visibility of lands in each distance zone. Concern Levels are based on the number of visitors and the interest of visitors in the scenery, and distance zones are based on the distance from the viewer, defined as foreground within 0.5 mi (0.8 km), middleground between 0.5 mi (0.8 km) and 4 mi (6 km), and background beyond 4 mi (6 km) from the observer. The visibility of lands is affected by the degree of discernible detail and perceptible visual range, or farthest distance a person can see without being clouded by haze, especially in the background distance zone. Perceptible visual range is attributable to the amount and size of particles in the air, depending on pollution levels, naturally occurring dust, and meteorological factors such as wind and humidity. Visibility is normally much better in dry climates, such as in southeastern Arizona, than in humid climates, although wind-suspended dust can significantly reduce visibility in drier periods. For further discussion of climate refer to Section 3.8, Air Quality.

- **Scenic Class** – a composite rating that indicates the relative importance of a landscape, based on the Scenic Attractiveness, Concern Level, and Landscape Visibility classifications of an area. Scenic Classes 1 and 2 have high public value, Classes 3 through 5 have moderate value, and Classes 6 and 7 have low value.

- **Scenic Integrity** – rating that indicates the degree of intactness and wholeness of the landscape character. Human alterations can lower, maintain, or raise Scenic Integrity. Scenic Integrity is rated as Very High, High, Moderate, Low, Very Low, or Unacceptably Low.

While the entire proposed project is described here in terminology and concepts consistent with the SMS, the quantitative rating and mapping of the visual attributes described above applies only to national forest land, and includes travelways both on and off the national forest land from which the proposed project may be viewed, such as I-19. The following sections describe the existing visual environment in the vicinity of the proposed project for each alternative, with separate sections addressing the national forest land.

It should be noted that the Coronado National Forest has recommended use of the SMS for visual analysis of the proposed project, rather than the former USFS Visual Resource Management System. In the early 1980s, the Coronado National Forest was mapped by USFS using the Visual Resource Management System, which included Visual Quality Objectives. In the early 1990s, the SMS was developed as a new system for managing scenic resources, including new terminology, different end products, increased public involvement, and mapping using Geographic Information Systems (GIS) technology. In 1994, the Deputy Chief of the USFS directed National Forests to use the SMS (Reynolds, 2380, August 22, 1994), and in 1996, the Chief directed the same (USFS 1995). Although it is unlikely that the proposed project would meet Visual Quality Objectives in the old Visual Resource Management System, the SMS is more appropriate (though not necessarily more stringent) for the proposed project analysis because the SMS takes into account increased public awareness and involvement in protecting scenic resources on national forest lands, and increased public use of the area, which has changed how the landscapes are viewed (the SMS considers viewsheds from trails). The Coronado National Forest has completed an inventory of its scenic resources using the SMS, and has developed new criteria for defining Scenic Attractiveness, a major component in mapping scenic resources. This information will be considered during the Forest Plan revision, and Scenic Integrity Objectives will be established through that process. Until then, the SMS inventory will be used for project-level analysis and design, such as the analysis that follows for the TEP Sahuarita-Nogales Transmission Line Project (USFS 2002b).

3.2.1 Western Corridor

Coronado National Forest. The Western Corridor crosses an estimated 29.5 mi (47.5 km) of the Coronado National Forest, primarily through a landscape of undisturbed vegetation set in steep sloped canyons, foothills, and mountains. The Western Corridor passes south along the west side of the Tumacacori and Atascosa Mountains (passing through Bear Valley just north of the Pajarita Wilderness), then meets and runs along the south side of Ruby Road as it turns gradually east at the Pajarita Wilderness (see Figures 3.1–1 and 3.2–2). The Western Corridor separates from Ruby Road west of Castle Rock, continuing south of Ruby Road until the Western Corridor intersects the El Paso Natural Gas (EPNG) pipeline right-of-way (ROW) and the Central and Crossover Corridors. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the EPNG pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type that encompasses southeastern Arizona and the entire Coronado National Forest. This region is characterized by strong contrasts of massive mountain ranges rising abruptly from arid desert floors, with areas of rugged foothills, cliffs, and canyons in between. “It is this mosaic of low deserts and high mountains that results in an incredible diversity of plants and animals and awesome scenery” (USFS 1999). Specifically within the Tumacacori Ecosystem Management Area (EMA) in the vicinity of the Western Corridor, the northern portion to the west of the Tumacacori Mountains is desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in grasses that are typically golden brown, as shown in Figure 3.2–1. During the summer months after the monsoon rains, the grasses become bright green in color. As the Western Corridor turns gradually east near the Pajarita Wilderness and continues along Ruby Road, the project corridor includes an increasing number of oak trees (Broadleaf Woodland Evergreen vegetation type) and rocky outcrops. Castle Rock, a prominent rocky outcrop topographic feature, is located in this area, to the southwest of Peña Blanca Lake. The area also includes numerous desert washes, mountain meadows, and canyon bottoms with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of

Figure 3.2–1. Typical Desert Grasslands Vegetation in the Coronado National Forest.

Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Western Corridor passes primarily through Distinctive (A) landscapes 21.2 mi (34.1 km), with 7.7 mi (12 km) of Typical or Common landscape (B), and 0.6 mi (1 km) of Undistinguished (C) landscape. Scenic Attractiveness and other visual attributes described in the following text are quantified for each proposed corridor in Table 3.2–1.

Table 3.2-1. Visual Attributes of the Western, Central, and Crossover Corridors.

On the Coronado National Forest									
			Scenic Attractiveness			Scenic Classes (Public Value)			
			A	B	C	High		Moderate	
Corridor	Total length	Length on the CNF	Distinctive	Typical	Undistinguished	1	2	3	4
Western (mi)	65.7	29.5	21.2	7.7	0.6	10.5	11.1	2.6	5.3
Central (mi)	57.1	15.1	5.4	9.6	0.1	1.8	13.3	-	-
Crossover (mi)	65.2	29.3	14.7	14.0	0.6	5.5	15.2	3.3	5.3

Source: USFS 2001b.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Western Corridor are Ruby Road, I-19, and Arivaca Road. The Concern Level 2 areas near the Western Corridor shown on the map are secondary travelways and use areas that receive a moderate amount of use, including several roads off Ruby Road, Forest Road 684, and trails to Atascosa Lookout and into the Pajarita Wilderness. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. Note that these broad-brush definitions of distance zones were used as the starting point for evaluating project visibility. The hilly terrain and canyons of the area provide wide-open views of the Western Corridor in some areas while blocking views of the Western Corridor in other areas. The Western Corridor would be most visible in the immediate foreground to travelers on Ruby Road in the area west of Peña Blanca Lake and northwest of the Pajarita Wilderness. The Western Corridor would be west of the Tumacacori and Atascosa Mountains and thus not visible in the national forest from I-19 until near Nogales.

Based on Scenic Attractiveness, Concern Levels, and distance zones, USFS has determined Scenic Class ratings for the Coronado National Forest. Scenic Class indicates the relative importance of landscapes for use during the forest planning process to compare the value of scenery to other resources. Scenic Classes 1 and 2 have high public value, Classes 3 to 5 have moderate value, and Classes 6 and 7 have low value. Figure 3.2–4 shows the Scenic Class ratings of the Coronado National Forest Tumacacori EMA. The figure shows that the Tumacacori EMA is predominantly Classes 1 and 2, with portions of Classes 3 and 4. The Western Corridor passes through 10.5 mi (16.9 km) of Class 1, 11.1 mi (17.9 km) of Class 2, 2.6 mi (4.2 km) of Class 3, and 5.3 mi (8.5 km) of Class 4. The Scenic Class ratings were mapped on a large forest-wide scale, and then verified through project-level consultation with USFS.

The human alterations to the natural landscape are minimal along the Western Corridor within the Coronado National Forest, as shown by the map of existing Scenic Integrity in Figure 3.2–5. Especially to the south and west of the Tumacacori and Atascosa Mountains, the landscape is pristine as far as the eye can see, resulting in very high Scenic Integrity (the landscape is intact). For a 1-mi (1.6-km) strip of land following Ruby Road through the Tumacacori EMA, the Scenic Integrity is high (appears to be intact). Although Ruby Road is a human alteration, because it provides visitor access and provides viewing platforms for the public, it is generally considered a fairly neutral element in the landscape (that is, it has a minimal impact on Scenic Integrity). Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby west of the proposed project, both have moderate Scenic Integrity (appears slightly altered). Subtle alterations to the area landscape include roads and trails off Ruby Road, and an electric distribution line on wooden poles near Peña Blanca Lake.

Outside the Coronado National Forest. Approximately 36.2 mi (58.3 km) of the Western Corridor (out of a total of 65.7 mi [106 km]) is outside of the Coronado National Forest. The landscape of this portion of the Western Corridor is characterized primarily by desert grassland set in scattered foothills, as depicted in Figure 3.2–1. Upon leaving the existing South Substation and crossing I-19, the Western Corridor passes a low-density residential area, and upon exiting Sahuarita passes several commercial properties. There are multiple mine tailings piles that dominate the landscape in this area. This section of the Western Corridor follows existing TEP transmission lines including a 345-kV and 138-kV line on BLM lands, and meets up with an EPNG pipeline ROW that passes by the existing TEP Cyprus Sierrita Substation, as depicted in Figure 3.11–1 showing existing utilities.

The Western Corridor separates from the Central Corridor and EPNG pipeline ROW at an estimated 3 mi (5 km) south of the Cyprus Sierrita Substation, turning to the southwest through desertscrub vegetation and crossing into the Coronado National Forest. The human alterations to the natural landscape such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Western Corridor reduce the Scenic Integrity of the landscape to Moderate to Low (the visual landscape appears slightly to moderately altered, and the mine tailings piles dominate some areas of the landscape). The Scenic Integrity of the BLM land is Moderate to Low given the two existing transmission lines. Upon separating from the Central Corridor, the Scenic Integrity increases to High (the landscape begins to appear unaltered). As the Western Corridor crosses I-19 and passes roads and residences, the proposed project would be visible to residents, travelers, and recreationalists in the foreground and middleground distance zones, until it is hidden behind mine tailings piles. Upon separating from the Central Corridor, the Western Corridor would be almost entirely obscured from view from I-19 by mine tailings piles and natural foothills.

Upon exiting the Coronado National Forest to the southeast, the three proposed corridors run together through a landscape of undeveloped land with natural vegetation, following the EPNG pipeline ROW. The corridors go along the eastern foothills of the Atascosa and Pajarita Mountains and into the edge of the City of Nogales and the proposed Gateway Substation. The corridors then continue south to the Mexico border through an area of industrial and limited residential development.

3.2.2 Central Corridor

Coronado National Forest. The Central Corridor crosses an estimated 15.1 mi (24.3 km) of the Coronado National Forest, all of which is within or near an existing Forest Transportation Systems and Utilities Corridor containing a buried EPNG pipeline within a 50 ft (15 m) ROW. The Central Corridor runs south along the east side of the Tumacacori Mountains and Atascosa Mountains, then turns southeast, crosses Ruby Road, and intersects the Western Corridor. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type, as described above for the Western Corridor. Within the Tumacacori EMA, the Central Corridor passes through desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in golden brown grasses. Vegetation within the EPNG pipeline ROW and access roads leading to the ROW is cleared, as shown in Figure 3.2–6. The area also includes some rocky outcrops, desert washes, and canyon bottoms with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Central Corridor passes primarily through Typical or Common (B) landscape (9.6 mi [15.4 km]), with 5.4 mi (8.7 km) passing through Distinctive (A) landscape, and 0.1 mi (0.2 km) passing through Undistinguished (C) landscape.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Central Corridor are Ruby Road and I-19. The Concern Level 2 areas near the Central Corridor shown on the map are secondary travelways on the east side of the Atascosa Mountains that receive a moderate amount of use, such as Rock Corral Canyon Road. San Cayetano Elementary School at Peck Canyon Road and I-19 is also a Concern Level 2 area. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. Note that these broad-brush definitions of distance zones were used as the starting point for evaluating project

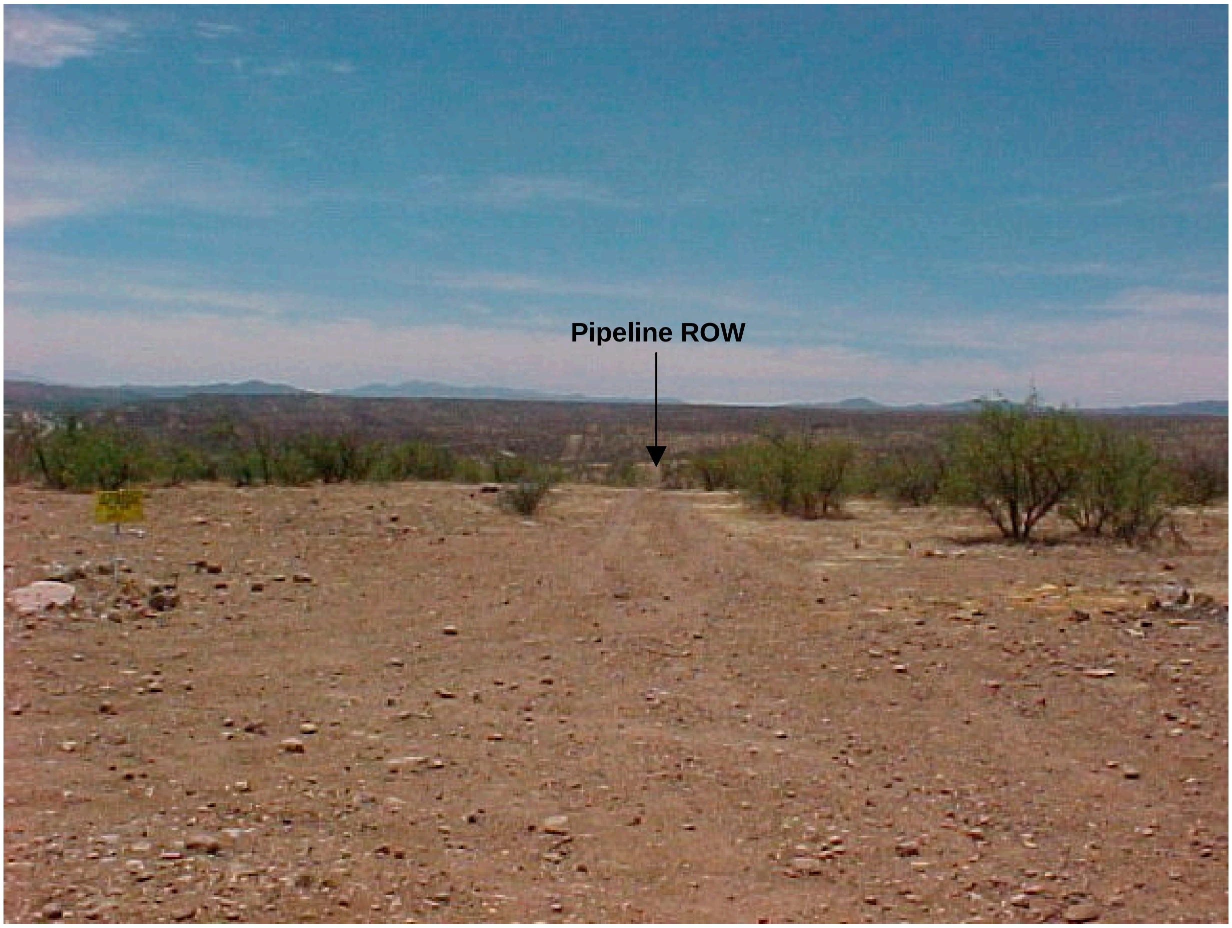

Figure 3.2–6. El Paso Natural Gas Pipeline ROW.

visibility; refined project maps showing actual project visibility based on screening created by the area's terrain and vegetation are included in Section 4.2, Visual Impacts.

The elevated landforms that run directly along the west side of I-19 block views of the Central Corridor from most of I-19 as the Central Corridor approaches and traverses the national forest land. A number of Concern Level 2 travelways in the area enter the foothills and provide more open vantage points of the Central Corridor, with segments of the Central Corridor evident in foreground, middleground, and background where it crosses the tops of ridges and foothills. As shown in Figure 3.2–4, the Central Corridor is in the foreground as it crosses Ruby Road. The Central Corridor is not visible from Peña Blanca Lake Recreation Area.

Based on Scenic Attractiveness, Concern Levels, and Distance Zones, USFS has determined Scenic Class ratings for the Coronado National Forest, as described above for the Western Corridor. The Central Corridor passes through 1.8 mi (2.9 km) of Class 1 and 13.3 mi (21.4 km) of Class 2.

Figure 3.2–5 is a map of existing Scenic Integrity within the Tumacacori EMA. The human alterations to the natural landscape along the Central Corridor within the Coronado National Forest are the linear disturbances of the EPNG pipeline ROW and access and recreational roads. The Scenic Integrity along the Central Corridor within the Tumacacori EMA is very high, except for a 1-mi (1.6-km) strip of land crossing Ruby Road where the Scenic Integrity is high. Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby west of the proposed project, both have moderate Scenic Integrity.

Outside of the Coronado National Forest. Approximately 42 mi (68 km) of the Central Corridor (out of a total of 57.1 mi [91.9 km]) is outside of the Coronado National Forest. The landscape of this portion of the Central Corridor is characterized primarily by desert grassland set in scattered foothills, as depicted in Figure 3.2–1. Upon leaving the existing South Substation and crossing I-19, the Central Corridor passes a low-density residential area and several commercial properties. There are multiple mine tailings piles that dominate the landscape in this area. This section of the Central Corridor follows existing TEP transmission lines, including a 345-kV and 138-kV BLM land, and meets up with an EPNG pipeline ROW that passes by the existing TEP Cyprus Sierrita Substation, as depicted in Figure 3.11–1 showing existing utilities.

The Central Corridor separates from the Western Corridor at approximately 3 mi (4.8 km) south of the Cyprus Sierrita Substation, continuing to follow the pipeline ROW south through primarily undeveloped land. The Central Corridor approaches to within approximately 1.0 mi (1.6 km) of I-19 near Amado, Tubac, and Tumacacori, passing adjacent to areas of low-density residential development. The Central Corridor passes within 0.25 mi (0.40 km) of several Tubac residences. The Central Corridor continues south until it enters the Coronado National Forest south of Tumacacori.

Given the human alterations to the natural landscape such as utilities, multiple very large mine tailings piles, and buildings in the northern portion of the Central Corridor, the existing Scenic Integrity of the landscape is Moderate to Low (the visual landscape appears slightly to moderately altered, and the mine tailings piles dominate some areas of the landscape). The Scenic Integrity of the BLM land is Moderate to Low, given the two existing transmission lines. Upon separating from the Western Corridor, the Scenic Integrity is Moderate as the landscape appears slightly altered due to residences, commercial establishments, and roads in the area connecting with I-19. In Sahuarita, the Central Corridor would be visible to residents, travelers, and recreationalists in the foreground and middleground distance zones, until it is hidden behind mine tailings piles. Upon separating from the Western Corridor, the Central Corridor would be intermittently visible and blocked by the elevated terrain that runs directly along the west side of I-19. The Central Corridor would be visible from a number of residences in Amado, Tubac, and Tumacacori, especially those on the west side of I-19.

Upon exiting the Coronado National Forest to the southeast, the three proposed corridors run together through a landscape of undeveloped land with natural vegetation, following the EPNG pipeline ROW. The corridors follow the eastern foothills of the Atascosa and Pajarita Mountains and into the edge of the City of Nogales and the proposed Gateway Substation. The corridors then continue south to the Mexico border through an area of industrial and limited residential development.

3.2.3 Crossover Corridor

Coronado National Forest. The Crossover Corridor crosses an estimated 29.3 mi (47.2 km) of the Coronado National Forest, part of which is within or near an existing Forest Transportation Systems and Utilities Corridor containing a buried EPNG pipeline within a 50-ft (15-m) ROW. The Crossover Corridor is the same as the Western Corridor upon entering the national forest land from the north, running along the west side of the Tumacacori Mountains. The Crossover Corridor then turns to the east, goes approximately 7 mi (11 km) through Peck Canyon, and joins the Central Corridor on the east side of the Tumacacori Mountains. The Crossover Corridor continues south along the east side of the Atascosa Mountains, then turns to the southeast, crosses Ruby Road, and intersects the Western Corridor. Upon rejoining, the three corridors continue together through a landscape of natural vegetation, following the

EPNG pipeline ROW along the eastern foothills of the Atascosa and Pajarito Mountains to the Coronado National Forest boundary.

The proposed project is set within the Sky Island Landscape Character Type, as described for the Western Corridor. Within the Tumacacori EMA, the northern portion of the Crossover Corridor west of the Tumacacori Mountains passes through desert grasslands with sparse, short, well-spaced vegetation that is gray-green to blue-green in color, set in golden brown grasses. Figure 3.2–1 shows typical desert grassland vegetation. As the Crossover Corridor approaches Peck Canyon, the project corridor includes an increasing number of oak trees (Broadleaf Woodland Evergreen vegetation type) and rocky outcrops. Within Peck Canyon there are many areas with riparian vegetation, green from seasonal water availability. The vegetation, topography, rock form, and water combine to create three categories of Scenic Attractiveness, as shown in Figure 3.2–2. This figure shows that the Crossover Corridor passes primarily through Distinctive (A) landscape (14.7 mi [23.7 km]), with 14.0 mi (22.5 km) passing through Typical or Common landscape (B), and 0.6 mi (1 km) passing through Undistinguished (C) landscape.

The degree of public importance placed on the landscape viewed from travelways and use areas is indicated by the Concern Levels defined in the SMS. Concern Level 1 roads and trails include primary travelways that receive a moderate to high amount of use by people that are likely to have high interest in the surrounding landscape. Figure 3.2–3 shows that the Concern Level 1 travelways in the vicinity of the Crossover Corridor are Ruby Road, I-19, and Arivaca Road. The Concern Level 2 areas near the Crossover Corridor shown on the map are secondary travelways and use areas that receive a moderate amount of use, such as Rock Corral Canyon Road and roads on the east side of the Atascosa Mountains. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area. The shadings on the map represent a broad-brush definition of foreground and middleground distance zones from the Concern Level 1 and 2 travelways. The elevated landforms that run directly along the west side of I-19 block views of the Crossover Corridor from most of I-19 on the national forest land. A number of Concern Level 2 travelways in the area enter the foothills and provide more open vantage points of the Crossover Corridor south of Peck Canyon, with segments of the Crossover Corridor evident in foreground, middleground, and background where it crosses the tops of ridges and foothills. The Crossover Corridor is in the foreground as it crosses Ruby Road. The Crossover Corridor is not visible from Peña Blanca Lake Recreation Area.

Based on Scenic Attractiveness, Concern Levels, and Distance Zones, the USFS has determined Scenic Class ratings for the Coronado National Forest, as described above for the Western Corridor. As shown in Figure 3.2–4, the Crossover Corridor passes through 5.6 mi (9.0 km) of Class 1, 15.3 mi (24.6 km) of Class 2, 3.4 mi (5.5 km) of Class 3, and 5.4 mi (8.7 km) of Class 4.

Figure 3.2–5 is a map of existing Scenic Integrity within the Tumacacori EMA. The human alterations to the natural landscape along the Crossover Corridor within the Coronado National Forest are the linear disturbances of the EPNG pipeline ROW and access and recreational roads. The Scenic Integrity along the Crossover Corridor within the Tumacacori EMA is very high, except for a 1-mi (1.6-km) strip of land crossing Ruby Road where the Scenic Integrity is High. Peña Blanca Lake Recreation Area, which includes visitor facilities, and the town of Ruby west of the proposed project, both have moderate Scenic Integrity.

Outside of the Coronado National Forest. An estimated 35.9 mi (57.7 km) of the Crossover Corridor is outside of the Coronado National Forest. The Crossover Corridor outside of national forest land is identical to the Western Corridor, and thus the affected environment is identical to the Western Corridor in this overlapping segment, as described in Section 3.2.1.

3.3 BIOLOGICAL RESOURCES

This section discusses the existing biological resources in the vicinity of the proposed project alternatives on lands administered by the U.S. Department of Agriculture Forest Service (USFS) and Bureau of Land Management (BLM), Arizona State Trust Lands, and private lands. Biodiversity, vegetation communities, wildlife, species afforded protection under the *Endangered Species Act* (ESA) of 1973, as amended, migratory birds, USFS Management Indicator Species (MIS), and USFS and BLM sensitive species, and Wildlife of Special Concern in Arizona are addressed.

3.3.1 Biodiversity

All of the proposed transmission line corridors cross a portion of an area known as the Sky Island Region, which includes portions of southern Arizona and New Mexico and northern Mexico. The term "sky island"[1] is used to describe isolated mountain ranges that are separated by grasslands or desert, which to varying degrees, are barriers to the movement of species found at higher elevations. This region is at the point of convergence of the tropical, subtropical, and temperate climatic zones. As a result, many plant and animal species' ranges overlap in this region resulting in a relatively high degree of biodiversity.

Other important local features that influence biodiversity in the region include topographic relief and geology. Precipitation increases and temperature decreases with elevation creating vertical range of habitat for various species. According to the Wildlands Project (Wildlands Project 2000), "Species with broadly similar climatic preferences or tolerances tend to sort themselves along the elevational gradient where the blend of temperature and aridity (and other factors) best supports them. This results in a stacking or layering of biotic communities varying with latitude, size, and elevation of each range."

Although numerous species in the region are considered "rare," many are at the limits of their normal range and may be more common elsewhere in the United States or Mexico. These species may or may not have been identified by the U.S. Fish and Wildlife Service (USFWS), USFS, Arizona Game and Fish Department (AGFD), or the Arizona Department of Agriculture (ADA) as requiring legal protection or requiring special management practices to prevent listing under the ESA. Plant and animal species listed for special protection or management considerations by USFWS, USFS, BLM, AGFD, and ADA are provided in Section 3.3.2, Vegetation and Wildlife. Refer to Section 3.1.1 for discussion of the Chiltipene Botanical Area within the northeastern portion of the Tumacacori Ecosystem Management Area (EMA) established by USFS as an in-situ botanical reserve. It is not possible to quantitatively distinguish the levels of biodiversity in the three corridors because no studies have been completed. Therefore, a qualitative assessment has been made.

The Tumacacori EMA, as shown in Figure 3.1–1, is part of the Coronado National Forest located in southeastern Arizona and bordered to the south by Mexico. It encompasses 203,800 acres (82,475 ha) and ranges in elevation from 3,200 to 6,200 ft (975 to 1,890 m). It is an ecologically rich area with nine distinctive vegetative community types, numerous deciduous and coniferous watersheds, and a variety of special interest plant and animal species.

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[1] The term "sky island" was coined by Weldon Heald in 1967 based on his observations of the Chiricahua Mountains (Warshall 1994).

3.3.1.1 *Western, Central, and Crossover Corridors*

Biodiversity is expected to be highest in the Crossover Corridor due to diverse terrain and vegetation, relatively few disturbances, and presence of water in portions of Peck Canyon (see Figure 3.1–1). Biodiversity is expected to be high in the Western Corridor because this corridor crosses the Atascosa Mountains at a higher elevation than the Central Corridor. Biodiversity within the Central Corridor is still considered to be high due to its proximity to the Atascosa Mountains.

3.3.2 Vegetation and Wildlife

In January 2001, Harris Environmental Group completed a preliminary Biological Evaluation (BE) of the proposed corridors (HEG 2001). This preliminary BE was prepared for all three corridors and described the major vegetation communities, or biomes (Figure 3.3–1), and identified special interest species (see Section 3.3.3, Special Interest Species, for further discussion) that may potentially occur. Special interest species were subsequently evaluated in greater detail in three Biological Assessments (HEG 2003a, 2003b, 2003c) that are included as Appendices D, E, and F of this Environmental Impact Statement (EIS).

According to Harris Environmental Group, all three corridors cross the following four distinct biotic communities (Figure 3.3–1) or biomes[2] as defined by Brown (Brown 1994): (1) Sonoran Desertscrub, (2) Semidesert Grassland, (3) Madrean Evergreen Woodland, and (4) Sonoran Riparian Deciduous Forest. No wetlands were found in the proposed project corridors during field surveys conducted by Harris Environmental Group and none have been identified by USFS (USFS 2003). However, wetland vegetation may be present in portions of all corridors in small areas associated with perennial water or cattle tanks (manmade earthen dams in washes). Topography in the northern portion of the proposed corridors is relatively flat throughout the low-lying desert valleys with small rises from hills and dips from ephemeral (short-lived) washes. The elevation begins to rise in the southern portion of the proposed corridors in the Tumacacori EMA.

Arizona Upland/Sonoran Desertscrub. This biome occurs in the northern portion of all of the corridors. Vegetation typically includes saguaro (*Carnegiea gigantean*), cholla and prickly pear (*Opuntia* spp. [multiple species]) cacti, ocotillo (*Fouquieria splendens*), mesquite (*Prosopis* spp.), acacia (*Acacia* spp.) and paloverde (*Cercidium* spp.) trees. Associated shrubs within this biome include creosote bush *(Larrea tridentata),* triangle-leaf bursage (*Ambrosia deltoidea*), and brittlebush (*Encelia farinosa*) (HEG 2003a, 2003b, 2003c).

Semidesert Grassland. This biome occurs in the central portions of the corridors. This biome is typically dominated by grama grass (*Bouteloua* spp.), lovegrass (*Eragrostis* spp.), and three-awn (*Aristida* spp.) grasses. Co-dominant plant species (sharing in the controlling influence of a biotic community) include low-stature mesquite (*Prosopis* spp.) and acacia (*Acacia* spp.) trees, agave (*Agave* spp.) and yucca (*Yucca* spp.) (HEG 2003a, 2003b, 2003c).

Madrean Evergreen Woodland. This biome occurs at the upper elevations of the corridors above 3,500 ft (1,066 m) above mean sea level. Representative plants within the corridors included Mexican blue oak (*Quercus oblongifolia*) and emory oak (*Q. emoryi*) trees, side-oats grama (*Bouteloua curtipendula*) and fluff grass (*Erioneuron pulchelum*) (HEG 2003a, 2003b, 2003c).

Sonoran Riparian Deciduous Forest. This biome is located along larger washes and drainage ways such as Sopori Wash and Peck Canyon. Higher water tables in these areas typical support large stands of cottonwood (*Populus fremonti*) and willow (*Salix* spp.) trees with canopy layers greater than 50 ft (15 m) in height (HEG 2003a, 2003b, 2003c).

USFS Classified Riparian. This classification system was developed by USFS and *only* applies to riparian areas administered by USFS. Riparian areas outside lands administered by USFS are discussed above. USFS has rated riparian areas as "satisfactory" or "unsatisfactory" depending on three primary factors: (1) the percent of woody plant composition present, (2) age classes, and (3) natural shrub and tree crown cover. Watersheds rated as "unsatisfactory" in the Forest Plan (USFS 1986) are given priority for watershed improvement projects.

The area of the above vegetation types occurring in each corridor was determined using Geographic Information Systems (GIS) software (ArcInfo) to map the corridors on the Arizona Gap Analysis Vegetation Study map (1999). The length of the corridor in each biome, as calculated by ArcInfo, was multiplied by the proposed corridor width (0.25 mi [0.4 km]). The resolution of this map is adequate for analysis of areas up to approximately 98 ft (30 m). This resolution is considered sufficient for large areas such as those portions of the corridors occurring in Sonoran Desertscrub, Semidesert Grassland, and Madrean Evergreen Woodland. However, this resolution is not sufficient to adequately map small areas such as those where Sonoran Deciduous Forest occurs. Therefore, Sonoran Deciduous Forest was identified on aerial photography and the amount of this habitat present in each corridor was estimated. Harris Environmental Group confirmed these estimations by visiting areas containing Sonoran Deciduous Forest. The acreage of each vegetation type, by corridor, is provided in the following discussion.

The USFS Classified Riparian category uses vegetation classes different from those used by Harris Environmental Group and only applies to lands administered by USFS. The acreage of this vegetation in each corridor was based on GIS data provided by USFS. Although "Classified Riparian" includes "Deciduous Riparian," these areas were not mapped by Harris Environmental Group; therefore, these areas were not counted more than once.

Wildlife. No wildlife surveys were conducted in the corridors. However, diversity and densities of wildlife in all of the corridors are expected to be typical of the Sky Island region (see discussion in Section 3.3.1). Large mammals, such as mule deer, javelina, black bear, mountain lion (cougar), coyote and kit fox can be expected to occur, as well as several species of small mammals such as ground squirrel, desert cottontail, black-tailed jackrabbit, and kangaroo rat. Amphibian and reptile species expected to occur include a variety of snake, lizard, toad, and frog species. Similarly, a wide variety of birds are expected throughout all of the corridors.

3.3.2.1 *Western Corridor*

Table 3.3–1 lists the approximate acreage of each vegetation community present in the Western Corridor.

USFS Classified Riparian. On lands administered by USFS in the Western Corridor, approximately 0.8 acres (0.3 ha) of deciduous riparian, 1.1 acres (0.4 ha) of evergreen riparian, and 0.3 acres (0.1 ha) of dry desert riparian have been mapped (Table 3.3–2). Note that the "evergreen riparian" is unique to the USFS classification system in the context of this EIS. Furthermore, this vegetation type is not found outside national forest lands in any of the alternatives, and therefore, not analyzed for other land administration or ownerships.

Table 3.3–1. Biotic Communities Present in the Western Corridor.

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	7,350	2,640	82	4,628
Madrean Evergreen Woodland	2,070	2,070	0	0
Sonoran Riparian Deciduous Forest	0.9	0.8	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	634	0	0	634
USFS Classified Riparian	NA	2	NA	NA
TOTAL	10,603	4,713	82	5,810

NA = not applicable.

Table 3.3–2. USFS Classified Riparian Areas in the Western Corridor.

Vegetation Type	Area (acres)	Area Name	Condition[a]
Deciduous Riparian	0.2	East Fork Apache	Unsatisfactory
Deciduous Riparian	0.3	Sycamore	Satisfactory
Deciduous Riparian	0.3	Peña Blanca	Satisfactory
Evergreen Riparian	1.0	Peña Blanca	Satisfactory
Evergreen Riparian	0.1	Alamo	Unsatisfactory
Dry Desert Riparian	0.3	Alamo	Unsatisfactory

[a] Note that these ratings may be biased so that dry desert riparian vegetation types are more likely to be rated as unsatisfactory due to infrequent water flows.

3.3.2.2 *Central Corridor*

Table 3.3–3 lists the approximate acreage of each vegetation community present in the Central Corridor.

Table 3.3–3. Biotic Communities Present in the Central Corridor.

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	7,634	2,226	82	5,326
Madrean Evergreen Woodland	180	180	0	0
Sonoran Riparian Deciduous Forest	4.4	4.4	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	748	0	0	748
USFS Classified Riparian	4	4	NA	NA
TOTAL	9,118	2,414	82	6,622

NA = not applicable.

USFS Classified Riparian. On lands administered by USFS in the Central Corridor, approximately 0.9 acres (0.4 ha) of deciduous riparian, 0.9 acres (0.4 ha) of evergreen riparian, and 2.2 acres (0.9 ha) of dry desert riparian have been mapped (Table 3.3–4).

Table 3.3–4. USFS Classified Riparian Areas in the Central Corridor.

Vegetation Type	Area (acres)	Area Name	Condition
Deciduous Riparian	0.1	Rock Corral	Unsatisfactory
Deciduous Riparian	0.8	Agua Fria	Satisfactory
Evergreen Riparian	0.9	Peck	Satisfactory
Dry Desert Riparian	1.3	Negro	Not rated
Dry Desert Riparian	0.6	Tinaja	Not rated
Dry Desert Riparian	0.3	Lost Dog	Not rated

3.3.2.3 *Crossover Corridor*

Table 3.3–5 lists the approximate acreage of each vegetation community present in the Crossover Corridor.

Table 3.3–5. Biotic Communities Present in the Crossover Corridor.

Vegetation Type	Entire Corridor (acres)	Coronado National Forest (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	548	0	0	548
Semidesert Grassland	8,847	4,136	82	4,629
Madrean Evergreen Woodland	572	572	0	0
Sonoran Riparian Deciduous Forest	4.4	4.4	0	<0.1
Disturbed (agriculture, urban, or unvegetated)	634	0	0	634
USFS Classified Riparian	48	48	NA	NA
TOTAL	10,653	4,760	82	5,811

NA = not applicable.

USFS Classified Riparian. On lands administered by USFS in the Crossover Corridor, approximately 1.3 acres (0.5 ha) of deciduous riparian, 13.3 acres (5.4 ha) of evergreen riparian, and 33.6 acres (13.5 ha) of dry desert riparian have been mapped (Table 3.3–6).

Table 3.3–6. USFS Classified Riparian Areas in the Crossover Corridor.

Vegetation Type	Area (acres)	Area Name	Condition
Deciduous Riparian	1.3	East Fork Apache	Unsatisfactory
Evergreen Riparian	13.3	Peck	Satisfactory
Dry Desert Riparian	19.3	Negro	Not rated
Dry Desert Riparian	9.5	Tinaja	Not rated
Dry Desert Riparian	4.8	Lost Dog	Not rated

3.3.3 Special Interest Species

Special interest species include those species that are listed or being considered for listing as threatened or endangered by USFWS (Federal endangered, threatened, proposed, or candidate species); or that are given sensitive species status by USFS or BLM; or that are considered Wildlife of Special Concern in Arizona by the AGFD; or listed by the ADA.

Federally listed threatened and endangered species, and their designated critical habitat, are afforded protection under the ESA. Potential impacts to threatened and endangered species are evaluated for every land jurisdiction under each alternative. Impacts to species that are proposed to be listed, or are candidates for listing, are also evaluated in case they are listed during the *National Environmental Policy Act* (NEPA) process. USFS and BLM Sensitive species are evaluated within their respective land jurisdiction under each alternative. Species designated as Wildlife of Special Concern in Arizona and plants listed by the ADA are not afforded status on Federal lands. However, both USFS and BLM consider potential impacts to these species during any NEPA process.

The USFS Sensitive category as reported in this document includes all federally protected and candidate species, plus species formerly included on USFWS Category 2 candidate species list (now discontinued, USFWS 1996). The USFS Sensitive status does not confer legal protection of a species; however, it does identify species that may need special management consideration to prevent population declines, which could necessitate listing under the ESA. USFS Sensitive species are defined (FSM 2607.5) as "those plant and animal species identified by the regional Forester for which population viability is a concern, as evidenced by:

a. Significant current or predicted downward trends in population numbers or density, or

b. Significant current or predicted downward trends in habitat capability that would reduce a species existing distribution."

Criteria for BLM Sensitive Species include those that are:

a. Under status review by the USFWS,

b. Whose numbers are declining so rapidly that Federal listing may become necessary,

c. Typically small and widely dispersed populations, or

d. Inhabiting ecological refugia (a type of sensitive and relatively unaltered habitat) or other specialized habitats.

Designation as a Wildlife of Special Concern in Arizona species protects a species in the State of Arizona against take (harm or harassment) as authorized under Arizona statute ARS Title 17-309. Plants listed by the ADA are regulated under the Arizona Native Plant Law.

Harris Environmental Group completed a preliminary BE for the entirety of all of the proposed corridors (HEG 2001). Subsequently, Harris Environmental Group completed a draft Biological Assessments for the entirety of each of the action alternatives (the Western, Central, and Crossover Corridors, contained in Appendices D, E, and F, respectively) (HEG 2003a, 2003b, 2003c). During the preparation of the Biological Assessment, Harris Environmental Group contacted USFWS, AGFD (which queried Heritage Data Management System), USFS, and BLM to obtain updated records and information of potential habitat of special-interest species for Pima and Santa Cruz Counties.

A total of 99 special interest species were identified by the above-referenced agencies as potentially occurring in the corridors (HEG 2003a, 2003b, 2003c) (Table 3.3–7). The Harris Environmental Group evaluated all 28 species listed by USFWS (Table 3.3–8), 40 USFS Sensitive, 13 BLM Sensitive, 12 Wildlife Species of Concern in Arizona, and 6 Arizona Department of Agriculture species. No federally designated Critical Habitat or proposed designated Critical Habitat, as defined in the ESA, is present in any of the corridors. The Western Corridor crosses a portion of the Sycamore Canyon watershed upstream of Critical Habitat for Sonora chub.

Table 3.3–7. Comparison of Special Interest Species Potentially Occurring in Each of the Corridors.

Special-Interest Species	**Corridor[a]**		
	Western	**Central**	**Crossover**
Federal Threatened and Endangered Species			
Plants			
Canelo Hills Ladies' Tresses	-	-	-
Huachuca Water Umbel	-	-	-
Kearney's Blue Star	-	-	-

Table 3.3–7. Comparison of Special Interest Species Potentially Occurring in Each of the Corridors *(continued)*.

Special-Interest Species	**Corridor[a]**		
	Western	**Central**	**Crossover**
Nichol's Turk's Head Cactus	-	-	-
Pima Pineapple Cactus	X	X	X
Mammals			
Jaguar	X	X	X
Jaguarundi	-	-	-
Lesser Long-nosed Bat	X	X	X
Mexican Gray Wolf	X	X	X
Sonoran Pronghorn	-	-	-
Ocelot	-	-	-
Birds			
Cactus Ferruginous Pygmy-owl	X	X	X
Masked Bobwhite	-	-	-
Northern Aplomado Falcon	-	-	-
Southwestern Willow Flycatcher	X	X	X
Bald Eagle	-	-	-
Brown Pelican	-	-	-
Yellow-billed Cuckoo	X	X	X
Mexican Spotted Owl	X	-	X
Mountain Plover	-	-	-
Amphibians			
Sonoran Tiger Salamander	-	-	-
Chiricahua Leopard Frog	X	-	X
Fish			
Loach Minnow	-	-	-
Desert Pupfish	-	-	-
Gila Topminnow	X	X	X
Sonora Chub	X	-	-
Spikedace	-	-	-
Gila Chub	-	-	-
USFS Sensitive			
Plants			
Alamos Deer Vetch	X	X	X
Arid Throne Fleabane	X	X	X
Arizona Giant Sedge	X	X	X
Bartram's Stonecrop	X	X	X
Beardless Chinch Weed	X	X	X
Broad-leaf Ground Cherry	-	X	X
Catalina Beardtongue	X	X	X
Chihuahuan Sedge	X	X	X
Chiltepine	X	X	X
Chiricahua Mt. Brookweed	X	X	X
Foetid Passionflower	X	X	X
Gentry Indigo Bush	X	X	X

Table 3.3–7. Comparison of Special Interest Species Potentially Occurring in Each of the Corridors *(continued)*.

Special-Interest Species	Corridor[a]		
	Western	**Central**	**Crossover**
Large-Flowered Blue Star	X	X	X
Lumholtz Nightshade	X	X	X
Mock-Pennyroyal	X	X	X
Nodding Blue-eyed Grass	X	X	X
Northern Gray Hawk	X	X	X
Pima Indian Mallow	-	X	X
Santa Cruz Beehive Cactus	X	X	X
Santa Cruz Star Leaf	X	X	X
Santa Cruz Striped Agave	X	X	X
Seeman Groundsel	X	X	X
Sonoran Noseburn	X	X	X
Superb Beardtongue	X	X	X
Supine Bean	X	X	X
Sweet Acacia	X	X	X
Three-nerved scurf-pea	-	-	X
Thurber Hoary Pea	X	X	X
Thurber's Morning-glory	X	X	X
Virlet Paspalum	X	X	X
Weeping Muhly	X	X	X
Wiggins Milkweed Vine	X	X	X
Wooly Fleabane	X	X	X
Mammals			
Cave Myotis	X	X	X
Southern Pocket Gopher	X	X	X
Birds			
Five-Stripped Sparrow	X	X	X
American Peregrine Falcon	X	X	X
Yellow-billed Cuckoo	X	X	X
Amphibians			
Lowland Leopard Frog	X	X	X
Western Barking Frog	X	X	X
Reptiles			
Giant Spotted Whiptail	X	X	X
Mexican Garter Snake	X	X	X
Invertebrates			
Arizona Metalmark	X	X	X
BLM Sensitive			
Plants			
Balloonvine	X	X	X
False Grama	X	X	X
Tumamoc Globeberry	X	X	X
Mammals			
California Leaf-nosed Bat	X	X	X

Table 3.3–7. Comparison of Special Interest Species Potentially Occurring in Each of the Corridors *(continued)*.

Special-Interest Species	**Corridor[a]**		
	Western	**Central**	**Crossover**
Underwood's Mastiff Bat	X	X	X
Fringed Myotis	X	X	X
Pocketed Free-Tailed Bat	X	X	X
Big Free-Tailed Bat	X	X	X
Spotted Bat	X	X	X
Birds			
Western Burrowing Owl	X	X	X
Loggerhead Shrike	X	X	X
Rufuos-winged sparrow	X	X	X
Reptiles			
Texas Horned Lizard	X	X	X
Wildlife of Special Concern In Arizona			
Mammals			
Mexican Long-tongued Bat	X	X	X
Californian Leaf-nosed Bat	X	X	X
Birds			
Black-bellied Whistling Duck	X	X	X
Elegant Trogon	X	X	X
Osprey	X	X	X
Crested Caracara	X	X	X
Thick-billed Kingbird	X	X	X
Rose-throated Becard	X	X	X
Tropical Kingbird	X	X	X
Amphibians			
Great Plains Narrow-mouthed Toad	X	X	X
Reptiles			
Desert Tortoise (Sonoran)	X	X	X
Mexican Vine Snake	X	X	X
Arizona Department of Agriculture Plants			
Bartram's Stonecrop	X	X	X
Gentry Indigo Bush	X	X	X
Santa Cruz Striped Agave	X	X	X
Catalina Beardtongue	X	X	X
Santa Cruz Beehive Cactus	X	X	X
Pima Indian Mallow	-	X	X

[a] An X in the "Corridor" denotes that a special interest species may potentially occur in that corridor.
Note: "-" denotes no potential occurrence of Special Interest Species.
Source: HEG 2003a, 2003b, 2003c.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties.

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Plants			
Canelo Hills Ladies' Tresses	E	None	Occurs in finely grained, highly organic, saturated soils of Cienegas below 5,000 ft. Known range is located well outside the three corridors.
Huachuca Water Umbel	E	None	Cienegas, perennial low gradient streams, and wetlands between 3500-6500 ft
Kearney's Blue Star	E	None	Known only from west-facing drainages in the Baboquivari Mountains.
Nichol's Turk's Head Cactus	E	None	Found in unshaded microsites in Sonoran desertscrub on dissected alluvial fans at the foot of limestone mountains.
Pima Pineapple Cactus	E	All	Occurs in alluvial basins or on hillsides in Semidesert Grassland in a wide range of soils on land with less than 10-15% slope.
Mammals			
Jaguar	E	All	Typically occurs in large canyon bottoms where surface water occurs and is also found in Sonoran Desertscrub up through subalpine conifer forest.
Jaguarundi	E	None	Occurs in humid tropical and sub-tropical forests, savannahs, and semi-arid thornscrub.
Lesser Long-nosed Bat	E	All	Desertscrub habitat with agave and columnar cacti present as food plants; day roosts in caves and abandoned tunnels.
Mexican Gray Wolf	E	None (however, potentially suitable habitat is present in all three corridors)	Historically occurred in chaparral, woodland, and forested areas. Only known population is an "experimental nonessential population" introduced in the Blue Primitive Area in eastern Arizona.
Ocelot	E	None	Occurs in humid tropical and sub-tropical forests, savannahs, and semi-arid thornscrub.
Sonoran Pronghorn	E	None	Found in broad intermountain alluvial valleys with creosote-bursage and palo verde-mixed cacti associations. Known range is located well outside the three corridors.
Birds			
Cactus Ferruginous Pygmy-owl	E	All	Mature cottonwood/willow, mesquite bosque, and Sonoran Desertscrub.
Masked Bobwhite	E	None	Desert grasslands with diversity of dense native grasses, forbs, and brush. Presently only known from reintroduced populations on Buenos Aires National Wildlife Refuge. Known range is located well outside the three corridors.

Table 3.3–8. Federally Listed Species Potentially Occurring in Pima and Santa Cruz Counties *(continued)*.

Common Name	Status [a]	Corridor Species May Occur in:	Preferred Habitat
Northern Aplomado Falcon	E	None	Occurs in grassland and savannah. Known range is located well outside the three corridors.
Southwestern Willow Flycatcher	E	All	Occurs and nests in dense riparian habitats along streams where cottonwood, willow, boxelder, tamarisk are present.
Bald Eagle	T	None	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.
Brown Pelican	T	None	Coastal land and islands; species found around many Arizona lakes and rivers
Mexican Spotted Owl	T	Western Crossover	Occurs in mature forest and woodland, shady wooded canyons and steep canyons.
Mountain Plover	P	None	Sporadically occurs in open arid plains, short-grass prairies, and cultivated farms.
Yellow-billed Cuckoo	C	All	Occurs in riparian areas dominated by tall cottonwood and willow trees.
Fish			
Desert Pupfish	E	None	Occurs below 5,000 ft. in shallow springs, small streams, and marshes. Tolerates saline and warm water. Known range is located well outside the three corridors.
Gila Topminnow	E	All	In Arizona, most of the remaining populations occur in the Santa Cruz River system.
Loach Minnow	T	None	A benthic species of small to large perennial streams with swift shallow water over cobble and gravel.
Sonora Chub	T	Western	Occurs in perennial and intermittent small to moderate streams with boulders and cliffs.
Spikedace	T	None	Occurs in moderate to large perennial streams with gravel cobble substrates and moderate to swift velocities over sand and gravel substrates.
Amphibians			
Sonoran Tiger Salamander	E	None	Lives in moist or damp areas such as rodent burrows and rotting logs. Breeds in stock tanks. Known range is located well outside the three corridors.
Chiricahua Leopard Frog	T	Western Crossover	Typically occurs in a wide variety of water sources in deserts, grasslands, chaparral, and oak woodlands.

[a] USFWS Endangered (E), Threatened (T), Proposed (P), Candidate (C).
Source: HEG 2003a, 2003b, 2003c.

Detailed evaluations of threatened and endangered species are provided in the Biological Assessments in Appendices D, E, and F.

3.3.3.1 *Western Corridor*

According to the Harris Environmental Group (2003a), ten species listed under the ESA could potentially be impacted under this alternative. Relative to the Western Corridor, either: (1) these species are known to occur, (2) these species have the potential to occur, (3) suitable habitat exists, or (4) these species could be indirectly impacted. Below is the status, a description and distribution of the species, relative to the Western Corridor.

Cactus Ferruginous Pygmy-owl (Endangered). Habitat for cactus ferruginous pygmy-owl, as defined by the USFWS, is present throughout the majority of the Western Corridor. However, no cactus ferruginous pygmy-owl are known to occur in the Western Corridor and none were detected during surveys by biologists at 142 call points in 2001 and 140 call points in 2002 (HEG 2003a). Historically cactus ferruginous pygmy-owl have been known to occur in the Nogales Ranger district in Sycamore Canyon (HEG 2003a), but USFS surveys in 1997 and 1998 failed to detect any individuals. In 1999 USFS biologists conducted 58 cactus ferruginous pygmy-owl habitat assessments in the Tumacacori EMA and identified four areas west and southwest of all of the corridors that warranted cactus ferruginous pygmy-owl surveys. As a result, approximately 2,300 acres (931 ha) were surveyed. No cactus ferruginous pygmy-owl was detected in these four areas (HEG 2003a).

Chiricahua Leopard Frog (Threatened). Chiricahua leopard frogs are known to presently occur at four locations within the Tumacocori EMA and there are 17 historical records in the Pajarito and Atascosa Mountains (HEG 2003a). None of these populations are located in the Western Corridor. No surveys for Chiricahua leopard frog have been completed in the Western Corridor.

Gila Topminnow (Endangered). Gila topminnows are currently known from 14 natural locations in Arizona. Historically, this species occurred in the Santa Cruz River and other major drainages throughout Arizona and Mexico. The nearest known present-day population is approximately 12 mi (19 km) northeast of Nogales, Arizona (approximately 12 mi [19 km] east of any of the corridors). No Gila topminnow occur in the Tumacacori EMA (HEG 2003a), or any other portion of the Western Corridor, and there are no plans for introductions in any locations.

Jaguar (Endangered). Jaguars have been documented with 2 mi (3.2 km) of the Western Corridor. It is likely that resident breeding populations occurred in the southwestern United States into the 20th century; however, there are presently no known breeding populations of jaguar in the United States. There have been numerous confirmed and unconfirmed sightings during the 1980s and 1990s of individuals along the Arizona-Mexico border. The most recent sightings of jaguar occurred in the Tumacacori EMA and this area is the most likely to provide habitat and support the future existence of this species in the United States (HEG 2002a). It is unknown how many, if any, jaguar occur the southwestern United States year round. Jaguars typically inhabit large canyon bottom habitats with surface water but occur in a wide variety of habitats.

Lesser Long-nosed Bat (Endangered). No lesser long-nosed bat roosts are known to exist in the Western Corridor. However, numerous caves, crevices, and abandoned mines, which may be suitable lesser long-nosed bat roosts, are present in the Tumacocori-Atascosa Mountains (HEG 2003a). The Corridor is within foraging distance of two known roost sites in southern Arizona and food plants (agave and saguaro) are present throughout portions of the Western Corridor.

Mexican Gray Wolf (Endangered). Mexican gray wolves are believed to have been extirpated (killed off completely) from Arizona by 1960 and from Mexico by 1980 by intensive predator control programs (Hoffmeister 1986). Historically, this species inhabited most non-desert areas above 4,000 ft (1,220 m) in oak, pine/juniper savannahs, and mixed conifer woodlands (USFWS 1998). In 1907, 45 wolves were killed in several southern Arizona mountain ranges. USFWS is in the process of re-establishing "a wild population" of at least 100 Mexican wolves in the Blue Range in Arizona. Mexican gray wolf may have historically occurred in portions of the Western Corridor.

Mexican Spotted Owl (Threatened). There are five Protected Activity Centers in the Tumacacori EMA (HEG 2003a). Although the Western Corridor does not cross any Protected Activity Centers, it is within 1 mi (1.6 km) of two different Protected Activity Centers south of Ruby Road. Much of the remaining Western Corridor lacks habitat for Mexican spotted owl.

The USFWS proposed to re-designate Mexican spotted owl critical habitat in 2000 after the courts revoked the critical habitat designated in 1995. The 2000 proposed critical habitat included 13.5 million acres (5.6 million ha) of land mostly administered by USFS. The southern portion of the Western Corridor crosses approximately 8 mi (13 km) of the critical habitat proposed in 2000 (*Federal Register* Volume 65, No. 141, July 21, 2000, p. 45336). The final rule published on February 1, 2001, did not designate critical habitat on national forest land in Arizona. The reason given for not designating critical habitat on national forest lands was that current Forest Plans conform to management guidelines outlined in the USFWS Recovery Plan for the Mexican spotted owl (USFWS 1995). On January 13, 2003, a Federal judge stated that the final rule designating critical habitat for Mexican spotted owl violated the ESA. Subsequent court orders have mandated the USFWS to re-propose critical habitat for Mexican spotted owl within nine months (October 13, 2003) and publish a final designation within 15 months (April 13, 2004). At the time of the preparation of this Draft EIS no critical habitat for Mexican spotted owl exists in the Western Corridor.

Pima Pineapple Cactus (Endangered). Pima pineapple cacti occur in patches throughout most of the northern portion of the Western Corridor. A total of 70 Pima pineapple cactus were located during surveys conducted from July 17, 2002, through March 31, 2003 (HEG 2003a). Within the Western Corridor, Pima pineapple cacti were located only between the forest boundary and the South Substation. Of the 70 Pima pineapple cacti found in the Western Corridor, three were found on the BLM land (two were within the proposed 125-ft [38.1-m] right-of-way [ROW]).

Southwestern Willow Flycatcher (Endangered). Southwestern willow flycatchers are not known to occur in the Western Corridor. However, Harris Environmental Group (2003a) identified potential habitat (that is, broad-leaved deciduous riparian habitat) where the Western Corridor crosses Sopori Wash. Individuals could use this area during migration but not for breeding.

Sonora Chub (Threatened). No Sonora chubs are known to occur within the Western Corridor. However, populations are known to occur in several streams and springs within the Tumacacori EMA and critical habitat have been designated approximately 1 mi (1.6 km) downstream of the Western Corridor. Sonora chub populations fluctuate widely in response to wet/dry periods. This species expands from pools into runs and riffles as they become available during rainy seasons.

USFS Sensitive Species. Forty USFS Sensitive Species were identified as potentially occurring in the Western Corridor (HEG 2003a) (see the following list). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Plants		
Alamos Deer Vetch	Gentry Indigo Bush	Supine Bean
Arid Throne Fleabane	Large-Flowered Blue Star	Superb Beardtongue
Arizona Giant Sedge	Lumholtz Nightshade	Sweet Acacia
Bartram's Stonecrop	Mock-Pennyroyal	Thurber Hoary Pea
Beardless Chinch Weed	Nodding Blue-eyed Grass	Thurber's Morning-glory
Catalina Beardtongue	Santa Cruz Beehive Cactus	Virlet Paspalum
Chihuahuan Sedge	Santa Cruz Star Leaf	Weeping Muhly
Chiltepene	Santa Cruz Striped Agave	Wiggins Milkweed Vine
Chiricahua Mt. Brookweed	Seeman Groundsel	Wooly Fleabane
Foetid Passionflower	Sonoran Noseburn	

Mammals		
Cave Myotis	Southern Pocket Gopher	

Birds		
American Peregrine Falcon	Northern Gray Hawk	Yellow-billed Cuckoo
Five-Stripped Sparrow		

Reptiles/Amphibians		
Giant Spotted Whiptail	Lowland Leopard Frog	Mexican Garter Snake
Western Barking Frog		

Invertebrates		
Arizona Metalmark		

BLM Sensitive Species. Thirteen BLM Sensitive species were identified as potentially occurring in the Western Corridor (HEG 2003a) (see the following list). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Plants		
Balloonvine	False Grama	Tumamoc Globeberry

Mammals		
Big Free-Tailed Bat	Californian Leaf-nosed Bat	Fringed Myotis
Pocketed Free-Tailed Bat	Spotted Bat	Underwood's Mastiff Bat

Birds		
Rufus-winged sparrow	Loggerhead Shrike	Western Burrowing Owl

Reptiles		
Texas Horned Lizard		

Wildlife of Special Concern In Arizona. Twelve AGFD Wildlife of Special Concern in Arizona were identified as potentially occurring in the Western Corridor (HEG 2003a) (see the following list). A description of these species and habitat requirements can be found in the Biological Assessment for the Western Corridor, Appendix D.

Mammals		
Californian Leaf-nosed Bat	Mexican Long-tongued Bat	
Birds		
Black-bellied Whistling Duck	Crested Caracara	Elegant Trogon
Osprey	Thick-billed Kingbird	Tropical Kingbird
Rose-throated Becard Great Plains		
Reptiles/Amphibians		
Desert Tortoise (Sonoran)	Mexican Vine Snake	Narrow-mouthed Toad

Arizona Department of Agriculture Plants. Five plants afforded protection under the Arizona Native Plant Law were identified as potentially occurring in the Western Corridor (see the following list). Plants that are classified as "Salvage Restricted" are plants that have a high potential for theft or vandalism of the whole plant. Collection, salvage, or harvesting requires permitting from the ADA. Plants that are classified as "Highly Safeguarded" are those species of native plants and parts of plants, including the seeds and fruit, whose prospects for survival in Arizona are in jeopardy or which are in danger of extinction.

Common Name	Status
Bartram's Stonecrop	Salvage Restricted
Catalina Beardtongue	Highly Safeguarded
Gentry Indigo Bush	Highly Safeguarded
Santa Cruz Beehive Cactus	Highly Safeguarded
Santa Cruz Striped Agave	Highly Safeguarded

3.3.3.2 *Central Corridor*

According to the Harris Environmental Group (2003b), seven federally listed species could potentially be impacted under this alternative. These species include: cactus ferruginous pygmy-owl, Pima pineapple cactus, southwestern willow flycatcher, lesser long-nosed bat, jaguar, Gila topminnow, and Mexican gray wolf. With the exception of Pima pineapple cactus, descriptions of these species, their status, and distribution are provided above. The distribution of Pima pineapple cactus within the Central Corridor is provided below. Although it is considered unlikely that Mexican spotted owl occur in the Central Corridor, formerly proposed critical habitat is located within a portion of the Central Corridor. Therefore, Mexican spotted owl is also discussed below.

Mexican Spotted Owl (Threatened). Much of the Central Corridor lacks habitat for Mexican spotted owl. However, the Central Corridor crosses approximately 2 mi (3.2 km) of the critical habitat proposed in 2000. At the time of the preparation of this EIS no critical habitat for Mexican spotted owl exists in the Central Corridor.

Pima Pineapple Cactus (Endangered). Pima pineapple cacti occur in patches throughout most of the Central Corridor. A total of 78 Pima pineapple cacti were located during surveys conducted from July 17, 2002 through March 31, 2003 (HEG 2003a). Within the Central Corridor, Pima pineapple cacti were only between the forest boundary and the South Substation. Of the 78 Pima pineapple cacti found in the Central Corridor, three were found on the BLM land (two were within the proposed 125-ft [38.1 m] ROW).

USFS Sensitive Species. Forty-two USFS Sensitive Species were identified as potentially occurring in, or within 3 mi (4.8 km) of the Central Corridor (HEG 2003b). In addition to those species listed above under Section 3.3.3.1, Pima Indian mallow and broad-leaf ground cherry potentially occur in the Central Corridor. A description of these species and habitat requirements can be found in the Biological Assessment for the Central Corridor, Appendix E.

BLM Sensitive Species. BLM Sensitive Species are identical to those addressed in Section 3.3.3.1 (HEG 2003b).

Wildlife of Special Concern In Arizona. Wildlife of Special Concern in Arizona species are identical to those addressed in Section 3.3.3.1 (HEG 2003b).

Arizona Department of Agriculture Plants. In addition to the five ADA plants listed under Section 3.3.3.1, Pima Indian mallow may occur in the Central Corridor. Pima Indian mallow is considered "Salvage Restricted" under the Arizona Native Plant Law (HEG 2003b).

3.3.3.3 *Crossover Corridor*

According to the Harris Environmental Group (2003c), nine federally listed species could potentially be impacted under this alternative. These species include: Pima pineapple cactus, cactus ferruginous pygmy-owl, Mexican spotted owl, southwestern willow flycatcher, lesser long-nosed bat, jaguar, Gila topminnow, Chiricahua leopard frog, and Mexican gray wolf. With the exception of Mexican spotted owl, the descriptions of these species, their status, and distribution are provided above under Section 3.3.3.1. The survey results for Pima pineapple cactus are identical to those under Section 3.3.3.1 because all of the individuals found were located within the portion of the Crossover Corridor shared with the Western Corridor.

Mexican Spotted Owl (Threatened). There is one Protected Activity Center within 0.6 mi (0.9 km) of the Crossover Corridor near Peck Canyon (HEG 2003c). Much of the remaining Crossover Corridor lacks habitat for Mexican spotted owl. The Crossover Corridor crosses approximately 2 mi (3.2 km) of the critical habitat proposed in 2000. This 2-mi (3.2-km) section is within the portion of the corridor that is common to the Central Corridor. At the time of the preparation of this EIS no critical habitat for Mexican spotted owl exists in the Crossover Corridor.

USFS Sensitive Species. Forty-three USFS Sensitive Species were identified as potentially occurring in, or within 3 mi (4.8 km) of the Crossover Corridor (HEG 2003c). In addition to those species listed above under Section 3.3.3.2, three-nerved scurf-pea potentially occurs in the Crossover Corridor. A description of these species and habitat requirements can be found in the Biological Assessment for the Crossover Corridor, Appendix F.

BLM Sensitive Species. BLM Sensitive Species are identical to those addressed in Section 3.3.3.1 (HEG 2003c).

Wildlife of Special Concern In Arizona. Wildlife of Special Concern in Arizona species potentially occurring in the Crossover Corridor are identical to those addressed above in Section 3.3.3.1 (HEG 2003c).

Arizona Department of Agriculture Plants. The six ADA plants listed under Section 3.3.3.2 may also occur in the Crossover Corridor (HEG 2003c).

3.3.4 Migratory Birds and Raptors

The *Migratory Bird Treaty Act* of 1918 (MBTA) governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. The take of all migratory birds is governed by MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent over-utilization. Section 704 of MBTA states that the Secretary of the U.S. Department of Interior is authorized and directed to determine if, and by what means, the take of migratory birds should be allowed and to adopt suitable regulations permitting and governing take. The Secretary in adopting regulations is to consider such factors as distribution and abundance to ensure that take is compatible with the protection of the species (SWCA 2002a). Raptors are birds of prey including various types of hawks, falcons, eagles, vultures, and owls. Most raptors occurring in the study area are covered under MBTA.

Potential impacts of the proposed project on birds protected under the MBTA (migratory birds) were evaluated for all of the action alternatives (SWCA 2002a). This evaluation included a review of the migratory birds potentially occurring within the entire length of all of the corridors by habitat type preference.

There are no designated Important Bird Areas (IBA) within the proposed corridors. IBAs are sites that provide essential habitat for one or more species of bird. IBAs include sites for breeding, wintering, and/or migrating birds (Audubon 2001). IBAs may be a few acres or thousands of acres, but usually they are discrete sites that stand out from the surrounding landscape. IBAs may include public or private lands, or both, and they may be protected or unprotected.

The nearest IBA is the proposed Lower San Pedro River IBA, which is over 45 mi (72 km) east of the Central Corridor. There is no important link between the bird communities that may encounter the proposed project corridors and those that inhabit the San Pedro River area. It should be noted, however, that the Santa Cruz River Valley retains many of the characteristics of the San Pedro River, especially in reaches of the Santa Cruz River that currently receive treated sewage effluent (approximately 2 mi [3.2 km] east of the Central Corridor). For this reason, this feature may serve migratory birds in a similar manner to the San Pedro River.

Other features that are important to migratory birds include stock tanks, springs, and cliffs. Field surveys prior to the final design of the selected route could allow avoidance of these features.

3.3.4.1 *Western, Central, and Crossover Corridors*

Table 3.3–9 lists migratory birds expected to occur regularly in the Western, Central, and Crossover Corridors. It is possible that any migratory bird listed under the MBTA could occur in these corridors because of the high degree of mobility of birds.

3.3.5 Coronado National Forest Management Indicator Species

An MIS Analysis and Report for the proposed project considered 48 MIS[1] (SWCA 2002b), within 7 designated Management Indicator Groups (indicator groups) (some of these species occur in more than one group). Potential impacts to species that are currently listed or are under consideration for listing by

[1] The USFS is charged with preserving and enhancing the diversity of plants and animals consistent with the overall multiple use objectives. To accomplish this, MIS are selected "because their population changes are believed to indicate the effects of management activities" (36 CFR 291.19 [a][I]).

USFWS were analyzed in Biological Assessments prepared by Harris Environmental Group (HEG 2003a, 2003b, 2003c).

The list of MIS is the same for the three proposed alternatives; the alternatives differ in terms of MIS analysis only in terms of the amount of national forest lands and corresponding MIS habitat that has the potential to be altered. Table 3.3–10 provides a brief summary of the potential MIS habitat that is present within each of the corridors. MIS habitat is only defined and analyzed for national forest lands.

Table 3.3–9. Bird Species Listed Under the Migratory Bird Treaty Act that are Likely to Occur in the Western, Central and Crossover Corridors by Vegetation Type. [a]

Vegetation Type	Species
Sonoran Desertscrub	Harris' hawk, elf owl, Gila woodpecker, verdin, cactus wren, curve-billed thrasher, black-throated sparrow great-horned owl, red-tailed hawk, phainopepla, verdin, Lucy's warbler, and black-tailed gnatcatcher
Semidesert Grassland	Swainson's hawk, prairie falcon, loggerhead shrike, grasshopper sparrow, Savannah sparrow, lark bunting and western kingbird
Madrean Evergreen Woodland	Arizona woodpecker, Mexican jay, bridled titmouse, Hutton's vireo, and black-throated gray warbler
Sonoran Deciduous Riparian Forest	yellow-billed cuckoo, violet-crowned, Lucifer, broad-billed, and blue-throated hummingbirds; zone-tailed, gray hawk, and black hawks; yellow-billed cuckoo; Mississippi kite; sulphur-bellied flycatcher; cliff swallow; yellow warbler; Bullock's oriole; summer tanager; rose-throated becard; and elegant trogon

[a] This list is not comprehensive, but is provided to indicate the diversity of birds potentially occurring in the corridors.

Table 3.3–10. USFS Management Indicator Species by Group in the Coronado National Forest, Arizona.

Cavity Nesters	**Primary Cavity Nesters**	**Other Secondary Cavity Nesters (cont.)**
	Elegant Trogon	Cordilleran flycatcher
	Sulphur-bellied Flycatcher	Dusky capped flycatcher
	Acorn woodpecker	Ash-throated flycatcher
	Gila woodpecker	Brown-crested flycatcher
	Ladder-backed woodpecker	Violet-green swallow
	Hairy woodpecker	Bridled titmouse
	Arizona (Strickland's) woodpecker	Juniper titmouse
	Northern flicker	Red-breasted nuthatch
	Other Secondary Cavity Nesters[a]	White-breasted nuthatch
	American kestrel	Pygmy nuthatch
	Flammulated owl	Brown creeper
	Western screech owl	Bewick's wren
	Whiskered screech owl	House wren
	Northern pygmy-owl	Eastern bluebird
	Elf owl	European starling
	Mexican spotted owl	Lucy's warbler
	Eared trogon	

Table 3.3–10. USFS Management Indicator Species by Group in the Coronado National Forest, Arizona (*continued*).

Riparian Species	Gray Hawk Blue-throated Hummingbird Elegant Trogon Rose-throated Becard Thick-billed Kingbird	Sulphur-bellied Flycatcher Northern Beardless-Tyrannulet Bell's Vireo Black Bear
Species Needing Diversity	White-tailed Deer Merriam's Turkey Elegant Trogon	Sulphur-bellied Flycatcher Buff-breasted Flycatcher Black Bear
Species Needing Herbaceous Cover	White-tailed Deer Montezuma quail Pronghorn Antelope	Baird's Sparrow Desert Massassauga
Species Needing Dense Canopy	Bell's Vireo Northern Beardless-Tyrannulet Gray Hawk	
Game Species	White-tailed deer Montezuma Quail Pronghorn antelope	Desert bighorn sheep Merriam's Turkey Black bear
Special Interest Species	Montezuma Quail Gray Hawk Blue-throated Hummingbird Elegant Trogon Rose-throated Becard	Thick-billed Kingbird Sulphur-bellied Flycatcher Buff-breasted Flycatcher Northern Beardless-Tyrannulet Five-striped Sparrow

[a] Primary cavity nesters are those bird species that excavate nesting holes into trees or columnar cacti. Secondary cavity nesters are those species that are unable to excavate nesting holes into trees or columnar cacti and must find existing cavities for breeding.

3.3.5.1 *Western Corridor*

The length of the Western Corridor within the Coronado National Forest is 29.5 mi (47.5 km). Under this alternative, approximately 460 acres (186 ha) of Madrean Evergreen Woodland and 260 acres (105 ha) of Semidesert Grassland that could be potential MIS habitats are located in the Western Corridor.

3.3.5.2 *Central Corridor*

The length of the Central Corridor within the Coronado National Forest is approximately 15.1 mi (24.3 km). Under this alternative, approximately 212 acres (85.8 ha) of Madrean Evergreen Woodland, 16 acres (6.5 ha) of Xeroriparian Mixed Scrub, and 0.2 acres (0.1 ha) of Deciduous Riparian that could be potential MIS habitats are located within the Central Corridor on national forest land.

3.3.5.3 *Crossover Corridor*

The length of the Crossover Corridor within the Coronado National Forest is approximately 29.3 mi (47.2 km). Under this alternative, a maximum of 365 acres (148 ha) of Madrean Evergreen Woodland and 345 acres (140 ha) of Semidesert Grassland that could be potential MIS habitats are located within the Crossover Corridor on national forest land.

3.3.6 Invasive Species

Under Executive Order (EO) 13112, Invasive Species (February 3, 1999), projects which occur on Federal lands or are federally funded must: "subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (1) prevent the introduction of invasive species; (2) detect and respond rapidly to, and control, populations of such species in a cost-effective and environmentally sound manner; (3) monitor invasive species populations accurately and reliably; and (4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded." Invasive species are most likely to occur in areas that have existing disturbances to soil. None of the proposed corridors have been surveyed for the presence of invasive species.

3.3.6.1 *Western, Central, and Crossover Corridors*

Given the vast expanse of land in all of the corridors, it is likely that some invasive species listed in EO 13112 occur. The only invasive species identified on lands administered by USFS is tree of heaven. No noxious weeds listed under EO 13112 are known to occur on lands administered by BLM. However, BLM has identified that buffelgrass is considered as a noxious weed and is located on BLM land in all three proposed corridors.

3.4 CULTURAL RESOURCES

This section discusses the cultural resources in the vicinity of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line project. The discussion is divided into Section 3.4.1, Archaeological and Historical Sites, and Section 3.4.2, Native American Concerns and traditional cultural properties.

Federal agency responsibilities with regard to cultural resources are addressed by a number of laws, implementing regulations, Executive Orders (EOs), programmatic agreements, and other requirements, including the *National Historic Preservation Act* of 1966 (NHPA), *Native American Graves and Repatriation Act* (NAGPRA), *American Indian Religious Freedom Act* (AIRFA), EO 13007 "Native American Religious Practices," and EO 13175 "Consultation and Coordination With Indian Tribal Governments." This protection extends to sites on private land potentially affected by actions requiring Federal approval. The principal Federal law addressing cultural resources is the NHPA, as amended (16 USC 470), with its implementing regulations (36 CFR Part 800). NHPA describes the process for identifying and evaluating historic properties; assessing the effects of Federal actions on historic properties; and consulting to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). Section 106 of the NHPA requires that Federal agency decisions affecting these places consider cultural and historic values and the options available to protect these properties. Section 106 also requires consultation with Indian tribes whose traditional lands may be affected by "undertakings," and EO 13175 delineates the Government-to-Government Relationship between Native American Tribal Governments and Federal agencies through which these consultations must occur. NAGPRA was enacted in 1990 to protect Native American burials, associated funerary objects, and objects of cultural patrimony encountered on Federal land. The AIRFA and EO 13007 both pertain to Native American sacred sites. EO 13007 states that Federal agencies must "to the extent practicable and not clearly inconsistent with essential agency functions, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites."

The U.S. Department of Energy (DOE), as the lead Federal agency, is responsible for identifying, evaluating, and assessing effects of construction and operation of the TEP Sahuarita-Nogales Transmission Line proposed project on cultural resources, in concurrence with the State Historic Preservation Officer (SHPO) and other consulting parties. As is common practice, this Draft Environmental Impact Statement (EIS) does not present the exact locations of cultural resources (including historical sites, archaeological sites, and traditional cultural properties) in an effort to help preserve those sites from vandalism. Instead, the descriptions below focus on known densities of sites within the corridors. Throughout this discussion, all federally recognized American Indian political entities consulted in this project are collectively termed the "tribes," even though many are Nations or Communities. DOE and the cooperating agencies recognize that each tribe is an individual, sovereign nation with a unique trust relationship to the U.S. government.

3.4.1 Archaeological and Historical Sites

DOE and Arizona State Museum personnel conducted record searches at the Arizona State Museum using Arizona Online Database of Archaeological Projects and Sites (AZSITE) in order to determine the number and type of previously documented archaeological and historical sites within the 0.25-mi (0.40-km) study corridor for each alternative. The U.S. Department of Agriculture Forest Service (USFS) provided information on known sites within the study corridors on the Coronado National Forest. DOE determined the degree to which each of the corridors had been previously surveyed for archaeological and historical sites by using AZSITE and data provided by USFS. Three 20th century sites are known to be crossed by all three of the proposed corridors: the historic alignment of Ruby Road (see Figure 3.1–1), the Potrero erosion control features constructed by the Civilian Conservation Corps (approximately 1.25 mi [2 km] northwest of Nogales), and a water conveyance feature known as the Ruby Pipeline that runs west from the Santa Cruz River through Peck Canyon to the town of Ruby. These three sites are included below in discussions of the total sites documented within the individual proposed corridors. The Atascosa Lookout Tower, an historic property northeast of the Western Corridor in the Atascosa Mountains, is outside the right-of-way (ROW) of the three proposed corridors. Additional sites that have been documented but have yet to be registered with the Arizona State Museum, USFS, or SHPO may also be located within each of the proposed corridors.

3.4.1.1 *Western Corridor*

The Western Corridor would involve the construction of a new transmission line that runs from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing through the Tumacacori and Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona (all locations noted on Figure 1.1–4, unless otherwise noted below).

Twenty-two previously identified archaeological and historical sites have been documented within this corridor, including six sites on the Coronado National Forest. Archaeological terms and site types are defined in the text box that follows. The prehistoric to historic Native American sites include five artifact scatters, two artifact scatters with rock features, one site with potential habitation features, three rock shelters with artifact scatters, one bedrock mortar site, and one pictograph site. Historical sites include two habitation sites, the historic alignment of Ruby Road, Peña Blanca Civilian Conservation Corps Camp F-64-A, a set of erosion control features constructed by the Civilian Conservation Corps, and a water conveyance feature known as the Ruby Pipeline. Additional sites include a multicomponent site containing a prehistoric artifact scatter and a historical ranch, a site consisting of two rock walls of unknown age, and an isolated check dam of unknown age. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density varies directly with the intensity of survey, with greater number of sites located in the areas more intensively surveyed. Fourteen of the 22 known sites are located on the descent of the Sierrita Mountains west of Sahuarita and Green Valley, 2 are located near the intersection of the Western Corridor and Sopori Wash (see Figure 3.7–1), and the remaining 6 are located in the mountainous areas of the Tumacacori and Atascosa Mountains on the Coronado National Forest. Data collected from AZSITE and USFS indicate that less than 15 percent of the Western Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains represent the majority of previously surveyed land. Because only a small percentage of the Western Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within it. Based upon the varied terrain of the Western Corridor, a wide range of archaeological site types are expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segment may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining-related sites. Intermontane valleys (valleys between mountains) are expected to contain a wide variety of prehistoric and historic sites.

Archaeological Terms and Site Types

Artifact Scatter	Archaeological site resulting from often undetermined past activity, represented only by artifacts on the present ground surface; often, there is little or no depth to the site deposits. These may represent the only visible remains of a long-term habitation site, or, in contrast, a limited activity site (pot break, flint knapping) or agricultural field where miscellaneous artifacts were included in field mulch.
Bedrock Mortar	Place where grinding or crushing of food or other materials took place on a large rock; these are not movable artifacts.
Cave Site	An archaeological site in a cave; the entrance of a cave is generally smaller than the depth into the rock cliff of the cave, as opposed to a rock shelter (see below).
Check Dam	Rocks aligned to form a small dam, constructed in a gully or on a slope, to decrease the water flow velocity and promote deposition of sediment.
Multicomponent Site	An archaeological site that contains the remains of more than one culture and often includes archaeological remains from more than one time period.
Petroglyph	An engraving on a rock produced by grinding, pecking, or incising.
Pictograph	A painting on rock.
Prehistoric	Of or pertaining to the time before written history in a given region.
Protohistoric	Of or pertaining to the time immediately preceding the advent of written documents in a given region. In practice, this is the period of time (from the arrival of Europeans in North America) until the time when written records of the area in question were produced.
Rancheria	A settlement of dispersed, unconnected houses common to historic groups in southern Arizona and California; as opposed to “pueblo,” which is a settlement made up of connected, multi-household rooms.
Rock Art	A general term for figures or designs painted or engraved on rock or formed through the placement of boulders.
Rock Feature	A human-made line, ring, cairn, or pile of rocks that could have been used for a number of different purposes in the past, including agricultural and religious uses.
Rock Shelter	A shallow overhang in a rock face, with an "entrance" wider than it is deep. When mentioned in archaeology, the shelter of the rock overhang was generally used by people in the past.
Tinajas	Rock tanks in which rain water collects.

3.4.1.2 *Central Corridor*

The Central Corridor runs from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing between the Santa Cruz River and the Tumacacori and Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona (locations noted on Figure 1.1–4). Most of the Central Corridor would follow or cross an existing El Paso Natural Gas Company (EPNG) pipeline alignment. Three significant historical sites are located near the Central Corridor: Tumacacori National Historical Park (in Tumacacori), Tubac Presidio State Historic Park (in Tubac), and the Juan Bautista de Anza National Historic Trail (immediately adjacent to the Santa Cruz River in the proposed project area).

Six previously identified archaeological and historical sites have been documented within this corridor, including four sites on the Coronado National Forest. The prehistoric to historic Native American sites include one artifact scatter and one partially excavated cave site. Historical sites include the historic alignment of Ruby Road, a set of erosion control features constructed by the Civilian Conservation Corps, and a water conveyance feature known as the Ruby Pipeline. One isolated check dam of unknown age has also been documented within this corridor. Additionally, several historical O'Odham rancherias are known to have existed along the Santa Cruz River south of Tumacacori and may lie within the Central Corridor. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density is low within the Central Corridor probably because very little of the corridor has been intensively surveyed. Two sites have been documented on the eastern descent of the Sierrita Mountains west of Sahuarita and Green Valley. The remaining four documented sites are located on the Coronado National Forest.

Data collected from AZSITE and USFS indicate that less than 15 percent of the Central Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains west of Green Valley represent the majority of previously surveyed lands. Because only a small percentage of the Central Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within this corridor. Based upon available data, site density south of Tucson is highest along the Santa Cruz River and along major washes that flow into the Santa Cruz River. These are, however, the areas that have been most intensively surveyed in the past.

3.4.1.3 *Crossover Corridor*

The Crossover Corridor would involve the construction of a new transmission line from the South Substation, located on the west bank of the Santa Cruz River in Sahuarita, across the eastern descent of the Sierrita Mountains, eventually passing through the Tumacacori Mountains (locations noted on Figure 1.1–4). The corridor turns eastward and follows Peck Canyon, located between the Tumacacori and Atascosa Mountains, and turns south again running between the Santa Cruz River and the Atascosa Mountains to the U.S.-Mexico border west of Nogales, Arizona.

Twenty-seven previously identified archaeological and historical sites have been documented within this corridor, including 11 on the Coronado National Forest. The prehistoric to historic Native American sites include seven artifact scatters, two artifact scatters with rock features, one site with potential habitation features, six rock shelters with artifact scatters (three rock shelters contain rock art), one bedrock mortar site, and one partially excavated cave site. Historical sites include two habitation sites, the historic alignment of Ruby Road, a set of erosion control features constructed by the Civilian Conservation Corps, a water conveyance feature known as the Ruby Pipeline, and a stone monument and historical artifact scatter marking the location of the historic Peck's Ranch. Additional sites include a multi-component site consisting of a prehistoric artifact scatter and a historical Euro-American ranch, a site consisting of two rock walls of unknown age, and an isolated check dam of unknown age. None of these sites are currently listed in the NRHP; however, all should be considered potentially eligible for listing until further work is done to evaluate their eligibility.

Site density varies directly with the intensity of survey, with greater number of sites located in the areas more intensively surveyed. Fourteen of the 27 known sites are located on the descent of the Sierrita Mountains west of Sahuarita and Green Valley, 2 are located near the intersection of the Crossover Corridor and Sopori Wash, and the remaining 11 are located on the Coronado National Forest. The majority of the sites on the Coronado National Forest are located along Peck Canyon. Data collected from AZSITE indicate that less than 15 percent of the Crossover Corridor has been previously surveyed for cultural resources. The area around Sahuarita and a portion of the eastern descent of the Sierrita Mountains west of Green Valley represent the majority of previously surveyed land. Because only a small percentage of the Crossover Corridor has been previously surveyed for cultural resources, it is extremely likely that additional prehistoric and historic sites exist within the corridor. Based upon the varied terrain of the Crossover Corridor, a wide range of archaeological site types are expected. Prehistoric and historic habitation sites are commonly located along river and wash corridors, whereas the mountainous segment may contain Native American rock art sites and shrines, as well as Historic Period ranching and mining related sites.

3.4.2 Native American Concerns

The proposed project is within the traditional territories of 12 Native American tribes. Four of these tribes are culturally closely related, all speak O'Odham, and work closely together in cultural resources consultation; they are referred to here as the "Four Southern Tribes" and are the Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community and the Tohono O'Odham Nation. Culturally, the Four Southern Tribes are also referred to as "O'Odham" which is their name for themselves, as well as their language, and literally means "people."

3.4.2.1 *Consultation Conducted*

DOE initiated formal government-to-government consultation in a November 20, 2001, letter (DOE 2001b) sent to tribal governments of the 12 Native American communities/tribes/nations that are likely to have traditional concerns in the area: the Ak-Chin Indian Community, Fort Sill Apache Tribe, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'Odham Nation, White Mountain Apache Tribe, Yavapai Apache Nation, and the Pueblo of Zuni (listed in Table 3.4–1). As the lead Federal agency on this project, DOE is consulting on behalf of the cooperating agencies, with both official government contacts and delegated cultural resources specialists to maintain the Government-to-Government relationship with Native American tribes in the NEPA process. Tribal consultation is ongoing, and is continued with the designated officials or employees when the tribes undergo personnel changes (SWCA 2002c; as noted in Table 3.4–1).

Seven of the 12 tribes contacted have indicated to DOE representatives that they have concerns about the proposed project and that portions of the project's Area of Potential Effect (APE) are important to them. These include the Four Southern Tribes, the Hopi Tribe, the Mescalero Apache Tribe, and the Pascua Yaqui Tribe. Consultation is ongoing with all tribes, but the O'Odham tribes and Pascua Yaqui have communicated their concerns in several meetings as well as during site visits on January 23, 2002 and February 4, 2003 (SWCA 2002c). Representatives of the Tohono O'Odham Nation have also met directly with DOE representatives in Washington, DC, to discuss their cultural concerns. Concerns discussed during these site visits and in meetings are presented in Section 3.4.2.2.

Table 3.4–1. Tribal Officials Contacted by DOE in Project Scoping.

Tribe	Name	Title
Ak-Chin Indian Community	Mrs. Delia Carlyle[a]	Chairperson
	Ms. Elaine Peters	Ak-Chin Him Dak Museum Director
	Mr. Jon Shumaker[b]	Tribal Archaeologist
Fort Sill Apache Tribe	Mrs. Ruey Darrow[c]	Chairperson
	Mr. Michael Darrow	Tribal Historian
Gila River Indian Community	Mr. Donald Antone	Governor
	Dr. John Ravesloot	CulturalResources Coordinator
	Mr. Barnaby Lewis[d]	Cultural Resources Specialist
Hopi Tribe	Mr. Wayne Taylor	Chairman
	Mr. Leigh Kuwanwisiwma	Hopi Cultural Preservation Office Director
Mescalero Apache Tribe	Ms. Sara Misquez	President
	Ms. Donna Stern-McFadden	Tribal Historic Preservation Officer
Pascua Yaqui Tribe	Mr. Robert Valencia	Chairman
	Ms. Amalia Reyes	Language and Culture Specialist
Salt River Pima-Maricopa	Mr. Ivan Makil[e]	President
Indian Community	Mr. Ron Chiago[f]	Cultural Resources Coordinator
San Carlos Apache Tribe	Mr. Raymond Stanley[g]	Chairman
	Ms. Vernelda Grant	Director, Historic Preservation and Archaeology
	Mrs. Jeanette Cassa	Elders Cultural Advisory Council
	Mr. Seth Pilsk	Ethnobotanist, Assistant to Elders Advisory Council
Tohono O'Odham Nation	Mr. Edward Manuel	Chairman
	Mr. Tony Burrell[h]	Chairman, Cultural Committee
	Mr. Peter Steere	Cultural Affairs Program Manage
	Mr. Joe Joaquin	Cultural Resrouces Specialist and NAGPRA Coordinator
White Mountain Apache Tribe	Mr. Dallas Massey, Sr.	Chairman
	Mr. Ramon Riley	Cultural Resources Director
	Dr. John Welch	Tribal Historic Preservation Officer
Yavapai-Apache Nation	Mr. Aaron Russell	Chairman
	Mr. Don Decker	Director, Apache Cultural Program
Pueblo of Zuni	Mrs. Katherine Marquez	Director, Yavapai Cultural Program
	Mr. Malcolm Bowekaty[i]	Governor
	Dr. Jonathan Damp	Tribal Historic Preservation Officer

[a] Terry O. Enos replaced Delia Carlyle as Chairman in 2002.
[b] Jon Shumaker no longer is employed by the Ak Chin Indian Community (as of July 2002). Nancy Nelson is now Cultural Resource Manager and Deborah Baptisto is Cultural Resources Specialist. Both have been consulted with on this project to follow up previous work with Jon Shumaker.
[c] Ruey Darrow is deceased (2002); current chairperson is Jeff Houser.
[d] Angela Garcia is now assistant cultural resources specialist and is assisting Barnaby Lewis with consultation on this project, as are other staff members.
[e] Ivan Makil is no longer President of the Community; Joni Ramos is the current President (2003).
[f] Mr. Chiago is no longer Cultural Resource Manager for the Salt River Pima Maricopa Indian Community. Other staff members, specifically Mr. Gary Gilbert, are communicating the Community's concerns on this project.
[g] Raymond Stanley is no longer Chairman; Kathleen Wesley-Kitcheyan was elected Chairwoman in Fall 2002.
[h] Tony Burrell is no longer on the Legislative Council and no longer serves as Chairman of the Cultural Preservation Committee. Mary Flores is now Chair of the Cultural Preservation Committee, and further consultation has been conducted with her, as well as other committee members: Felicia Nuñez, Jerome Joaquin, Emilio Lewis, and Frances Miguel.
[i] Malcolm Bowekaty is no longer Governor; Arlen Quetawki, Sr. was elected in Fall 2002.

The Hopi Tribe, on December 4, 2001, requested the opportunity to review both the project EIS and all archaeological inventories prepared for this project (SWCA 2002c). Mescalero Apache Tribe representatives have also stated that they would like to consult further on this project and that they hope to set up a meeting and site visit with USFS Coronado National Forest (SWCA 2002c). The Four Southern Tribes Consulting Group requested further site visits and presentations on the project, and they wish to review all project documents, including all archaeological and cultural resource reports, the Draft and Final EIS, as well as any biological reports prepared that may present information about plants and animals traditionally used by the O'Odham. The Pascua Yaqui Tribe also wishes to be included on future site visits and to review cultural resource reports and the Draft EIS and Final EIS. Dates are pending for continued consultation between the Mescalero and DOE and cooperating agencies, as well as between the O'Odham and DOE and cooperating agencies.

3.4.2.2 *Cultural Concerns and Traditional Cultural Properties*

Traditional cultural information is often confidential and sensitive, and many tribal representatives are reluctant to divulge information about traditional localities. A lack of response to tribal notification should neither be interpreted as a lack of concern nor an indication that there are no sensitive localities within the proposed project area. The Coronado National Forest has provided a very useful summary of the published literature on O'Odham use of the Forest through which portions of the three proposed corridors would cross (USFS 2002d). This document details the ethnography, occupation, and traditional O'Odham uses of the Tumacacori Uplands region (region including Tumacacori and surrounding higher ground, see Figure 1.1–4), and also references the Apache and Yaqui presence in the Tumacacoris during historic times. O'Odham plant use and the kinds of landmarks that are culturally significant to traditional O'Odham are also very well summarized in this document, and together this provides valuable background for assessing the potential cultural impacts to USFS land in this project.

An issue of concern to all responding tribes is the possibility that project construction would disturb previously undiscovered human remains (SWCA 2002c; USFS 2002d). Procedures for consultation with the tribes regarding unavoidable or unanticipated disturbance of human remains and funerary objects located on non-Federal land in Arizona are specified in amendments to the *Arizona Antiquities Act* (Arizona Revised Statutes [ARS] §41-844 and §41-865). Any remains located on Federal land are subject to the provisions established by NAGPRA, and procedures for handling any discoveries would be specified in a project Memorandum of Agreement and Plan of Action. No discoveries of human remains are expected on this project because care would be taken to minimize archaeological site disturbance through careful location of project facilities.

A second issue of concern is the disturbance of localities or natural features named in traditional stories, the "Cultural Landscape." Some of these localities may also serve as shrine or ritual sites and may still be in use. To date, none of the tribes consulted have identified or named specific localities, natural features, or other landscape features that may be affected by this project, beyond the suggestion that protohistoric O'Odham villages may be impacted (SWCA 2002c). The known locations of these villages are not in any of the proposed project corridors (SWCA 2002c; USFS 2002d) and efforts would be made to identify any previously unknown villages that are located within the proposed corridors. Furthermore, none of the tribes consulted have yet identified stories or oral traditions that may relate to the project area (SWCA 2002c; USFS 2002d). That stated, individual communities often have local interpretations of landscape features, and these sometimes "place widely known creation-time events at local landmarks" (USFS 2002d); only further discussion with American Indian elders is likely to identify oral traditions identifying local landmarks.

Third, a great concern to most responding groups is the natural landscape of the Western Corridor (SWCA 2002c). Because there has been minimal disturbance to this area, the tribes believe that there may be many previously unrecorded archaeological features within the route's APE, as well as culturally significant plants and animals (SWCA 2002c, USFS 2002d). The undisturbed nature of the Western Corridor is significant to the tribes because it is one of the few areas still existing in southern Arizona where the pre-European contact landscape can be encountered (SWCA 2002c).

The consulted Native American groups recommend avoiding the Western Corridor entirely. They believe construction of the proposed transmission line (including the ROW and access roads) has the potential both to discover cultural resources (prehistoric, historic, or modern) and to adversely impact such resources. Avoidance of both known and newly discovered cultural resources is the mitigation recommended by all responding Native American tribes to date; however, if avoidance is not possible, it would be necessary to develop and implement plans to mitigate potential adverse effects. The O'Odham representatives request that these mitigation plans include both archaeological recovery and an ethnographic cultural landscape study. This evaluation of the cultural landscape would include interviews with elders to enhance the inclusive analyses of geographic landscape features and archaeological/historical data using a geographic information system (GIS) mode of analysis to portray the links between landscape and cultural features.

O'Odham. As described previously, the O'Odham are represented by four modern tribes: the Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and the Tohono O'Odham Nation. The eastern boundary of the main portion of the Tohono O'Odham Nation is approximately 27 mi (43 km) west of the intersection of the Western Corridor and Arivaca Road (Figure 3.1–1). The southern boundary of the San Xavier District of the Tohono O'Odham Nation, which is not contiguous with the main reservation, is approximately 1.0 mi (1.6 km) north of all three project corridors as they exit the South Substation. The area of O'Odham traditional land use extends east of the Tohono O'Odham Nation boundary across the Santa Cruz and San Pedro River Valleys, and almost to the New Mexico border. All alternative corridors for the project are within O'Odham traditional lands (SWCA 2002c), and the Tohono O'Odham Nation is taking the lead in consultation on behalf of other O'Odham groups because of the proximity of the project to the Tohono O'Odham Nation.

The Tohono O'Odham Nation regards the lands involved in the proposed transmission line corridors as "culturally sensitive since they contain many significant cultural sites including traditional cultural places, archaeological sites, sacred sites, religious sites, plant collection areas for basket materials, and medicines and burial sites" (SWCA 2002c). Background research on the area, though not identifying any specific localities, also suggests that such culturally sensitive localities may occur within the proposed corridors (USFS 2002d). The Tumacacori Uplands support a number of plant taxa that were traditionally important to the O'Odham and many of these are relatively rare in the desert lowlands to the west and north where the majority of O'Odham reservation land is located (SWCA 2002c, USFS 2002d). These taxa include but are not limited to: oaks, agaves, banana yucca, beargrass, walnuts, mulberry, chiltepines, and sayas (USFS 2002d). Specific information about the location of such places or resources has not yet been provided to DOE by the Tohono O'Odham Nation.

Of the known archaeological sites described in the previous section, none are identified as sacred sites, religious sites, or burial sites (SWCA 2002c, USFS 2002d). Peaks, caves, shrines, burials, rock art sites, and sacred object caches have been recognized as culturally important places to the O'Odham within the greater region (USFS 2002d). Some of these types of places (rock art sites, caves) are present in the Tumacacori Uplands, but their specific cultural significance has not been established (SWCA 2002c, USFS 2002d). Archaeological sites within O'Odham traditional lands are important to the preservation of O'Odham heritage because the sites are the remains of their ancestors (SWCA 2002c, USFS 2002d). Burial areas are considered shrines (SWCA 2002c). Traditionally, rock art panels and *tinajas* (rock tanks in which rain water collects) are also important sites; many are active shrines that are not disclosed to outsiders. The area known as Tinajas Hills near the Western Corridor and the Sierrita Mountains is particularly important to the O'Odham (SWCA 2002c).

Although archaeological remains are very significant to the O'Odham, they also place high regard and value on native plants and animals, and the natural landscape of their traditional use area (SWCA 2002c, USFS 2002d). All native plants and animals are linked and considered significant in O'Odham tradition (SWCA 2002c, USFS 2002d). "Many authors have noted the close connection between O'Odham religion and the landscape they live in" and "every part of the natural environment is also personified and must be treated with circumspection and respect" (USFS 2002d). O'Odham representatives stated that they do not want plants and animals affected by this project, but they have not yet named species or specific locations in the project areas other than national forest lands. The preservation of relatively undisturbed landscapes similar to those used by the O'Odham prior to European contact is important to the O'Odham, especially in areas where people traditionally collected subsistence foods and lived in villages (SWCA 2002c). According to the NRHP, eligibility of such an ethnographic landscape that does "not contain, or connect, specific special places or landmarks is tenuous at best" (USFS 2002d). Nevertheless, the Tohono O'Odham Nation's preference for undisturbed landscapes gives added weight to the general visual quality concerns.

The Tohono O'Odham Nation is also concerned about the cumulative impacts to both "the cultural and physical landscapes and view sheds of the proposed transmission line corridors, including possible impacts to national forest lands; the Pajarita Wilderness Area, the Goodding Research Natural Area, the riparian zones in Sycamore Canyon and many unique plant and animal species found in the area" (SWCA 2002c). The Pajarita Wilderness, Goodding Research Natural Area, and Sycamore Canyon are shown in Figure 3.1–1.

O'Odham representatives were consulted about a specific published passage regarding the effects of constructions (such as power lines) that disrupt the space between significant landmarks, and thus disrupt the forces that hold the earth together (quoted in USFS 2002d, SWCA 2002c). Further consultation is needed to gauge the depth of this concern and it is likely an issue better considered under the AIRFA rather than under usual NHPA consultations. All issues raised concerning NHPA, AIRFA, as well as all relevant EOs are being evaluated during this NEPA process. Following selection of a preferred alternative, discussion regarding specific mitigation would occur as part of ongoing tribal consultation conducted under NEPA.

O'Odham representatives from all four tribes have stated that they oppose the Western Corridor because it would affect a relatively pristine area and it may also affect archaeological sites and possibly culturally-sensitive sites as well (SWCA 2002c). No specific traditional cultural properties (TCPs) have been identified along the proposed corridors to date. All comments have been made during telephone conversations, meetings, site visits, or in a submitted letter (SWCA 2002c).

Pascua Yaqui. The Pascua Yaqui have deep ties to both the Western and Central Corridors because these areas were used by their ancestors during their wide-ranging food-gathering excursions in the distant past. More recently, during the 1889-1921 Mexican Wars (sometimes referred to as the "Yaqui Wars"), direct ancestors of the Pascua Yaqui traveled through this corridor of land between Nogales and Tucson as they fled political persecution. Traveling near and along the Santa Cruz River, the Yaqui refugees-turned-immigrants also transported guns and ammunition to their relatives struggling against the Mexican government. Many of these refugees bore wounds, and it is likely that some died and were buried in the countryside. The Pascua Yaqui Tribe considers these Yaqui burials and campsites as TCPs. During consultation on this project, Yaqui representatives stated that some TCPs may be located along project corridors, but none have been specifically identified to date (SWCA 2002c). If any are encountered in the project area, these sites must be evaluated for inclusion in the NRHP and discussed as part of compliance with the NHPA.

No specific Yaqui TCPs have yet been identified along this or any of the proposed corridors by representatives of the Pascua Yaqui tribe. All comments from the Pascua Yaqui tribe have been made during telephone conversations or the January 2002 site visit.

Hopi. The Hopi view archaeological sites as proof of their oral traditions, specifically as evidence of their Covenant of Natwani. Sacred Hopi oral traditions describe migrations of many clans to the Hopi mesas from all directions prior to the arrival of Euro-Americans in Arizona. A distinct and significant area named in Hopi traditional history is referred to as Palatkwapi, located to the south of present-day Hopi reservation. Some believe that Palatkwapi is in southeastern Arizona. Because of the importance of archaeological remains to Hopi culture and religion, the Hopi wish to be informed about any disturbances to archaeological materials or human remains encountered on the proposed project. Hopi representatives have stated that all archaeological sites eligible for the NHRP are of cultural importance and are potentially Hopi TCPs. To date, the Hopi tribe has not specifically identified any Hopi TCPs within the proposed project area. All comments have been made in either telephone calls or in the submitted letter (SWCA 2002c).

Apache and Yavapai. The Fort Sill Apache Tribe, San Carlos Apache Tribe, White Mountain Apache Tribe, and Yavapai-Apache Nation have not yet stated their cultural concerns in response to requests for consultation, nor have they expressed their intention to consult on this project. The Mescalero Apache Tribe wishes to consult on this project because it is concerned about the project's impacts on their heritage sites (SWCA 2002c).

Zuni. No response to the DOE letter, or follow-up telephone calls, has yet been received from the Pueblo of Zuni.

3.5 SOCIOECONOMICS

This section describes current socioeconomic conditions within a region of influence (ROI) where the majority of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project workforce is expected to reside, based on proximity to the proposed corridors and historic employment patterns. The ROI is a two-county area in Arizona comprised of Pima and Santa Cruz Counties (see Figure 1.1–3). The ROI covers an area of 10,424 mi^2 (26,998 km^2) around the proposed corridors (Census 2000a, 2000b). The ROI would be the same, regardless of the project alternative selected, because the workforce required to construct each alternative is expected to reside within these two counties.

3.5.1 Population and Housing

The City of Tucson comprises a small portion (223 mi^2 [577.6 km^2] or 2.4 percent) of Pima County, yet is home to the majority of the population (57.6 percent) in the county (Census 2000c, Tucson 2001). The majority of Pima County outside of Tucson and all of Santa Cruz County are largely rural in character. Over the last 40 years, the population of Arizona has grown at an extremely accelerated rate, and has nearly quadrupled in number. Though the ROI has not experienced quite the same level of population growth as the state, the ROI has also experienced a high rate of population growth with the population more than tripling over the past 40 years. During the 1990s, Arizona's population increased by 40 percent, while the population of the ROI increased by 26.6 percent. Future population predictions show that the rapid population growth throughout Arizona is expected to continue in the near future. The population of the ROI is expected to grow at a higher rate than the state, 22.2 percent compared to 19.8 percent, over the next 10 years. Table 3.5–1 presents the historic and projected populations in the ROI and the state.

Table 3.5–1. Historic and Projected Population.

	1960	1970	1980	1990	2000	2010
Pima County	256,660	351,667	531,443	666,880	843,746	1,031,623
Santa Cruz County	10,808	13,966	20,459	29,676	38,381	46,246
ROI (Pima and Santa Cruz)	267,468	365,633	551,902	696,556	882,127	1,077,869
Arizona	1,302,160	1,770,900	2,718,215	3,665,228	5,130,632	6,145,108

Source: Census 2000a, 2000b.

Tucson is the largest city in the ROI with a population of 486,699 in the year 2000. Other cities include Green Valley in Pima County, with a population of 17,283 in 2000, and Nogales and Rio Rico in Santa Cruz County with populations of 20,878 and 10,413 in 2000 respectively (Census 2000c).

Table 3.5–2 presents housing characteristics in the ROI. There was a total of 379,773 housing units in the ROI in 2000.

In 2000, the median value of owner-occupied housing in the ROI was $85,000 in Santa Cruz County and $154,000 in Pima County. In 2000, median monthly rent was $475 in Santa Cruz County and $544 in Pima County. The rental vacancy rate in the ROI is equivalent to the state level of 9.2 percent. Based on the number of occupied rental units and the vacancy rate in the ROI, over 12,000 rental units are estimated to be currently vacant (Census 2000b).

Table 3.5–2. Region of Influence Housing Characteristics.

	Total Number of Housing Units	Number of Owner-Occupied Units	Owner-Occupied Vacancy Rates	Median Value	Number of Occupied Rental Units	Rental Vacancy Rates
Pima County	366,737	213,603	1.8%	$154,000	118,747	9.2%
Santa Cruz County	13,036	11,809	2.1%	$85,000	3,783	8.2%
ROI (Pima and Santa Cruz)	379,773	225,412	1.8%	NA	122,530	9.2%
Arizona	2,189,189	1,293,556	2.1%	NA	607,771	9.2%

Source: Census 2000c.

3.5.2 Employment and Income

Employment by sector over the last decade has changed slightly, as shown in Table 3.5–3. The services sector provides the highest percentage of the employment in the ROI, with 34.5 percent, followed by the wholesale and retail trade and government sectors with 21.2 percent and 17.9 percent, respectively. Farm employment has decreased over the last decade, providing 0.4 percent of employment in 1990 but only 0.3 percent in 1997 (BEA 1999). Table 3.5–3 presents employment levels for the major sectors of the ROI economy.

Table 3.5–3. Employment by Sector (Percent).

Sector	1990	1997
Services	32.2	34.5
Wholesale and retail trade	22.2	21.2
Government and government enterprises	18.0	17.9
Manufacturing	8.7	7.6
Construction	5.8	6.1
Finance, insurance, and real estate	7.6	6.4
Transportation and public utilities	3.3	4.2
Farm employment	0.4	0.3
Mining	0.8	0.7
Other Sectors	1.0	1.2

Source: BEA 1999.

The ROI experienced slight changes to the labor force throughout the late 1990s. The labor force decreased from 399,475 in 1995 to 397,175 in 2000, a 5-year growth rate of -0.6 percent. Employment experienced growth despite the decline in the labor force, increasing from 383,725 in 1995 to 384,425 in 2000, a 5-year growth rate of 0.2 percent. The ROI unemployment rate was 3.9 percent in 1995, falling to 3.2 percent in 2000, as shown in Table 3.5–4. Santa Cruz County experienced a large decrease in its unemployment rate during this period, with the rate dropping from 19.6 percent in 1995 to 13.8 percent in 2000. The average unemployment rate for the State of Arizona was 3.9 percent in 2000 (ADES 2001).

Per capita income in the ROI was $26,248 in 1999, more than a 19 percent increase from the 1995 level of $22,013. Per capita income was $20,855 in Santa Cruz County and $26,440 in Pima County. The per capita income in Arizona averaged $28,807 in 1999, while the U.S. average was $32,109 (CBP 1995a, 1995b, 1999a, 1999b, 1999c, 1999d).

Table 3.5–4. Region of Influence Unemployment Rates (Percent)

	1995	2000
Pima County	3.3	2.8
Santa Cruz County	19.6	13.8
ROI Total (Pima and Santa Cruz)	3.9	3.2
Arizona	5.1	3.9

Source: ADES 2001.

3.5.3 Community Services

This subsection presents the availability of community services in the project's ROI. Tucson is located approximately 15 mi (24 km) north of the northern end of the proposed project and large fire and police services associated with major metropolitan areas can be found there. Other fire and police stations are located along the various routes analyzed. In Pima County, there are 13 police stations and 24 fire stations, and in Santa Cruz County, there is one police station and 7 fire stations.

There are approximately 45 school districts serving the ROI, with the majority of them located in the Tucson metropolitan area in Pima County. These districts utilize over 7,200 teachers to educate over 139,000 students (EDU 2001a, 2001b). There are also 37 private schools in the ROI educating approximately an additional 9,800 students (EDU 2001c, 2001d). There are a number of institutions of higher learning in the ROI, including the University of Arizona, the University of Phoenix-Tucson Campus, Tucson University, and Pima Community College.

Although public transportation services exist in Pima and Santa Cruz counties, workers would not be able to take public transportation to construction staging areas.

Thirteen major hospitals are located in the ROI, 12 in Tucson and 1 in Nogales. There are 2,532 beds in these hospitals and over 2,500 physicians throughout the ROI (AHA 1995, AMA 1995). The majority of the hospital beds and physicians are located in the city of Tucson in Pima County.

3.5.4 Revenues for Forest-Based Activities

Revenues generated from activities on Federal lands are shared with local governments through various regulations, including the *25 Percent Fund Act* (Public Law 60-136) and Payments in Lieu of Taxes (PILT) (Public Law 94-565, Public Law 97-258). The majority of the revenues are generated by timber sales; however, mineral resources, grazing fees, and recreation also contribute to the total revenue generated by national forest land. In 1997, USFS, through the 25 Percent Fund, paid the State of Arizona $2,214,865, of which $43,676 and $46,815 were paid to Pima and Santa Cruz Counties respectively. Additionally, PILT payments totaling $9,439,156 were made to Arizona during 1997, including $954,001 to Pima County and $305,255 to Santa Cruz County. This total does not include payments made through the Minerals Management Service of the Department of the Interior.

Recently, these laws were amended by the *Secure Rural Schools and Community Self Determination Act* of 2000 (Public Law 106-393). Counties that have received payments previously are now eligible to collect either the traditional amount (usually 25 percent for USFS land) or an amount equal to the average of the three highest years' payments between 1986 and 1999. If the latter amount is requested (referred to as the "full payment"), the counties must use 80 to 85 percent of the total for traditional payments to support roads and schools (the percentage depends on the total amount received). The balance of the payment would be used for public land projects or county-level projects as determined by a resource advisory council in the local area. This new law went into effect for the fiscal year 2001 payments to states.

3.6 GEOLOGY AND SOILS

This section describes the existing geologic and soil environment in the vicinity of the proposed project. Discussions of geology and soils that apply to all three proposed corridors are followed, respectively, by information specific to the Western, Central, and Crossover Corridors.

3.6.1 Geology

The proposed project area is located within the Basin and Range Physiographic Province that is characterized by alternating mountain ranges and broad valleys, most of which were formed by block faulting during the last part of the Cenozoic Era, 5 to 15 million years ago (NRCS 2001).

Elevations in the vicinity of the three proposed corridors range from 2,675 ft (815 m) above mean sea level (AMSL) at the South Substation to the high point in the Coronado National Forest of 6,244 ft (1,903 m) AMSL at the Atascosa Fire Lookout. The elevation at the U.S.-Mexico border is 4,085 ft (1,245 m) AMSL. Ground slope within the Tumacacori Ecosystem Management Area (EMA) varies from nearly flat to over 40 percent, with over half the land at 15 to 40 percent slope, and steeper slopes within the Tumacacori and Atascosa Mountains (USFS 2001b).

Several geologic units are present along the three proposed corridors, such as unconsolidated sediments (surficial alluvium deposited by running water), sedimentary rock, and volcanics (Figure 3.6–1). The unconsolidated sediments include young alluvium and older surficial deposits. The young alluvium consists of sediments carried from the mountains and deposited in present-day rivers and stream channels, floodplains, and playas. The older surficial deposits consist of alluvial and aeolian (wind-deposited) deposits found in present-day valleys and piedmonts (bases of mountains).

Geologic Resources. As is common in many areas of Arizona, the Santa Cruz Valley contains abundant geologic resources, including copper, molybdenum, silver, and gold, that are mined along the common northern segments of the three proposed corridors.

Sand and gravel mining operations do not occur within the three proposed corridors, and there are no significant coal or oil and gas resources in the immediate area. Inactive mine tailing areas are located adjacent to the common northern segments of the three proposed corridor west of Sahuarita, in Township 17 South, Range 13 East.

Geologic Hazards. The geologic hazards that could affect the project include faults and seismic activity, and ground failures such as slumping, landslides, debris flows, and subsidence causing ground fissures.

Faults and Seismic Hazards. In order to assess earthquake hazards, historical earthquakes are described and faults along which movement has occurred in the past 2 million years (the Quaternary Period) are mapped and characterized. The historical record of earthquakes in Arizona dates to about 1776, but records are sparse prior to the late 1800s. The following discussion of earthquake hazard is primarily summarized from an Arizona Geological Survey publication, *Arizona Geology* (Arizona 2000).

Since 1850, over 20 earthquakes with magnitudes greater than 5 on the Richter Scale have occurred in or near Arizona. A table of the Richter scale and its description is shown in Table 3.6–1. Most earthquakes have occurred in northern Arizona and in California, adjacent to the southwest corner of Arizona. The largest earthquake recorded in the region was the magnitude 7.4 (on the Richter Scale) Sonoran earthquake of 1887. It was centered about 125 mi (205 km) southeast of Sahuarita, and caused 51 deaths in Sonora and extensive property damage throughout southeastern Arizona. The fault that generated the 1887 Sonoran earthquake probably had not caused a similar earthquake for at least 100,000 years (Arizona 2000).

Table 3.6–1. Richter Scale.

Magnitude	Descriptor
Less than 3.0	Very minor-generally not felt
3-3.9	Minor-generally felt, no damage
4-4.9	Light-felt widely, slight damage near epicenter
5-5.9	Moderate-damage to poorly constructed buildings
6-6.9	Strong-can be destructive in areas up to approximately 100 km across where people live
7-7.9	Major-can cause serious damage over larger areas
8 and higher	Great-can cause serious damage in areas several hundred km across

Source: Richter 2003, USGS 2003.

Potentially active faults that could generate magnitude 6.5 to 7.2 earthquakes are scattered throughout southeastern and central Arizona, including much of the Phoenix and Tucson areas. Earthquakes of this magnitude are considered to be destructive to major ones. All of the potentially active faults in the Phoenix and Tucson areas have low slip rates, long intervals between ruptures, and have had little historic activity. Because of this, the Arizona Geological Survey places these areas in the low to moderate hazard category.

Slumping, Landslides, and Debris Flows. Almost any steep or rugged terrain is susceptible to slope failure under certain conditions. Flash floods, however, can occur in the numerous narrow washes that cross the valley floor of the proposed project area.

Subsidence. Extensive and long-term groundwater withdrawal can in some areas cause ground subsidence. Over time, this can lead to ground fissures given the right geologic conditions. This geologic hazard is a concern in the Tucson area and areas north of Tucson, as substantial ground subsidence with resultant fissures has occurred in these areas of Arizona. Subsidence hazards have not been documented along the three proposed corridors, and are therefore not expected.

3.6.1.1 *Western Corridor*

As part of the analysis of roads required by the U.S. Department of Agriculture Forest Service (USFS), Terracon conducted a geotechnical evaluation of the proposed project area on the Coronado National Forest (Terracon 2002). Relatively intact bedrock is near to or exposed at the ground surface along the majority of the Western Corridor on the western side of the Tumacacori Mountains, as shown by the areas of tertiary conglomerate and sandstone in Figure 3.6–2 on national forest land (Terracon 2002). The photograph in Figure 3.6–3 shows exposed bedrock along the Western Corridor. The bedrock would be suitable for supporting poles on a rock bolted base, in which small holes are drilled into the bedrock and the tower is attached with large bolt, as described in Section 4.6, Geology and Soils.

Areas of the Western Corridor that are relatively flat (much of the northern half of the corridor) may be considered too flat to be affected by mass movements such as slumping, landslides, and debris flows. The terrain along the Western Corridor has relatively mild slopes, except where it crosses occasional drainages and steep mountain slopes (Terracon 2002). The mountainous areas of the Western Corridor, primarily located in the Coronado National Forest, can be considered areas where mass movements could occur. The U.S. Geological Survey (USGS) has mapped much of the Coronado National Forest as general areas susceptible to debris flows, although none have been documented in the project area (USGS 1999).

Castle Rock is a prominent topographical feature at the edge of the Western study corridor south of Peña Blanca Lake (as shown in Figure 3.2–2). TEP's preliminary siting of the 125-ft (38-m) right-of-way (ROW) avoids this rocky outcrop.

Figure 3.6–3. Exposed Bedrock Along the Western Corridor.

3.6.1.2 *Central Corridor*

A majority of the Central Corridor near and on the Tumacacori EMA has exposed soil at the surface rather than bedrock, as depicted by areas of Quaternary alluvium in Figure 3.6–1, and as shown in Figure 3.6–4. The foundations for towers along the Central Corridor in these exposed soil areas would most likely require embedment poles, as described in Section 4.6, Geology. The terrain along the Central Corridor is generally defined by a series of hills separated by washes (Terracon 2002).

3.6.1.3 *Crossover Corridor*

The discussion of geology for the Western and Central Corridors also applies to the Crossover Corridor in segments where these corridors overlap. Where the Crossover Corridor passes through Peck Canyon for approximately 7 mi (11 km), the majority of the land has bedrock exposed at the surface. The terrain along Peck Canyon is rough and jagged, with steeply sloping canyon walls and a narrow winding canyon bottom (Terracon 2002).

3.6.2 Soils

This section describes the existing soil environment in the vicinity of the proposed project. Depending on the type of soil present in each proposed corridor, foundations used in the area would differ as described in Section 4.6, Geology and Soils.

Figure 3.6–4. Exposed Soil Along the Central Corridor.

Soil Map Units. The three proposed corridors would cross five soil associations, as mapped by the Natural Resources Conservation Service (NRCS) and shown in Figure 3.6–5. None of the soils identified have any characteristics that would present any obstruction to standard construction techniques. Brief summaries of the soil associations in the corridors are provided below (USDA 1979).

Comoro-Pima Association. This soil association consists of well-drained sandy and clay loams (an easily crumbled mixture of clay and sand) to a depth of 60 in (152 cm) or more. These soils are on floodplains with slopes ranging from 1 to 3 percent and alluvial fans (fan-shaped deposits that are dropped by a stream) with slopes from 1 to 10 percent. The permeability (quality of soil that enables water or air to move through it) is moderate to rapid. The soil erosion hazard is generally slight, but soils in narrow drainages can be susceptible to gully erosion. Soils in floodplains can be subject to seasonal flooding.

Continental-Sonoita Association. This soil association consists of well-drained gravelly sandy loams to a depth of 60 in (152 cm) or more. Continental soils are typically found on older alluvial fans and terraces with slopes ranging 1 to 15 percent. Sonoita soils are found on reworked fan remnants with slopes typically ranging from 1 to 20 percent; although some short terrace breaks (raised embankment with a leveled top) have slopes as great as 45 percent. Permeability is moderately slow to moderate. The erosion hazard is generally slight in the different series comprising this association. The exception is the gravelly loams of the Rillino Series. These soils occur on the ends and sides of long narrow ridge remnants of dissected alluvial fans where runoff is rapid, and the erosion potential is high.

Bernardino-White House-Hathaway Association. This soil association consists of deep gravelly clay loams, gravelly sandy loams, gravelly loams, or clays to a depth of 60 in (152 cm) or more. This soil association is typically found on fans or piedmont plains (formed at the base of mountains) with slopes ranging from 0 to 45 percent. The erosion hazard is generally slight to moderate, except in two series that occur on steep slopes on either long, narrow sides of ridges or on strongly dissected upper old alluvial fans.

Caralampi-White House-Hathaway Association. This soil association consists of deep gravelly loams or gravelly sandy loams to a depth of 60 in (152 cm) or more. This soil association is typically found on dissected fans and piedmonts with slopes ranging from 10 to 60 percent. Permeability is moderate or slow. The erosion hazard is slight to high, and is primarily dependent upon slope, with the steeper slopes and vertical scarps (a line of cliffs produced by faulting or erosion) posing a higher erosion potential.

Lampshire-Chiricahua-Graham Association. This soil association consists of very cobbly (coarse) loams, very cobbly clay loams, or cobbly sandy loams with shallow to very shallow depths. Lampshire soils are 4 to 20 in (10 to 51 cm) deep and occur on mountains. Chiricahua are 20 in (50 cm) deep and are found on foothills and low mountains. Graham Soils are 10 to 20 in (25 to 51 cm) deep and on lower parts of mountains. Slopes range from 0 to 60 percent. Permeability above bedrock (solid rock beneath loose surface material) is moderate or slow. The erosion hazard is primarily slight to moderate, but is high on some steep slopes in the Atascosa and Tumacacori Mountains.

Prime Farmland. The NRCS has designated certain soil types as "prime farmland" subject to protection under the *Farmland Protection Policy Act.* Soils that are classified as prime farmland derive their value from their general advantage as cropland due to soil and water conditions. These soils are best suited for producing food, feed, fiber, forage, and crops. They have favorable growing seasons and receive sufficient quantities of moisture to produce yields on average of 8 out of every 10 years. The only soil types found in the corridors that are classified as prime farmland are the Comoro soil series (0 to 5 percent slope only, and referred to as Comoro soils in this document) and the Pima soil series. These soils are found within the Continental-Sonoita and Comoro-Pima soil associations, and are considered prime farmland only when irrigated.

Coronado National Forest Soil Classifications. USFS has classified the soil condition of the Tumacacori EMA, based on the vegetation, slope, and soil type combination, or on the watershed condition rating where the former were unavailable. Satisfactory soil condition indicates the current soil loss is below the tolerance level, and unsatisfactory soil condition indicates the current soil loss is above the tolerance level.

3.6.2.1 *Western Corridor*

The Western Corridor begins on the Comoro-Pima soil association and crosses the Bernardino-White House-Hathaway, Continental-Sonoita, and Lampshire-Chiricahua-Graham associations before separating from the Central Corridor. It continues on the Lampshire-Chiricahua-Graham association and crosses areas of the Comoro-Pima and Continental-Sonoita associations before entering the Coronado National Forest.

On the Coronado National Forest, the Western Corridor crosses primarily the Lampshire-Chiricahua-Graham association, and crosses the Caralampi-White House-Hathaway association for the remainder of the route to Nogales. The Western Corridor passes through unsatisfactory soil conditions upon entering the Tumacacori EMA from the north, then passes through satisfactory soil conditions as it turns east at Ruby Road, and exits the Tumacacori EMA near Nogales again in unsatisfactory soil conditions (USFS 2001b).

In Santa Cruz County, the Western Corridor would cross approximately 1,900 linear ft (580 m) of prime farmland soils located in the far northwest corner of the county. These soils are Comoro soils and are grouped within the Continental-Sonoita soil association. These soils are found in the area of the Sopori and Batamote Washes and are considered prime farmland only when irrigated. Some of the area of Sopori and Batamote Washes are irrigated and farmed.

The NRCS soil survey for the project area within Pima County is out of print and not publicly available. However, staff from the local NRCS office indicated that there are little, if any, prime farmland soils (when irrigated) in the project area of Pima County (NRCS 2003).

3.6.2.2 *Central Corridor*

After separating from the Western Corridor, the Central Corridor continues on the Lampshire-Chiricahua-Graham association, crosses a small area of the Comoro-Pima association, and continues on the Continental-Sonoita association to the Coronado National Forest boundary, as shown in Figure 3.6–4. The soils in the Central Corridor primarily consist of gravelly sands with a high percentage of cobbles and boulders (Terracon 2002).

On the Coronado National Forest, the Central Corridor crosses primarily the Caralampi-White House-Hathaway association, with a short section of the Lampshire-Chiricahua-Graham association just north of the crossing of Ruby Road. The Central Corridor passes almost entirely through unsatisfactory soil conditions, as described in Section 3.6.2.1, within the Tumacacori EMA (USFS 2001b).

In Santa Cruz County, the Central Corridor would cross approximately 5,600 linear ft (1,700 m) of prime farmland soils located near Amado and Tubac. Near Tubac, approximately 1,000 linear ft (305 m) of prime farmland soils would be crossed in the vicinity of Puerto Canyon and Tubac Creek. These soils are the Comoro soils and are grouped within the Continental-Sonoita soil association. In the Amado area, approximately 4,600 linear ft (1,400 m) of prime farmland soils would be crossed in the area of the Toros, Sopori, Diablo, and Las Chivas Washes. These soils are Comoro soils (grouped within the Continental-Sonoita and Comoro-Pima soil associations), and Pima soils (within the Comoro-Pima association). All prime farmland soils within the project area are considered as such only when irrigated.

Specific locations of prime farmland soils in the corridors within Pima County have not been determined.

3.6.2.3 *Crossover Corridor*

The portion of the Crossover Corridor that is not common to one of the other corridors crosses primarily the Lampshire-Chiricahua-Graham association, plus a small area of the Caralampi-White House-Hathaway association. The Crossover Corridor passes almost entirely through unsatisfactory soil conditions, as described in Section 3.6.2.1, except for the east-west crossing through Peck Canyon, where the soil conditions are satisfactory (USFS 2001b).

There are no prime farmland soils located within the Crossover Corridor, except for where it is common with the Western Corridor in the northwest corner of Santa Cruz County, as described in Section 3.6.2.1.

3.7 WATER RESOURCES

This section discusses the existing water resources in the project area, including surface water, floodplains, wetlands, and groundwater.

3.7.1 Floodplains, Wetlands, and Surface Water

The following discussion of surface water, floodplains, and wetlands applies to all three proposed corridors. Information specific to the Western, Central, and Crossover Corridors is presented separately following the general discussion.

Surface Water. There are numerous small perennial surface waterbodies (present at all seasons of the year) in the proposed project area, some of which would be spanned by the proposed transmission line. The largest intermittent surface water feature, the Santa Cruz River, would not be crossed by any of the three proposed corridors. The Santa Cruz River, as shown in Figure 3.7–1, flows northward from Mexico into the project area. Historical data from the U.S. Geological Survey over 76 years (water years 1913-22, 1930-95) indicate that the average discharge near Nogales is 28.3 cubic feet per second (ft^3/s) (0.801 cubic meters per second [m^3/s]), or 20,500 acre-feet per year (acre-ft/yr). The median of yearly mean discharges is 20 ft^3/s (0.57 m^3/s), or 14,500 acre-ft/yr (USGS 2001).

Northern Portion. All three proposed corridors would cross one drainage in the vicinity of land managed by the Bureau of Land Management (BLM). There are no major washes on the BLM land.

Tumacacori Ecosystem Management Area. In the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, there are many ephemeral and three perennial streams and washes. One of the perennial streams is Sycamore Creek. A 1,759-acre (712-ha) section of Sycamore Creek and its surrounding environment were nominated in 1993 as a Wild and Scenic River under the *National Wild and Scenic Rivers System Act* of 1968 (USFS 2001b), although never designated as such. As shown in Figure 3.7–2, the proposed project (Western Corridor) crosses the Sycamore Canyon watershed, but is north of the nominated section, which is south of Ruby Road to the U.S.-Mexico border (see Figure 3.12–1). Arivaca Lake and Peña Blanca Lake, also shown in Figure 3.7–2, are man-made lakes within the Coronado National Forest, although not crossed by any of the three proposed corridors. Surface water uses within the Coronado National Forest include wildlife, livestock, recreation, mining, and domestic use.

The U.S. Department of Agriculture Forest Service (USFS) has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water. Water quality is based on analysis of parameters such as fecal coliform, bacteria, dissolved oxygen, pH, salinity, and temperature at points downstream from the Coronado National Forest. Watershed condition and function is based on soil condition, soil productivity, riparian condition, water quality, and how water cycles through the ecosystem. Satisfactory watershed condition and function denote a watershed functioning at a sustainable desired level with no long-term changes predicted and a very low risk of management-induced deterioration. Unsatisfactory watershed condition and function would require capital investment to bring the watershed to the desired condition (USFS 2001b).

Nogales U.S.-Mexico Border Area. The proposed crossing of the U.S.-Mexico border would be the same for all three corridors. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border (TEP 2003). The United States Section of International Boundary Water Commission, U.S.-Mexico (USIBWC) will not approve any construction in the United States that increases, concentrates, or relocates overland drainage flows into either the United States or Mexico. Surface drainage must be handled so that there is no increase of volume, peak runoffs, or flow concentration across the border in either direction (USIBWC 2003). Prior to construction of the selected corridor, Tucson Electric Power Company (TEP) would provide site-specific drawings to USIBWC for approval along with any hydrological or hydraulic studies for work proposed in the vicinity of the U.S.-Mexico border. This would include review of any structures proposed to be constructed in any drainage courses that cross the border. No structures are currently proposed to be constructed in drainage courses that cross the border.

Floodplains and Wetlands. Under Executive Order 11988, *Floodplain Managemen*t, and Executive Order 11990, *Protection of Wetland*s, Federal agencies are required to consider the impact of proposed actions on wetlands and floodplains. The Executive Orders are intended to be used by Federal agencies to implement floodplain and wetland requirements through existing procedures, such as those established to implement the *National Environmental Policy Act* of 1969 (NEPA). The U.S. Department of Energy (DOE) requirements for compliance with Executive Orders 11988 and 11990 are found in Title 10, *Code of Federal Regulations* (CFR), Part 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements." A Floodplain and Wetland Assessment, in compliance with Title 10 CFR 1022, has been prepared and is included in Appendix C of this Draft Environmental Impact Statement (EIS). A floodplain/wetlands assessment consists of a description of the proposed action, a discussion of its effects on the floodplain and wetlands, and consideration of the alternatives.

If DOE determines that there is no alternative to implementing a proposed project in a floodplain, a brief statement of findings must be prepared. This statement of findings would include a description of the proposed action, an explanation indicating why the project must be located in a floodplain, a list of alternatives considered, measures that will be taken to comply with state and local floodplain protection standards, and a description of the steps to be taken to minimize adverse impacts to the floodplain.

Floodplains are delineated (that is, mapped and classified) by the Federal Emergency Management Agency (FEMA). When maintained in a natural state, floodplains provide valuable services by moderating the extent of flooding, thereby (1) reducing the risk of downstream flood loss; (2) minimizing the impacts of floods on human safety, health, and welfare; and (3) providing support to wetlands, fish, and wildlife. For the purposes of this assessment, the extent of the 100-year floodplain along the Santa Cruz River and its tributaries was determined from FEMA Flood Insurance Rate Maps, county soil survey maps, and consultation with USFS (USFS 2003). The expansion of the South Substation, regardless of the corridor selected, would occur within the 100-year floodplain, as shown in Figure 3.7–3. Each of the three proposed corridors would also cross portions of the 100-year floodplain. The FEMA maps indicate that the following tributaries could be part of the 100-year floodplain: Sopori, Toros, Diablo, Las Chivas, and Mariposa Canyon Wash (see Figure 3.7–3, and Figures 2 through 5 in Appendix C). Additional unmapped floodplains may also occur in the project area. In those areas where the regulatory floodplains have not been delineated, the county engineer may require the project proponent to establish the regulatory floodplain and floodway limits through a hydrologic and hydraulic study prepared by an Arizona registered professional civil engineer.

Wetlands are a subset of waters of the United States. Waters of the United States are defined in the *Clean Water Act* (CWA) as "surface waters, including streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, and other ephemeral watercourses and wetlands." Waters of the United States on the project area are under the jurisdiction of the U.S. Army Corps of Engineers (USACE), and activities that result in impacts to waters of the United States (including wetlands) must be permitted by USACE under Section 404 of the CWA. TEP is currently in consultation with USACE on a preliminary jurisdictional delineation for the South Substation. Upon final selection of an alternative, TEP would apply to USACE for either a nationwide permit or individual permit for the proposed corridor. TEP would site the transmission line structures and new access roads, to the extent feasible, such that they would span across (rather than be located within) any jurisdictional waters.

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (40 CFR 230.3[t]). Wetlands serve a variety of functions within the ecosystem, including water quality preservation, flood protection, erosion control, biological productivity, fish and wildlife habitat, cultural values, aesthetic values, economic values, and scientific values.

No wetlands (either within or outside of the USACE jurisdiction) were found in the proposed project corridors during field surveys conducted by Harris Environmental Group for the Biological Assessments (HEG 2003a, b, and c) and none were identified by USFS (USFS 2003). There may be small areas of potential wetlands within the proposed corridors that are associated with manmade stock ponds and impoundments; TEP would site the transmission line to avoid such areas.

3.7.1.1 *Western Corridor*

The Western Corridor would cross numerous very small dry washes and approximately 15 large washes (TEP 2001). Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Proctor, Batamote, Sopori, and Saucito Wash as shown in Figure 3.7–1. Within the Coronado National Forest, the Western Corridor passes through the watersheds of the perennial surface waters of Sycamore, East Fork Apache, and Peck Canyons, shown in Figure 3.7–2, along with numerous smaller tributaries to these waterbodies. The following drainages are crossed by the Western Corridor in the Coronado National Forest: Alamo Canyon Creek, Pesqueria Canyon Creek, Calabasas Canyon Creek, Walker Canyon Creek, Peña Blanca Canyon Creek, Apache Canyon Creek, Murphy Canyon Creek, Lobo Canyon Creek, Sardina Canyon Creek, Sycamore Canyon Creek, and Cedar Canyon Creek. The Western Corridor approaches within 2 mi (3 km) of a total of 10 mapped springs (URS 2003a).

The USFS has classified (as described in Section 3.7.1) watershed and surface water parameters (watershed condition and function) within the Tumacacori EMA. The water quality is Satisfactory for Sycamore Canyon and the portion of the Western Corridor south of Ruby Road, and Unsatisfactory for the remaining portion of the Western Corridor north of Ruby Road. The areas with Unsatisfactory water quality also generally have Unsatisfactory watershed condition and function. Likewise, those areas with Satisfactory water quality also have Satisfactory watershed condition and function.

3.7.1.2 *Central Corridor*

The Central Corridor would cross numerous very small dry washes and approximately 14 large washes. Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Sopori, Toros, Diablo, and Las Chivas Washes, and Tubac Creek, Aliso Canyon, and Rock Corral Canyon, as shown in Figure 3.7–1. Within the Coronado National Forest, the Central Corridor passes through the watershed of the perennial surface waters of Peck Canyon, shown in Figure 3.7–2, along with numerous smaller tributaries. The following drainages are crossed by the Central Corridor in the Coronado National Forest: Potrero Canyon Creek, Alamo Canyon Creek, Pesqueria Canyon Creek, Bellotosa Canyon Creek, Calabasas Canyon Creek, Caralampi Canyon Creek, Agua Fria Canyon Creek, Peck Canyon Creek, Negro Canyon Creek, Tinaja Canyon Creek, Rock Corral Canyon Creek, Aliso Canyon Creek, Luback Creek, and Puerto Canyon Creek. The Central Corridor does not approach within 2 mi (3 km) of any mapped springs (URS 2003a).

USFS has classified the Tumacacori EMA according to a number of parameters evaluating the area’s watersheds and surface water parameters (watershed condition and function). The water quality and watershed function is Unsatisfactory for the northern portion of the Central Corridor within the

Tumacacori EMA, and is Satisfactory from just north of crossing Ruby Road to exiting the Forest near Nogales. The watershed condition is Unsatisfactory for almost the entire length of the Central Corridor within the Tumacacori EMA.

3.7.1.3 *Crossover Corridor*

The Crossover Corridor would cross numerous very small dry washes and approximately 15 large washes. Outside of the Coronado National Forest, the larger washes crossed, starting from west of Sahuarita and going south, include Demetries, Esperanza, Escondido, Proctor, Batamote, Sopori, and Saucito Wash, as shown in Figure 3.7–1. Within the Coronado National Forest, the Crossover Corridor passes through the watersheds of the perennial surface water of East Fork Apache Canyon and Peck Canyon, shown in Figure 3.7–2, along with numerous smaller tributaries. Agua Fria (Peña Blanca) Canyon is another perennial surface waterbody crossed by the Crossover Corridor in the Tumacacori EMA. The following drainages are crossed by the Crossover Corridor in the Coronado National Forest: Alamo Canyon Creek, Pesqueria Canyon Creek, Bellotosa Canyon Creek, Calabasas Canyon Creek, Caralampi Canyon Creek, Agua Fria Canyon Creek, Peck Canyon Creek, Lost Dog Canyon Creek, Pine Canyon Creek, Apache Canyon Creek, Murphy Canyon Creek, Lobo Canyon Creek, Cedar Canyon Creek, Sardina Canyon Creek, and Potrero Canyon Creek. The Crossover Corridor approaches within 2 mi (3 km) of 4 mapped springs (URS 2003a).

USFS has classified the Tumacacori EMA according to a number of parameters evaluating the area's watersheds and surface water parameters (watershed condition and function). The water quality and watershed function is classified as Unsatisfactory for the northern portion of the Crossover Corridor within the Tumacacori EMA, and is classified as Satisfactory from just north of crossing Ruby Road to exiting the Coronado National Forest near Nogales. The watershed condition has been classified as Satisfactory for the portion of the Crossover Corridor traversing Peck Canyon, and Unsatisfactory for remaining portions of the Crossover Corridor within the Tumacacori EMA.

3.7.2 Groundwater

3.7.2.1 *Western Corridor*

The project area is located within two Active Management Areas (AMAs) for groundwater as identified by the State of Arizona, Department of Water Resources. The Santa Cruz AMA is located in the southern portion of the project area, while the Tucson AMA covers the northern part. These areas (and three others) were established to aid in the proper management of groundwater resources in Arizona.

In the Santa Cruz AMA, basin-fill sediments along the Santa Cruz River between Nogales and Amado form three aquifer units in the area. In ascending order, they are the Nogales Formation, the Older Alluvium, and the Younger Alluvium. Both of the latter alluvial units are generally unconfined and hydraulically connected, although the Older Alluvium does exhibit semi-confined and confined conditions in some places. The Nogales Formation is not a good aquifer (that is, does not produce useable quantities of water) and is best considered as "hydrologic bedrock" (ADWR 1999a).

The aquifer closest to the surface, the Younger Alluvium, is comprised of coarse-grained stream channel and floodplain deposits, and is typically found at depths from 40 to 150 ft (12 to 46 m). Hydraulic conductivities are quite large and some wells yield over 1,000 gallons per minute (3,785 liters per minute). The amount of groundwater in storage in the Younger Alluvium is estimated at 159,500 acre-ft (ADWR 1999a).

The Tucson AMA consists of two hydrogeologic subbasins the Avra Valley Subbasin and the northern part of the Upper Santa Cruz Valley Subbasin. The uppermost aquifers in these subbasins are the Upper Alluvial Unit and the Recent Alluvial Deposits, respectively. The former is composed of silt and gravel, while the Recent Alluvial Deposits are predominately unconsolidated sand and gravel (ADWR 1999b).

Depth to groundwater in the Tucson AMA varies greatly, from less than 100 ft (30 m) to over 600 ft (183 m). In general, depths to water tend to be shallower near rivers and major washes and deeper near mountain fronts where land surface elevations are higher (ADWR 1999b).

Groundwater levels have declined substantially in the Tucson AMA in the last 50 years as a result of groundwater pumping for municipal, agricultural, and industrial uses. In some areas outside of the project area, significant land subsidence has occurred.

The amount of groundwater in storage to a depth of 1,000 ft (3,785 m) in the Tucson AMA is estimated at 12.7 million acre-ft (ADWR 1999b).

The U.S. Environmental Protection Agency (EPA) designated the aquifers in the Tucson and Santa Cruz AMAs as Sole Source Aquifers. Under this program, the aquifers present in this area are collectively referred to as the Upper Santa Cruz and Avra Basin Aquifer. The Sole Source Aquifer program was created under the *Safe Drinking Water Act* of 1974 to protect drinking water supplies in areas with few or no alternative sources to the groundwater resource.

A small number of private wells are scattered throughout the proposed project area.

3.7.2.2 *Central Corridor*

The groundwater resources described above for the Western Corridor also apply to the Central Corridor.

3.7.2.3 *Crossover Corridor*

The groundwater resources described above for the Western Corridor also apply to the Crossover Corridor.

3.8 AIR QUALITY

This section discusses the climatic regime and existing air quality in the area between Tucson and Nogales, Arizona. Because this information applies to each alternative in the same manner, the discussion is combined rather than repeated separately for each alternative. Refer to Section 3.10.2, Corona Effects, for a discussion of potential photochemical reactions in the air surrounding transmission lines.

3.8.1 Climate

The climate in the vicinity of the project is an arid desert characterized by hot temperatures, large daily air temperature ranges, and sparse precipitation. Table 3.8–1 presents the climatological data for the Tucson area normalized over a period of 30 years.

Table 3.8–1. Climate Data for Tucson, Arizona.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature												
Average Daily Maximum Temperature (^oF)	63.9	67.8	72.8	81.2	89.9	99.6	99.4	96.8	93.3	84.3	72.7	64.3
Average Daily Minimum Temperature (^oF)	38.6	41.0	44.6	50.4	58.7	67.9	73.6	72.1	67.5	56.6	45.6	39.8
Average Monthly Temperature (^oF)	51.3	54.4	58.7	65.8	74.0	83.8	86.6	84.5	80.4	70.4	59.2	52.0
Precipitation												
Maximum Monthly Precipitation (in)	4.81	2.90	2.26	1.66	1.11	1.46	6.17	7.93	5.11	4.98	1.90	5.02
Average Monthly Precipitation (in)	0.87	0.70	0.72	0.30	0.18	0.20	2.37	2.19	1.67	1.06	0.67	1.07
Minimum Monthly Precipitation (in)	T	0.00	0.00	0.00	0.00	0.00	0.01	0.23	0.00	0.00	0.00	0.00
Mean number of days of precipitation (0.1 in or more)	4.6	3.8	4.3	2.0	1.6	1.7	10.1	9.4	4.6	3.3	3.0	4.7
Percent of Possible Sunshine	80	82	86	92	93	93	78	80	87	88	85	79
Wind												
Mean Speed (mph)	7.9	8.1	8.6	8.9	8.8	8.7	8.4	7.9	8.3	8.2	8.1	8.3
Prevailing Wind Direction	SE	SE	SE	SE	SE	SSE	SE	SE	SE	SE	SE	SE

T = trace amount.
Source: Climate 2003.

The data show a mean annual temperature of 68.4ºF (20.2ºC) with average maximum temperatures ranging from 63.9ºF (17.7ºC) in January to 99.6ºF (37.6ºC) in June. The average annual precipitation for the period of record is 12.0 in (30.5 cm), peaking from July through September, with a second lower peak in the winter months. The average maximum precipitation ranges from 1.11 in (2.8 cm) in May to 7.93 in (20.1 cm) in August, with the minimum precipitation ranging from 0.0 in (0 cm) to 0.23 in (0.58 cm) in August. The mean number of days receiving 0.1 in (0.25 cm) or more of precipitation ranged from 1.6 days in May to 10.1 days in July. The percent of possible sunshine ranges from 78 percent to 93 percent.

The mean wind speed ranges from 7.9 mi per hour (13 km per hour) to 8.9 mi per hour (14 km per hour) with the direction of prevailing wind blowing from the southeast. Figure 3.8–1 is a “wind rose” of surface wind measurements taken in 1990 at the National Weather Station at Tucson International Airport (NOAA 2003).

The Coronado National Forest portion of each corridor is higher in elevation and has lower average temperatures and higher levels of precipitation than the rest of the corridors. For example, mean annual precipitation in evergreen woodland communities is 20 in (51 cm).

3.8.2 Air Quality

The U.S. Environmental Protection Agency (EPA) established air quality standards for six different pollutants, referred to as criteria pollutants, based on the protection of public health and the environment. These National Ambient Air Quality Standards (NAAQS) set limits for the following criteria pollutants: nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and inhalable particulate matter (PM_{10}), or particles with an aerodynamic diameter less than or equal to 10 microns. (The diameter of a human hair is approximately 70 microns.) In addition, in 1997 EPA finalized new air quality standards for ozone and $PM_{2.5}$ (particles with an aerodynamic diameter less than or equal to 2.5 microns). A series of legal challenges in the U.S. Court of Appeals ensued, culminating with the U.S. Supreme Court upholding the NAAQS for ozone and $PM_{2.5}$ on February 27, 2001. Based on the ambient (outdoor) levels of the criteria pollutants, EPA evaluates individual Air Quality Control Regions (AQCRs) to establish whether or not they meet the NAAQS. Areas that meet the NAAQS are classified as attainment areas, and areas that exceed the NAAQS for a particular pollutant(s) are classified as non-attainment areas for the pollutant(s). Areas that have been redesignated by EPA as attainment areas within the last 10 years are classified as maintenance areas.

There are over 100 ambient air quality monitoring sites located throughout Arizona (ADEQ 2002). These sites monitor air pollutants and other parameters on a continuous or periodic basis. The air pollutants monitored include: CO, hazardous air pollutants (metals), nitrogen oxides (NO_x), SO_2, O_3, specific Volatile Organic Compounds (VOCs), PM_{10}, and $PM_{2.5}$.

The proposed project is located within portions of Pima and Santa Cruz Counties. Table 3.8–2 shows the attainment status of the project area and vicinity. The project area is designated as being in attainment or unclassifiable for all criteria pollutants, with the exception of the Nogales area in Santa Cruz County, which is designated as a moderate non-attainment area for PM_{10}, and for which the state has set specific emissions and permitting requirements. The Tucson area is a CO maintenance area. Figure 3.8–2 shows the location of the proposed project relative to the Nogales PM_{10} non-attainment area and the Tucson CO maintenance area. EPA has not yet classified areas as being in attainment or non-attainment for $PM_{2.5}$ standards, as states are still collecting data to establish these classifications.

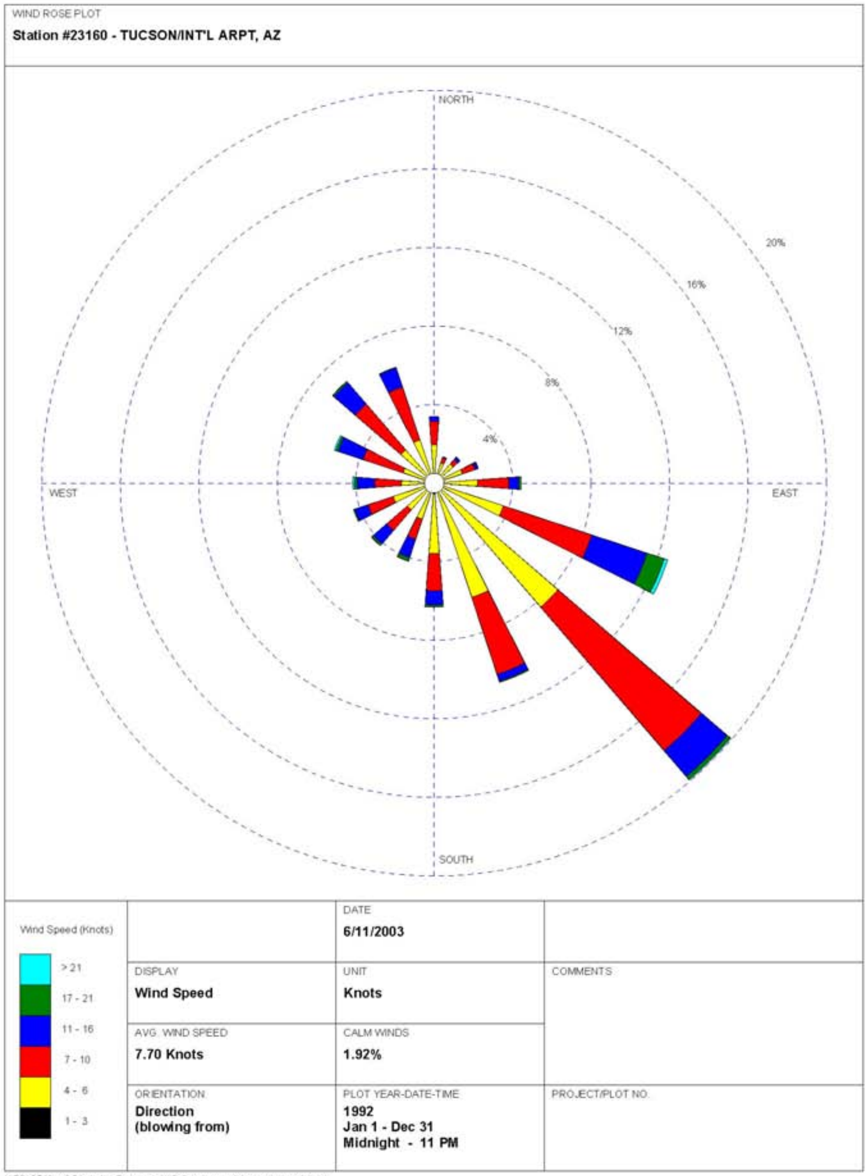


Figure 3.8–1. Wind Rose of Surface Winds at Tucson.

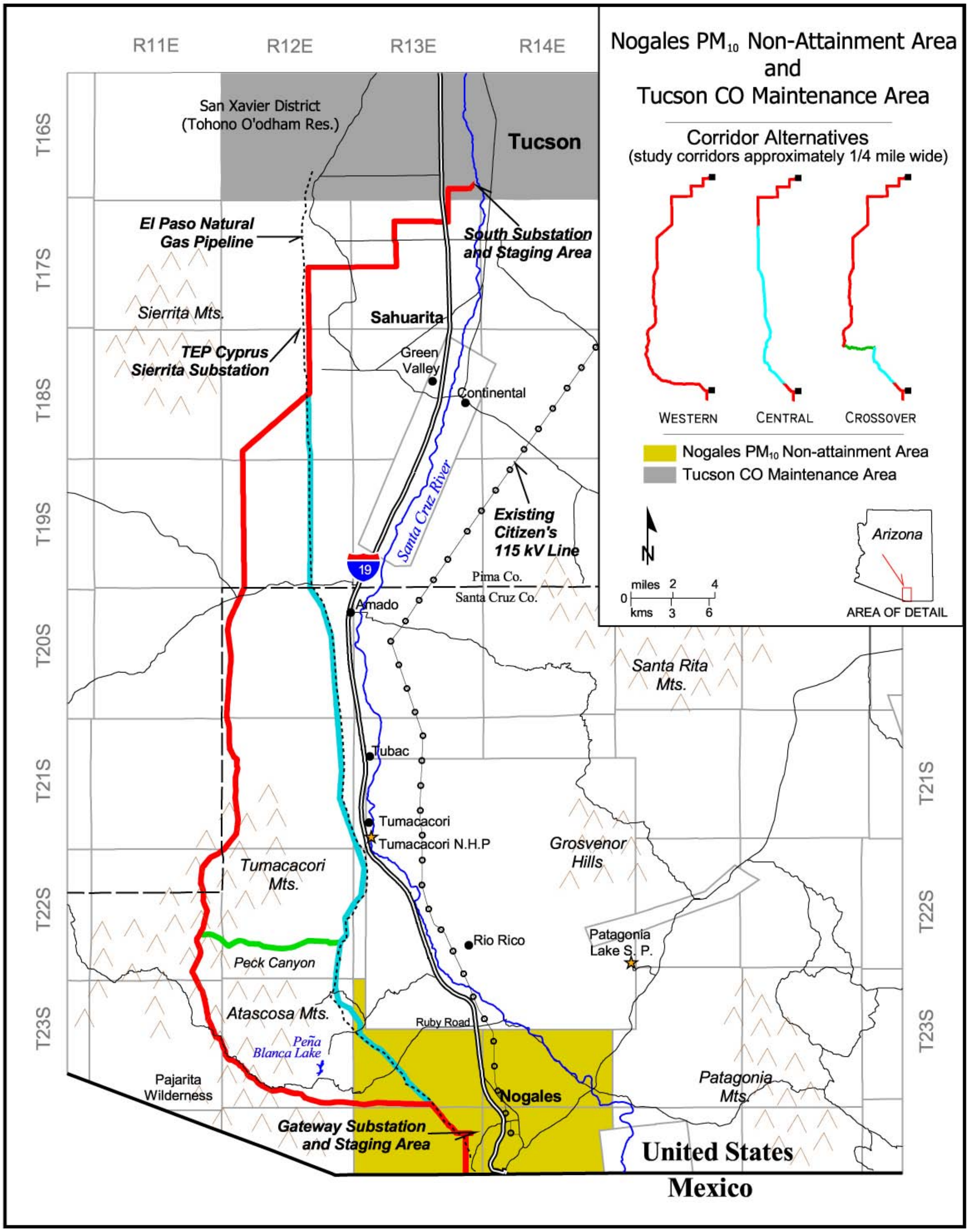


Figure 3.8–2. Nogales PM_{10} Non-attainment Area and Tucson CO Maintenance Area.

Table 3.8–2. Criteria Pollutant Attainment Status in the Proposed Project Area.

Area	Pollutant	Attainment Status[a]
Pima County (excluding Rillito and Ajo)[b]	NO_2	Unclassifiable
	SO_2	Better than national standards
	PM_{10}	Unclassifiable
	CO	Attainment[c]
	Pb	Attainment
	O_3	Unclassifiable/Attainment
Santa Cruz County (excluding Nogales for PM_{10})	NO_2	Unclassifiable
	SO_2	Better than national standards
	PM_{10}	Unclassifiable
	CO	Unclassifiable/Attainment
	Pb	Attainment
	O_3	Unclassifiable/Attainment
Santa Cruz County – Nogales	PM_{10}	Non-attainment (moderate)

[a] Unclassifiable areas are areas that cannot be classified on the basis of available information as meeting or not meeting the NAAQS for a particular pollutant.
[b] Rillito and Ajo are non-attainment areas northwest of Tucson, outside the area of study for the proposed project.
[c] The Tucson area was redesignated as a CO attainment area in 2000 and is thus classified as a CO maintenance area.
Source: EPA 2003.

The primary sources of PM_{10} in the project area are large copper mines, traffic on unpaved roads, construction activities, and significant natural events such as windstorms. Another potential source of PM_{10} associated with the Nogales area's non-attainment status is activities on the Mexican side of the international border (Yockey 2001). The Pima County Department of Environmental Quality (PDEQ) and Arizona Department of Environmental Quality (ADEQ) monitor air quality and regulate emissions of air pollutants from industrial and commercial facilities as required under the *Clean Air Act* (CAA) and state and local regulations. Attainment and maintenance of the NAAQS in the project area are governed by a federally enforceable air quality management plan, called a State Implementation Plan (SIP).

The CAA provides special protection for visibility and other air quality related values in specially designated areas such as National Parks and Wilderness Areas, officially designated as "Class I" areas. Special visibility modeling analysis must be performed for major new sources and modifications that may affect a Class I area under the CAA's Prevention of Significant Deterioration (PSD) program. The nearest Class I area to the proposed project is the Saguaro National Monument East, an estimated 18 mi (29 km) north of TEP's South Substation in Sahuarita (Yockey 2001). See Section 3.2 for discussion of visual range.

3.9 NOISE

This section discusses the existing noise levels in the vicinity of the proposed TEP Sahuarita-Nogales Transmission Line Project and describes the basic measurements used for sound.

3.9.1 Background

With regard to this Environmental Impact Statement (EIS), noise concerns are associated primarily with construction activities. Noise is also a potential concern for the operation of transmission lines, as described in Section 3.10.2, Corona Effects. The description of the existing sound environment requires a general understanding of how sound is measured and its effects on the human environment. Because this background information applies to each alternative in the same manner, the discussion is combined rather than repeated separately for each alternative.

Noise is defined as sound that is undesirable because it interferes with speech, communication, or hearing; is intense enough to damage hearing; or is otherwise annoying. The measurement and human perception of sound involve two basic physical characteristics: intensity and frequency. Intensity is a measure of the sound energy of the vibrations, and frequency is the measure of the tone or pitch of the sound.

The physical unit most commonly used to measure sounds is the decibel (dB). The higher the energy carried by the sound, the louder the perception of that sound, and thus, the higher the dB rating of the sound. A sound level of just above 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. The dB scale is logarithmic, meaning that a 60 dB sound is not perceived as twice as loud as a 30 dB sound. Rather, a 60 dB sound is perceived as approximately twice as loud as a 50 dB sound. Humans typically can barely perceive loudness changes of less than 2 to 3 dB.

The second important characteristic of sound is its tone or frequency, which is the number of times per second the air vibrates, measured in Hertz (Hz). The human ear is most sensitive to frequencies in the 1,000 to 4,000 Hz range. To account for the variable response of the human ear to different tones, decibels may be adjusted to A-weighted decibels. The adjusted A-weighted decibels (dBA) represent the human hearing response to sound. The maximum sound levels of typical events are shown in Table 3.9–1.

In addition to measuring a single sound event, a time-average sound level can be calculated (also in dBA) to represent the average sound over a specified length of time. For the evaluation of community noise effects, and particularly construction noise effects, the Day-Night Average Sound Level (DNL) is often used. The DNL averages construction sound levels at a location over a complete 24-hour period, with a 10 dB adjustment added to those noise events that take place between 10:00 p.m. and 7:00 am. This 10 dB “penalty” represents the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient (background) sound levels during nighttime are typically about 10 dB lower than during daytime hours.

It is important to distinguish between the measurement of a single sound event and the calculation of a time-averaged DNL, both of which are often represented in dBA. Because the DNL is a measurement of an average, a DNL of 50 dBA could result from a few noisy events or a large number of quieter events. DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure.

The U.S. Department of Housing and Urban Development established a DNL standard of 65 dBA for homes that are funded through federally guaranteed loans. In 1974, the U.S. Environmental Protection

Agency (EPA) identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

Table 3.9–1. Comparative A-Weighted Sound Levels.

Common Outdoor Sound Levels	Sound Level (dBA)	Common Indoor Sound Levels
	110	
Jet flyover at 1,000 feet		Rock band
	100	
Gas lawnmower at 3 feet		Inside subway train
	90	
Diesel truck at 50 feet		Food blender at 3 feet
		Garbage disposal at 3 feet
Noisy urban daytime	80	
		Shouting at 3 feet
Gas lawnmower at 100 feet	70	Vacuum cleaner at 10 feet
		Normal speech at 3 feet
Commercial area	60	
Heavy traffic at 300 feet		
		Large business office
		Dishwasher in next room
	50	
		Small theater, large conference room (background)
Quiet urban nighttime	45	
		Library (background)
Quiet suburban nighttime	40	
		Bedroom at night
		Concert hall (background)
Quiet rural nighttime	30	
		Broadcast and recording studio (background)
	10	
	0	Threshold of hearing

Source: Canter 1977.

3.9.2 Western, Central, and Crossover Corridors

The proposed transmission line corridors cross primarily rural undeveloped land. Thus, current noise levels along each corridor are predominately low, typically with a DNL near 30 dBA. The DNL may increase to 45 to 60 dBA in suburban residential areas and near industry, major roads, and I-19. In wilderness locations the DNL is typically on the order of 20 dBA (Canter 1977).

All existing noise levels are below what is normally considered compatible with residential land uses and other noise impact guidelines. The primary sources of noise are (1) everyday vehicular traffic along nearby roadways, such as I-19; (2) minor construction activities related to maintenance of roadways, bridges, and the other structures and facilities; and (3) noise associated with industrial activity.

Within the Coronado National Forest, the existing noise sources are minor and are primarily associated with recreation (for example, hikers, off-road vehicle users, and picnickers at Peña Blanca Lake Recreation Area). Existing noise derived from construction and recreation is generally intermittent and highly variable depending on the time of day and year. In addition, the proposed project area, including portions of the Coronado National Forest, is part of a Military Operating Area in which the U.S. Air Force conducts periodic low-level flights.

3.10 HUMAN HEALTH AND ENVIRONMENT

This section discusses existing background information regarding electric and magnetic field (EMF) effects and corona effects. Because this background information applies to each alternative in the same manner, the discussion is combined rather than repeated separately for each alternative.

Both current and voltage are required to transmit electrical energy over a transmission line. The current, a flow of electrical charge, measured in amperes (A), creates a magnetic field. The voltage, the force or pressure that causes the current to flow, measured in units of volts (V) or thousand volts (kV), creates an electric field. Both fields occur together whenever electricity flows, hence the general practice of considering both as EMF exposure.

The possibility of deleterious health effects from EMF exposure has increased public concern in recent years about living near high-voltage lines. The available data have not revealed any conclusive evidence that EMF exposure from power lines poses a hazard to animal or human health. However, while such a hazard has not been established from the available evidence, the same evidence does not serve as proof of a definite lack of a hazard. In light of the present uncertainty, this section and Appendix B contain a summary of the existing credible scientific evidence relevant to evaluating the potential impacts of EMF, as required by the *National Environmental Policy Act* of 1969 (NEPA) implementing regulations (40 CFR 1502.22).

This section also discusses the safety considerations in the immediate vicinity of transmission lines. Additionally, the potential for corona effects on the human environment from transmission lines is discussed. Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors, the wires that carry electricity. Corona effects are of concern for potential radio and television interference, audible noise, and production of visible light.

3.10.1 Electric and Magnetic Fields

Magnetic Field Health Studies. The focus of the EMF health studies for power lines has been on the magnetic fields created by the power lines. Electric fields were studied in previous years, and were not found to be a concern for levels typical of power lines. A 60 Hz magnetic field is created in the space around transmission line conductors by the electric current flowing in the conductors. This is the frequency of ordinary household current, usually referred to as 60 cycle. The strength of the magnetic field produced by an electric transmission line depends on the electrical load, the configuration of the conductors (spacing and orientation), the height of the conductors, the distance from the line, and the proximity of other electrical lines. As the load on a transmission line varies continually on a daily and seasonal basis, the magnetic fields likewise vary throughout the day and year. Physical structures, such as buildings (unless of metal construction), are usually transparent to magnetic fields created by power lines (that is, buildings do not generally have a shielding effect), thus fueling the interest in potential health effects.

Existing EMF levels in the project vicinity are primarily dominated by EMF from common household appliances. EMF levels of some common household appliances are listed in Table 3.10–1. This table shows that the magnetic fields at a distance of 3 ft (1 m) range from less than 0.1 milligauss (mG) to 18 mG. Existing transmission and distribution lines also contribute to EMF levels. Figure 3.11–1 shows existing transmission lines in the project vicinity. As an example of maximum existing EMF, Tucson Electric Power Company (TEP) has modeled existing EMF levels on Bureau of Land Management (BLM) land (reference Figure 1.1–4) from the two existing transmission lines that run adjacent to the north of the proposed project. At a distance of 280 ft (85 m) south of the existing southernmost transmission line (which coincides with the proposed location of TEP's new transmission line), the existing magnetic field is 1.1 mG and the existing electric field is 0.01 kV/m. At a distance of 340 ft (104 m) south of the existing southernmost transmission line (which coincides with the southern edge of the right-of-way [ROW] of TEP's proposed transmission line), the existing magnetic field is 0.76 mG and the existing electric field is 0.006 kV/m (TEP 2003). The existing EMF level at the southern edge of the proposed ROW is below an average daily exposure to magnetic fields from some common household appliances (approximately 0.8 mG) (NIEHS 1999).

Table 3.10–1. EMF Level of Some Common Household Appliances.

Appliance	Magnetic Field at 3 ft (mG)
Clothes dryers	0.0-1
Clothes washers	0.2-0.48
Electric shavers	Less than 0.1-3.3
Fluorescent desk lamp	0.2-2.1
Hair dryers	Less than 0.1-2.8
Irons	0.1-0.2
Portable heaters	0.1-2.5
Television	Less than 0.1-1.5
Toasters	Less than 0.1-0.11
Vacuum cleaners	1.2-18.0

Source: Waveguide 2003.

No Federal regulations have been established specifying environmental limits on the strengths of fields from power lines. However, the Federal government continues to conduct and encourage research necessary for an appropriate policy on EMF. Several states have opted for design-driven regulations ensuring that fields from new lines are generally similar to those from existing lines. For instance, Florida and New York require ROWs for new power lines 500-kV and higher to be wide enough so that the magnetic field at the edge of the ROW is equivalent to the magnetic field of lower voltage (345-kV) lines. Some states have set specific environmental limits on one or both fields in this regard. Florida and New York limit the magnetic field at the edge of a ROW to 200 mG. These limits are, however, not based on any specific health effects. Most regulatory agencies believe that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

Safety. The potential safety considerations in the immediate vicinity of electric power lines include the potential for electric shock, the clearance of the power lines aboveground, low-level military flights in the area, measures to prevent unauthorized climbing of the poles, and the proximity of the transmission lines to other utilities such as the El Paso Natural Gas Company (EPNG) pipeline. The proposed project area includes portions that are part of a Military Operating Area in which the U.S. Air Force conducts periodic low-level flights (see Chapter 10 for the U.S. Department of Energy [DOE] consultation with the U.S. Air Force).

The electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception and neurobehavioral responses.

- *Induced Currents* – When a conducting object, such as a vehicle or person, is placed in an electric field, currents and voltages are induced. For example, it is not unusual for a fluorescent light tube to glow in the vicinity of high voltage lines. The magnitude of the induced current depends on the electric-field strength and size and shape of the object. The induced currents and voltages represent a potential source of nuisance shocks near a high-voltage transmission line.

- *Steady-State Current Shock* – Steady-state currents are those that flow continuously after a person contacts an object, such as a vehicle, and provides a path to ground for the induced current. The effects of these shocks range from involuntary movement in a person to direct physiological harm. Steady-state current shocks occur in instances of direct or indirect human contact with an energized transmission line.

- *Spark-Discharge Shocks* – Induced voltages appear on objects such as vehicles when there is an inadequate ground. If the voltage is sufficiently high, a spark-discharge shock will occur as contact is made with the ground. Spark-discharge shocks that create a nuisance occur in instances of carrying or handling conducting objects, such as irrigation pipe, under transmission lines.

- *Field Perception and Neurobehavioral Responses* – When the electric field under a transmission line is sufficiently strong, it can be perceived by hair raising on an upraised hand. This is the effect of harmless levels of static electricity, similar to the effect of rubbing stocking feet on a carpet.

An additional safety concern in the immediate vicinity of electric power lines is the potential for climbing of poles. Poles can be designed in a manner to prevent the unauthorized climbing of the poles by members of the public. In addition, sufficient clearance height must be considered to avoid contact with the lines either directly or by contact with other objects.

The Amended "Certificate of Environmental Compatibility" issued to TEP on October 29, 2001, by the Arizona Corporation Commission (ACC) (ACC 2001), includes a provision that all transmission structures must be at least 100 ft (30 m) away from the edge of the existing EPNG pipeline ROW. TEP would follow this provision in the precise siting of the proposed project.

Smoke is a conductor of electrical current. When a fire is in the vicinity of a 345-kV transmission line, the transmission line could start fires outside the fire perimeter. From 1986 through 1999 there were 67 human-caused fires (burning 13,747 acres [5,563 ha]), and 24 lightning-caused fires (burning 5,692 acres [2,303 ha]) within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest. Of these fires, 53 were less than 10 acres (4 ha), 23 were between 10 and 300 acres (4 and 121 ha), and 5 were over 300 acres (121 ha). The fires were dispersed throughout the EMA, with a higher concentration near high-use areas such as along Ruby Road (USFS 2001).

3.10.2 Corona Effects

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona is of concern for potential radio and television interference, audible noise (60-cycle hum), and photochemical reactions. Corona can occur on the conductors, insulators, and hardware of an energized high-voltage transmission line. Corona on conductors occurs at locations where the field has been enhanced by protrusions, such as nicks, insects, or drops of water. During fair weather, the number of these sources is small and the corona effect is insignificant. However, during wet weather, the number of these sources increases and corona effects are much greater (DOE 2001a).

The Electric Power Research Institute (EPRI) reports that "corona and arcing activity may occur at numerous points in overhead transmission, substation, and distribution power systems. This activity may result in audio noise or radio interference complaints or indicate a defective component that may be close to failure. If the offending component can be located, it can be replaced. EPRI's daytime corona and arcing visual inspection technology (DayCor) lets the exact position, type, and magnitude of corona activity be determined, thus enabling the identification of the offending component and the possibility of failure. DayCor observations are totally unaffected by sunlight and allow corona inspection to become part of everyday inspections" (EPRI 2001).

- *Audible Noise* – Corona-generated audible noise from transmission lines is generally characterized as a cracking/hissing noise. The noise is most noticeable during wet weather conditions. There are no noise codes applicable to transmission lines in Arizona. Audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW. Refer to Section 3.9, Noise, for a complete description of existing noise in proposed project area.

- *Radio and Television Interference* – Corona-generated radio interference is most likely to affect the amplitude modulation (AM) broadcast band (535 to 1,605 kilohertz); frequency modulation (FM) radio is rarely affected. Only AM receivers located very near to transmission lines have the potential to be affected by radio interference. The potential for interference from corona effects is more severe during damp or rainy weather.

- *Visible Light* – Corona may be visible at night as a bluish glow or as bluish plumes. On the transmission lines in the area, the corona levels are so low that the corona on the conductors usually is observable only under the darkest conditions with the aid of binoculars.

- *Photochemical Reactions* – When coronal discharge is present, the air surrounding the conductors is ionized and many chemical reactions take place producing small amounts of ozone and other oxidants. Approximately 90 percent of the oxidants are ozone, while the remaining 10 percent are composed principally of nitrogen oxides. Refer to Section 3.8, Air Quality, for a complete description of existing air quality.

3.11 INFRASTRUCTURE

This section discusses the existing infrastructure in the project area, including utilities and facilities. Also discussed are current waste management issues. Roads are discussed in Section 3.12, Transportation. Because this background information applies to each alternative in the same manner, the discussion is combined rather than repeated separately for each.

3.11.1 Utilities and Facilities

Figure 3.11–1 depicts the existing utility infrastructure in the project area. Tucson Electric Power Company's (TEP's) existing South Substation is located at 500 East Pima Mine Road (Section 36, Township 16 South, Range 13 East). The site is an estimated 26.4 acres (10.7 ha) and is wholly within the incorporated town of Sahuarita, Arizona. Two existing transmission lines provide most of the power to the substation: a 345-kV transmission line from Westwing Substation near Phoenix enters from the west and another 345-kV line from Springerville, via Vail Substation, enters from the east. The proposed project would utilize existing power on the Western electric grid, and would not require expansion of the Palo Verde Nuclear Generating Station located approximately 50 mi (80 km) west of Phoenix, Arizona.

TEP currently has two transmission lines in the Sahuarita area both of which cross Federal land managed by the Bureau of Land Management (BLM): 345-kV and 138-kV. Arizona Electric Power Company has three transmission lines in the Sahuarita area: 345-kV, 230-kV, and 115-kV. The remaining transmission line in the area belongs to TRICO Electric Cooperative, Inc., and is a 69-kV line. Citizens Communications Company (Citizens) has a 115-kV transmission line from the vicinity of Sahuarita to Nogales, Arizona. An electrical distribution line runs east from Peña Blanca Lake Recreational Area following Ruby Road and exiting national forest land.

There are facilities at Peña Blanca Lake including a boat launch, fishing dock, picnic area, and a campground at Calabasas Group Area.

An El Paso Natural Gas Company (EPNG) pipeline is present in the project area. It is buried within a 50-ft (15-m) right-of-way (ROW) and runs from Nogales west of Interstate 19 (I-19) to just west of Sahuarita. This pipeline, shown in Figure 3.11–1, is 6 in (15 cm) in diameter and transports natural gas at a pressure of 650 lbs/in^2 (46 kg force/cm^2), delivering approximately 500,000 ft^3 (14,158 m^3) per day. There is a road of varying width above portions of the pipeline. A railroad line also runs between Nogales and Sahuarita as shown in Figure 3.11–1.

3.11.2 Waste Management

TEP's existing South Substation generates minor quantities of municipal waste, usually limited to paper and plastic wrapping materials from new equipment. Municipal waste generated is disposed of in an approved county landfill. No hazardous waste is generated from substation operation.

There are no significant waste management issues associated with the existing transmission lines in the area. There are several solid waste disposal facilities located in the project area. The Los Reales Solid Waste Facility is in Pima County, about 8 mi (13 km) north and 4 mi (6.4 km) east of the South Substation. Two solid waste landfills are located near the proposed Central Corridor: the northern most is in Section 25, Township 20 South, Range 12 East and is an estimated 0.75 mi (1.2 km) south of Amado; the southerly landfill is in the NW4 of Section 16, Township 22 South, Range 13 East, an estimated 1.6 mi (2.6 km) east of the Central Corridor.

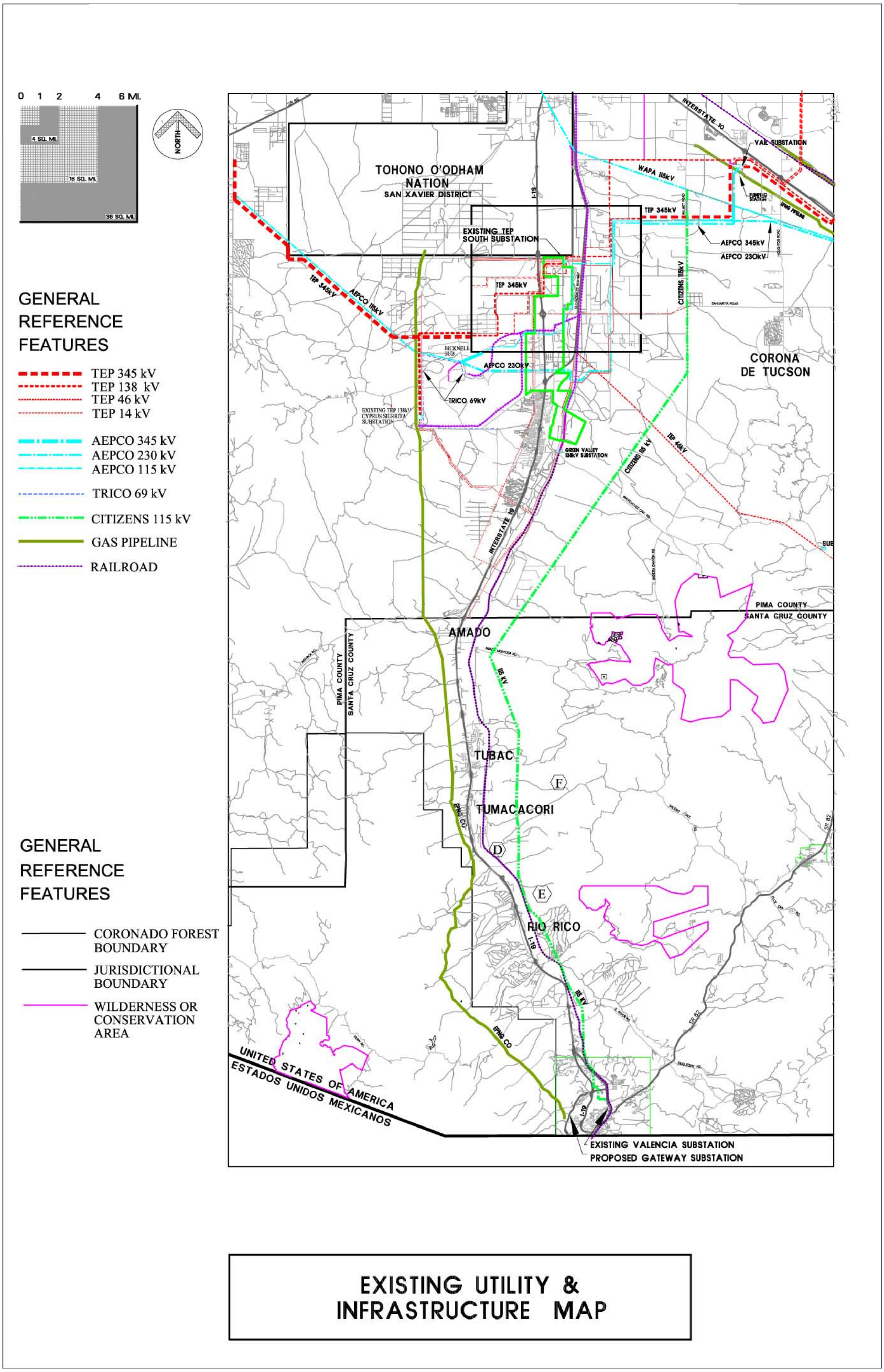


Figure 3.11–1. Existing Utility Infrastructure.

3.12 TRANSPORTATION

This section discusses the existing transportation system in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line proposed project. The discussion includes a description of the existing roads and access for each alternative corridor in Pima and Santa Cruz Counties, and quantification of existing traffic patterns. Figure 3.11–1 shows most of the roads and railroad lines in the vicinity of the project.

3.12.1 Western Corridor

As shown in Figure 1.1–4, Interstate 19 (I-19) is the primary continuous transportation link running north to south between Sahuarita and Nogales, with approximately 70 exits to collector roadways. In addition, the transportation system in the proposed project vicinity consists of ranch trails and graded dirt roads that provide access to cattle tanks, are utilized for construction and maintenance of existing utility rights-of-way (ROWs), or are utilized for fire suppression.

The three exits from I-19 that would be the primary points of access to the Western Corridor mobilization and reporting sites are (1) Pima Mine Road exit in Sahuarita to access the South Substation, (2) Arivaca Road exit in Amado for the central access point, and (3) Mariposa Road exit to access the southern mobilization yard at the Gateway Substation in Nogales. The average daily traffic numbers for the year 2000 on I-19 at the segment north of Mariposa Road (milepost 2.95) are 18,744 vehicles, at the Arivaca Road exit (milepost 30.95) are 17,919 vehicles, and at the Pima Mine Road exit (milepost 49.62) are 25,271 vehicles. The percentage of commercial traffic is fairly uniform, at approximately 10.5 percent (ADOT 2000).

Access to the proposed ROW within the Western Corridor would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Access to the South Substation would be on existing electric utility maintenance dirt roads. On non-Federal land west of I-19, access to the Western Corridor would be from paved section line roads and along short dirt radial trails that range in length from 75 ft (23 m) to 200 ft (60 m).

On the land managed by the Bureau of Land Management (BLM), west of Sahuarita, an existing access road to TEP's 345-kV Westwing-South transmission line would be utilized by turning off Mission Road. In this area, two short access road segments would be developed for construction of the transmission line. The first new access road, located west of Mission Road, would provide access to four structure sites and would be an estimated 0.63 mi (1.0 km) in length. The second would provide access to one pole east of Mission Road and would be an estimated 0.13 mi (0.21 km) in length. These two new access road segments would be an estimated 12 ft (3.7 m) wide and would primarily provide adequate clearance for delivery of long pole segments in an area that has steep inclines on the existing access road. Access to the remaining structures on BLM land would be accomplished by creating spurs to each structure from the existing access road, totaling an estimated 0.14 mi (0.23 km) (TEP 2003).

Upon reaching Continental Road west of Green Valley, the Western Corridor joins the El Paso Natural Gas Company (EPNG) pipeline ROW. At this point, the paved road to the south has a series of access points to the EPNG pipeline ROW which would be used as much as possible to access the proposed structure locations. As the Western Corridor turns to the southwest, the access points would be coordinated with the operations of the land owner and would be sited on previously disturbed terrain as much as possible, including many dirt trails which have been established by ranching and hunting interests over the past 50 years. In the vicinity of Amado and south of Arivaca Road, the ROW access would shift to the Arivaca Road mobilization site and utilize the same trail access as much as possible.

Radial access trails or paths to structures would cross open desert scrub and avoid trees and shrubs where feasible.

Within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, approximately 320 mi (515 km) of U.S. Department of Agriculture Forest Service (USFS) classified roads exist, both paved and unpaved (USFS 2001b). Classified roads are those under the jurisdiction of USFS that are determined to be necessary for the protection, administration, and use of the national forests and are intended for long-term use. Classified roads are inventoried, maintained, and managed by USFS. In addition to USFS classified roads there are unclassified roads, known as wildcat roads, which are roads on national forest lands that are not needed and not managed as part of the USFS transportation system. Unclassified roads include unplanned roads, abandoned travelways, off-road vehicle tracks which have not been designated and managed as a trail, and those roads no longer under permit or authorization. Wildcat roads have resulted from the increasing numbers of users on national forest lands. Because most wildcat roads have not been subjected to the USFS planning process, and therefore may not meet technical or environmental protection standards, they may pose a threat to both the environment (for example, increased sedimentation in riparian corridors) and to user safety (URS 2003a).

There are approximately 31 vehicular access points to the EMA. Ruby Road, a USFS classified road, is one of the primary access points. The current configuration of the road system serves as a “limiter” to the EMA in accordance with the Forest Plan (USFS 1986). The Forest Plan gives direction to “Limit density of existing and new road construction to one mile of road or less per square mile” (0.62 km of road per km^2); USFS has indicated that current road density is estimated to be near this level (USFS 2001b). Within the vicinity of the Western Corridor, approximately 54 percent of the existing roads are wildcat roads, with the remaining 46 percent being USFS classified roads (URS 2003a).

Figure 3.12–1 shows existing roads within the Tumacacori EMA, some of which would provide access to the Western Corridor. This inventory of existing roads is based on the Roads Analysis (RA) for the proposed project for which data were obtained from USFS, agency and public input; interpreted from recent aerial imagery; and documented during extensive field reviews (URS 2003a). Below is a description of the USFS Road Maintenance Levels for the existing roads shown in Figure 3.12–1.

USFS Road Maintenance Levels

- Level 1 Roads: Closed for more than one year to motorized use, but may be open for non-motorized use. Roads are physically closed (for example, with gates) and have basic maintenance such as drainage facilities, but dirt surfaces.

- Level 2 Roads: Open for use by high-clearance vehicles, with normally minor traffic including dispersed recreation uses, with dirt surfaces.

- Level 3 Roads: Open and maintained for low-speed, single lane driving in standard passenger cars, with either native (dirt) or processed material (for example, gravel) surfaces.

- Level 4 Roads: Open for moderate travel speeds in standard passenger cars, typically with smooth aggregate surfaces and double lanes.

- Level 5 Roads: Roads maintained to the highest standards. Provide a high level of user comfort, and are typically double lane paved facilities.

Figure 3.12–1 shows there is an existing network of Level 2 and wildcat roads on the west side of the Tumacacori Mountains. The yellow markers on the map indicate locations where minor repairs, such as repairing erosion damage, breaking rocks, removing brush, or reducing a hump, would be necessary for project construction. Where the Western Corridor runs along Ruby Road, this graded gravel Level 3 road would provide primary construction access. East of Peña Blanca Lake, Ruby Road becomes a Level 4 paved asphalt two-lane road heading northeast for 9.5 mi (15 km) to I-19. As Ruby Road bears to the northeast away from the proposed ROW, the access would be indirect using existing wildcat roads that follow the canyons which intersect the proposed ROW.

The Western Corridor joins the Central and Crossover Corridors, and the EPNG pipeline ROW, where the access again would follow the pipeline access dirt road. At the point the corridors separate from the EPNG pipeline ROW (approximately 0.75 mi [1.2 km] west of the proposed Gateway Substation), project access would be primarily on existing dirt trails in the area. Public roads within Nogales would be utilized to access the structures from the Gateway Substation to the U.S.-Mexico border.

3.12.2 Central Corridor

The primary points of access along the Central Corridor would be similar to those for the Western Corridor. The Central Corridor parallels the Western Corridor from the South Substation to the point where the Western Corridor separates from the EPNG pipeline ROW. Continuing to follow or cross the EPNG pipeline ROW, access to the Central Corridor would be on existing pipeline access trails, many of which would require upgrade to meet TEP's construction needs. There are several washes where the access for the proposed ROW may diverge from the pipeline ROW access to reduce the need for grading and mitigate impact to the wash areas.

To the south of Arivaca Road near Amado, the Central Corridor access would be from I-19 and the frontage roads which access the ranch or canyon roads leading to the pipeline ROW. The existing dirt access roads would be used wherever possible.

Within the Tumacacori EMA, as shown in Figure 3.12–1, existing Level 2 roads and wildcat roads would provide access to a majority of the Central Corridor. This would continue as the preferred method of access to the point where the Central Corridor rejoins the Western Corridor west of Nogales. Within the vicinity of the Central Corridor, approximately 65 percent of the existing roads are wildcat roads, with the remaining 35 percent being USFS classified roads (URS 2003a). Access to the three overlapping corridors from the point of overlap to Nogales and the U.S.-Mexico border would be the same as described for the Western Corridor.

3.12.3 Crossover Corridor

The primary points of access along the Crossover Corridor would be similar to those for the Western Corridor. The Crossover Corridor parallels the Western Corridor from the South Substation to the point within the Tumacacori EMA where the Crossover Corridor turns east at Peck Canyon, and access in this common segment would be as described above for the Western Corridor. Within Peck Canyon on the segment unique to the Crossover Corridor, existing access is limited to wildcat roads. This area is within an inventoried roadless area (IRA), as described in Section 3.1, Land Use. Upon joining with the EPNG pipeline ROW and Central Corridor, access to the Crossover Corridor would be on existing pipeline access trails. This would continue as the preferred method of access to the point where the Crossover Corridor rejoins the Western Corridor west of Nogales. Within the vicinity of the Crossover Corridor, approximately 58 percent of the existing roads are wildcat roads, with the remaining 42 percent being USFS classified roads (URS 2003a). Access to the three overlapping corridors from the point of overlap to Nogales and the U.S.-Mexico border would be the same as described for the Western Corridor.

3.13 MINORITY AND LOW-INCOME POPULATIONS

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, 16 February 1994), directs each Federal agency to "make…achieving environmental justice part of its mission" and to identify and address "…disproportionate high and adverse human health or environmental effect of its programs, policies, and activities on minority and low-income populations." The Presidential Memorandum that accompanies EO 12898 emphasized the importance of using existing laws, including the *National Environmental Policy Act* (NEPA), to identify and address environmental justice concerns, "including human health, economic, and social effects, of Federal actions."

The Council on Environmental Quality (CEQ), which oversees the Federal government's compliance with EO 12898 and NEPA, has subsequently developed guidelines to assist Federal agencies in incorporating the goals of EO 12898 into the NEPA process. This guidance, published in 1997, was intended to "…assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed" (CEQ 1997a). Pursuant to EO 12898, this section identifies possible minority or low-income populations that might be subject to disproportionately high and adverse environmental impacts or health effects from the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project.

Methodology

The following discusses the methodology that the U.S. Department of Energy (DOE) used to identify possible minority and low-income populations in the project area.

Minority Populations. Environmental justice guidance defines "minority" as individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ 1997a). The Council identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis.

For this Draft Environmental Impact Statement (EIS), DOE followed the environmental justice methodology used in the Durango Area Drainage Master Plan (ADMP) that was prepared for the Flood Control District of Maricopa County, Arizona, and submitted to the Federal Emergency Management Agency and the U.S. Army Corps of Engineers (Dibble 2000). This methodology is based on CEQ's definition of minority populations, and expands upon the second criterion above by defining a "meaningfully greater" minority population if:

- It has proportions of ethnic minority groups that are at least an additional 10 percent greater than that tabulated for the United States in the 2000 census (i.e., minority percentage plus an additional 10 percent). Using this formula, the following are the specific ethnic minority thresholds used for this evaluation: (1) African American – 22.3 percent or greater, (2) American Indian, Eskimo, Aleut – 10.9 percent or greater, (3) Asian, Pacific Islander – 13.7 percent or greater, (4) Persons of Hispanic Origin – 22.5 percent or greater, and (5) Other race – 15.5 percent or greater (Census 2000d).

Since the Durango ADMP project was located in one of the most disadvantaged sections of Phoenix, Arizona, and the Durango ADMP was accepted by several Federal agencies, DOE determined that the Durango ADMP environmental justice methodology would be suitable for this EIS.

Applying the previously discussed criterion to identify minority populations, the following section details the minority composition of the area in close proximity to the proposed transmission corridors utilizing census block group data (data available from the 2000 Census that divide counties into census block groups for analysis).

Low-Income Populations. Environmental justice guidance defines "low-income" using statistical poverty thresholds from the Bureau of Census Current Population Reports, Series P-60 on Income and Poverty, by household (Census 2001). In identifying low-income populations, a community may be considered either as a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effects.

For this EIS, DOE followed the environmental justice methodology used in the Durango ADMP (Dibble 2000), for the reasons previously discussed. The methodology for identifying low-income populations in the Durango ADMP is based on CEQ's definition of low-income households, and establishes a threshold above which a population is considered to be a low-income population if:

- It has proportions of low-income households that are at least an additional 10 percent greater than that tabulated for the United States in the 2000 Census (i.e., incomes less than or equal to the official 2000 poverty rate of $17,463 for a family of four). Using this formula, the specific low-income threshold used for this evaluation is 23.3 percent (i.e., the national poverty level of 13.3 percent plus an additional 10 percent) (Census 2000d).

Applying the above criterion to identify low-income populations, the following section details the low-income composition of the area in close proximity to the proposed transmission corridors utilizing census block group data (similar to the Durango ADMP) from the 2000 Census.

3.13.1 Western, Central, and Crossover Corridors

Figures 3.13–1 and 3.13–2 present the census block groups in the project area and identify which of these census block groups have meaningfully greater minority and low-income populations, respectively. (Figure 3.13–3 shows the detail of block group boundaries for populated areas.) Tables 3.13–1 and 3.13–2 present the census block group data for Pima County and Santa Cruz Counties, respectively, that DOE used to prepare Figures 3.13–1 and 3.13–2. As shown in these figures, ten census block groups are intersected by the Central Corridor, and eleven census block groups are intersected by the Western and Crossover Corridors. Four of the intersected census block groups are in Santa Cruz County, and the remaining intersected census block groups are in Pima County.

Figure 3.13–1 shows that five of the intersected census block groups for the Central Corridor, and six of the intersected block groups for the Western and Crossover Corridors, exceed the meaningfully greater minority population percentage (of 22.5 percent for Hispanics, or of 10.9 percent of American Indians in the case of the block group on the San Xavier District Tohono O'Odham Reservation). None of the census block groups exceed the meaningfully greater minority population percentages for other minorities listed in the Methodology section.

Figure 3.13–2 shows that the one census block group that is intersected by all three proposed corridors exceeds the low-income population threshold value of 23.3 percent of households.

Table 3.13–1. Pima County Census Block Groups On and Near the Corridors.

Block Group ID	Total Pop	One Race: White	One Race: African American	One Race: American Indian	One Race: Asian	One Race: Pacific Islander	One Race: Other	Two or More Races	Hispanic: Non-Hispanic	Hispanic: Hispanic	Below Poverty Level	Intersect Corridor?: Western	Intersect Corridor?: Crossover	Intersect Corridor?: Central	Percent Minority[a]	Percent Below Poverty Level
9409001	1940	548	0	1294	0	0	16	82	1502	438	479				67%	25%
0043131	4701	3241	64	70	15	0	1108	203	2804	1897	1050				40%	22%
0041091	1588	1386	15	77	8	0	78	24	1342	246	60				15%	4%
0041061	7804	4818	647	285	19	13	1538	484	4045	3759	892				48%	11%
0043163	1247	1091	0	24	5	0	70	57	908	339	260	Y	Y		27%	21%
0043162	366	362	0	0	0	0	4	0	359	7	72	Y	Y	Y	2%	20%
0043142	526	377	0	12	0	0	134	3	293	233	53	Y	Y	Y	44%	10%
0043161	753	612	0	40	0	0	93	8	577	176	55	Y	Y	Y	23%	7%
0043164	1513	1170	0	0	16	0	226	101	702	811	304	Y	Y	Y	54%	20%
0041071	2944	2562	27	64	14	0	206	71	2203	741	304				25%	10%
0041081	2411	2109	12	3	0	0	217	70	1713	698	244				29%	10%
0043141	3073	2805	4	7	27	0	179	51	2433	640	182				21%	6%
0043181	1226	1142	0	0	0	0	24	60	1122	104	72				8%	6%
0043171	839	839	0	0	0	0	0	0	839	0	34				0%	4%
0043071	1144	1113	5	0	4	0	22	0	1084	60	26				5%	2%
0043172	859	859	0	0	0	0	0	0	838	21	18				2%	2%
0043182	2025	2020	0	0	5	0	0	0	1952	73	39				4%	2%
0043183	1024	987	0	14	0	0	0	23	1004	20	47				2%	5%
0041072	145	141	0	0	3	0	0	1	121	24	27				17%	19%
0043072	733	733	0	0	0	0	0	0	721	12	6				2%	1%
0043173	1223	1195	7	0	0	0	13	8	1196	27	52				2%	4%
0043151	2349	2313	0	5	10	0	17	4	2227	122	26	Y	Y	Y	5%	1%
0043152	2666	2656	0	0	0	0	0	10	2646	20	70				1%	3%
0043184	718	714	0	0	0	0	4	0	709	9	0				1%	0%
0043073	772	772	0	0	0	0	0	0	723	49	15				6%	2%
0043074	649	649	0	0	0	0	0	0	642	7	46				1%	7%
0043153	982	953	17	0	0	0	12	0	964	18	50				2%	5%

[a]Percent minority is based on percent Hispanic, as this is the largest minority, except in Block Group 9409001 on the San Xavier District Tohono O'Odham Reservation, where American Indians are the largest minority.
Source: Census 2000d.

Table 3.13–2. Santa Cruz County Census Block Groups On and Near the Corridors.

Block Group ID	Total Pop	One Race						Two or More Races	Hispanic		Below Poverty Level	Intersect Corridor?			Percent Minority[a]	Percent Below Poverty Level
		White	African American	American Indian	Asian	Pacific Islander	Other		Non-Hispanic	Hispanic		Western	Crossover	Central		
9960001	858	792	4	8	3	0	34	17	748	110	42				13%	5%
9960002	854	763	0	13	3	0	67	8	541	313	214				37%	25%
9960003	318	272	0	4	0	0	25	17	245	73	61				23%	19%
9961011	402	339	0	0	13	0	26	24	297	105	65	Y	Y	Y	26%	16%
9961012	598	598	0	0	0	0	0	0	587	11	19	Y	Y	Y	2%	3%
9961013	766	627	0	16	0	8	108	7	335	431	73				56%	10%
9961021	5375	3692	67	15	44	0	1337	220	1441	3934	532				73%	10%
9961022	5900	3862	12	32	163	0	1681	150	914	4986	803	Y	Y	Y	85%	14%
9961023	1278	930	0	0	17	0	320	11	57	1221	448				96%	35%
9961024	322	296	2	0	0	0	22	2	149	173	22				54%	7%
9962001	296	289	0	0	0	0	0	7	26	270	85	Y	Y	Y	91%	29%
9962002	2627	2122	0	10	0	0	484	11	100	2527	1210				96%	46%
9963001	889	687	0	0	2	0	200	0	134	755	120				85%	13%
9963002	2872	2143	11	0	0	0	634	84	103	2769	554				96%	19%
9963003	1546	1212	0	0	0	0	334	0	38	1508	564				98%	36%
9963004	2425	1670	12	8	8	0	705	22	131	2294	1207				95%	50%
9964011	1529	1249	0	0	0	0	149	131	103	1426	392				93%	26%
9964012	2116	1566	5	14	17	0	438	76	69	2047	766				97%	36%
9964021	2274	1793	0	54	39	0	319	69	237	2037	637				90%	28%
9964022	2725	2055	6	58	0	0	529	77	91	2634	1279				97%	47%

[a]Percent minority is based on percent Hispanic, as this is the largest minority.
Source: Census 2000d.

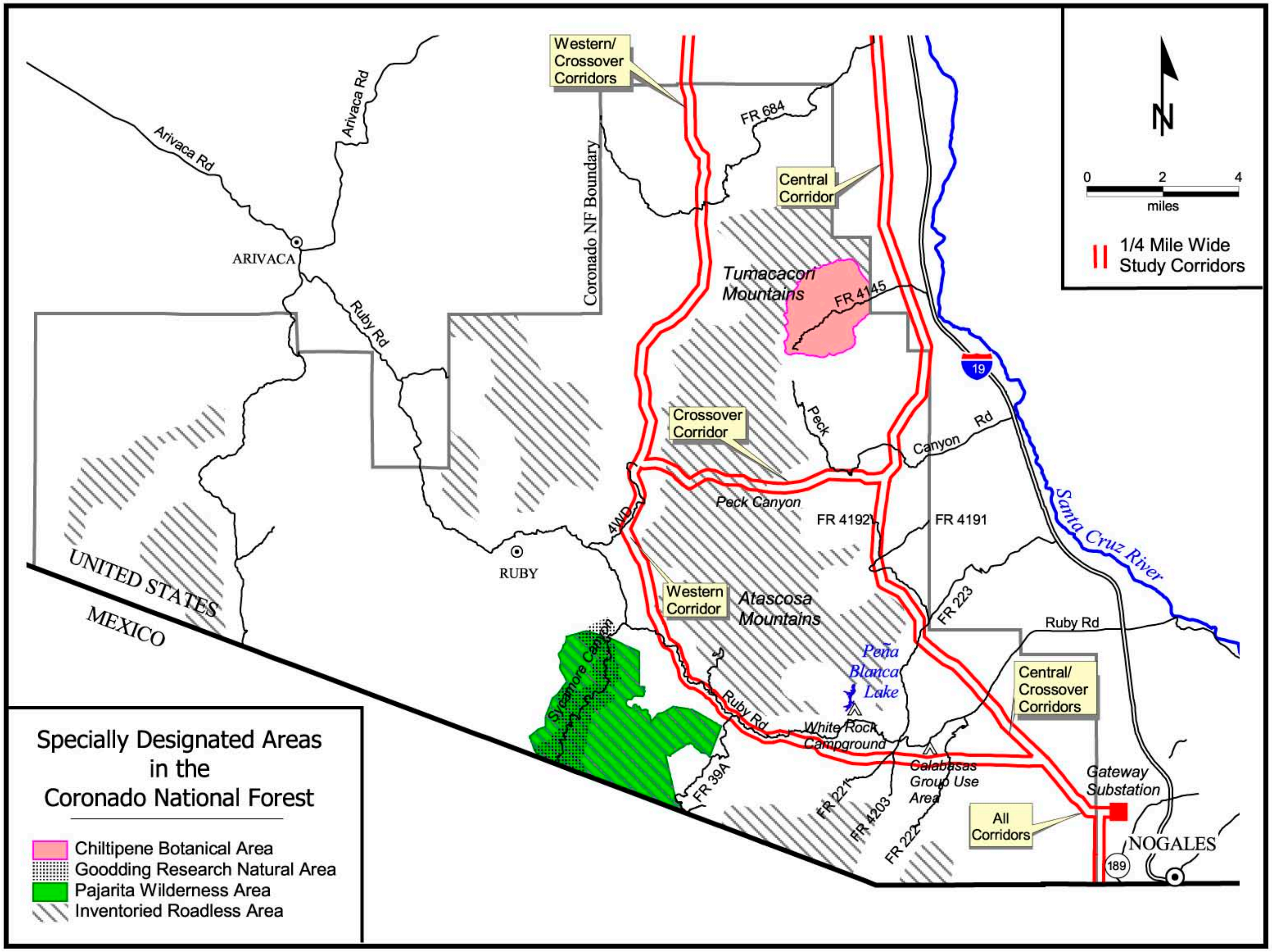


Figure 3.1–1. Specially Designated Areas on the Coronado National Forest.

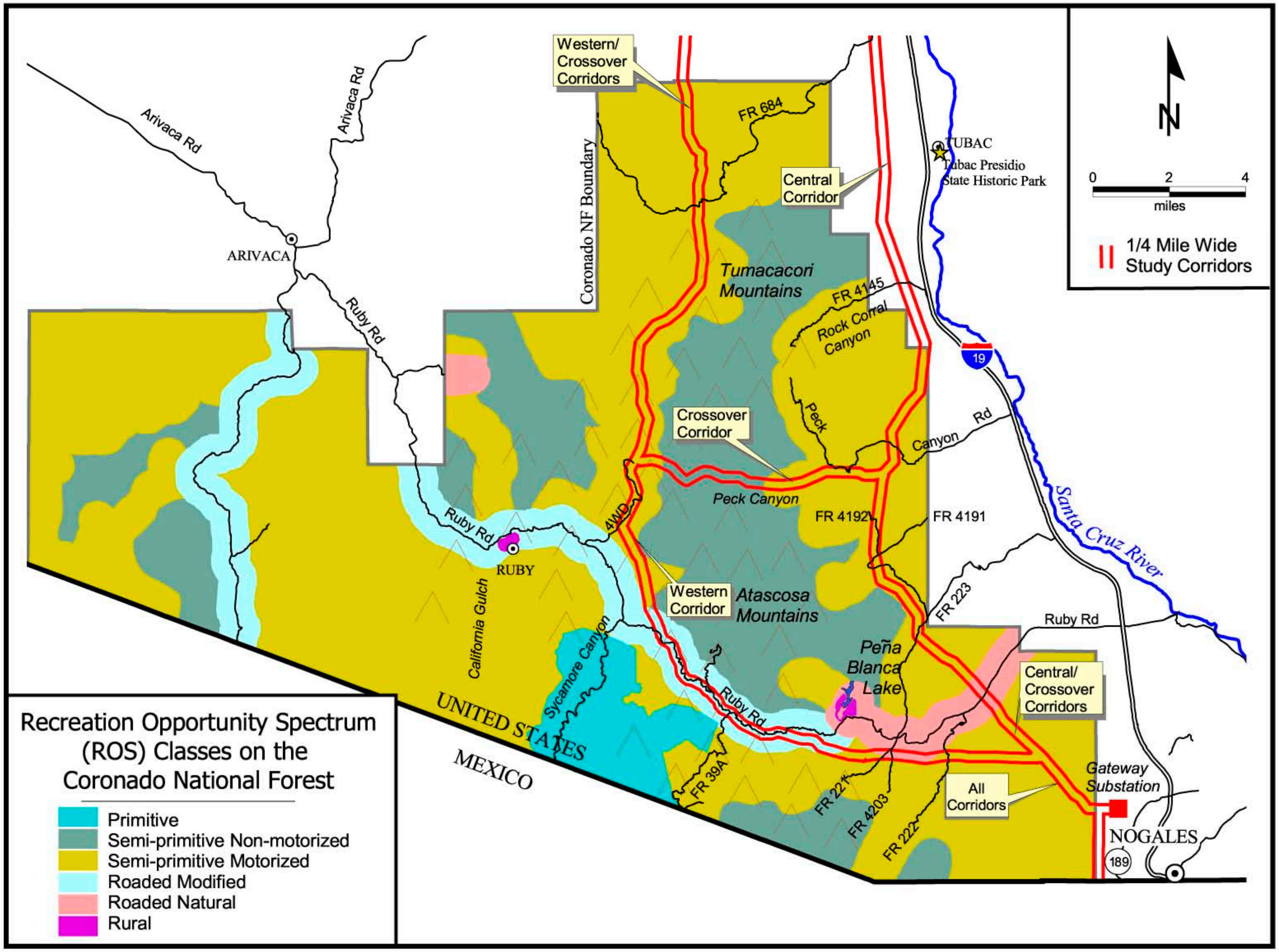


Figure 3.1–2. Recreation Opportunity Spectrum Classes on the Coronado National Forest.

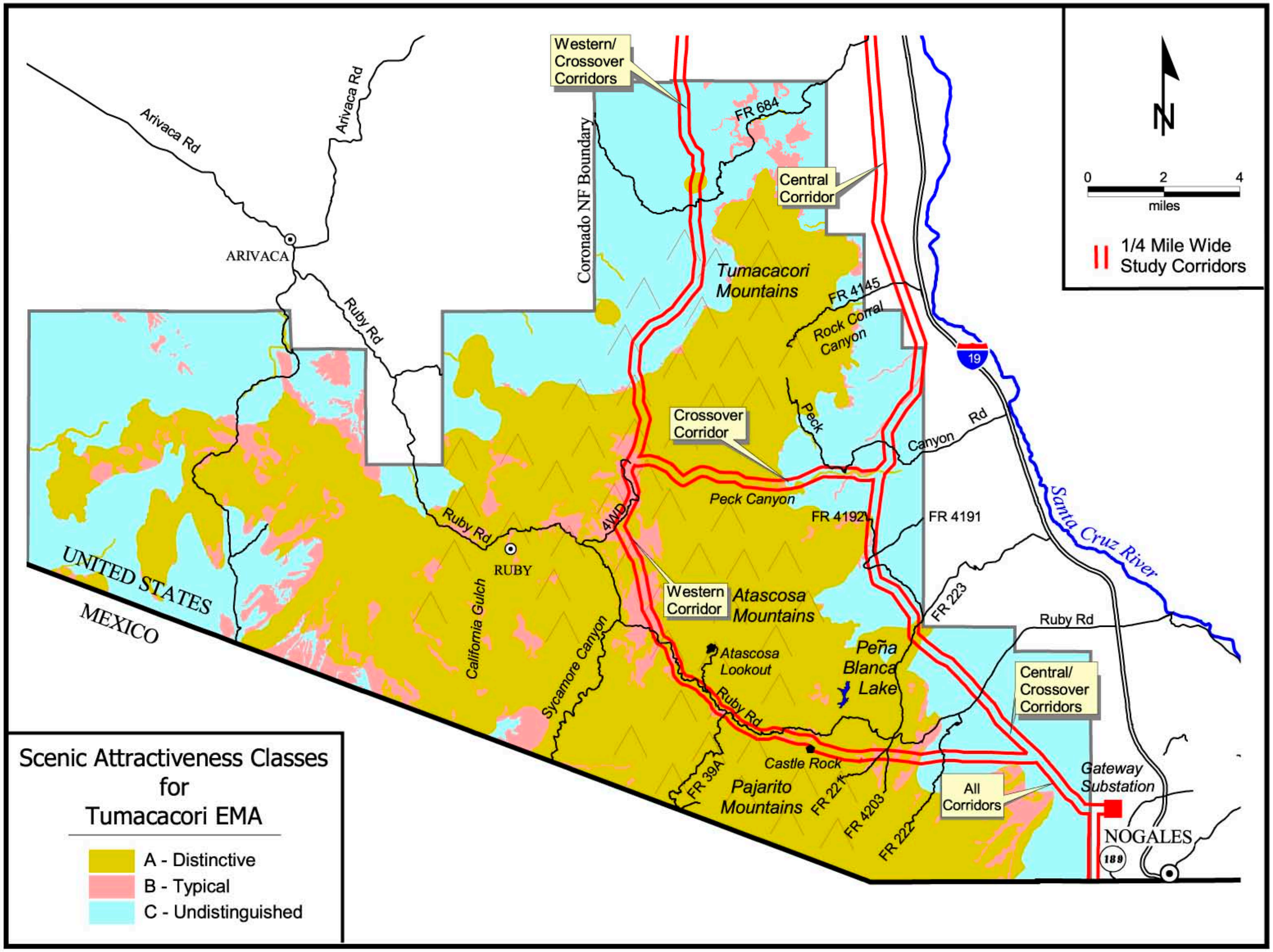


Figure 3.2–2. Scenic Attractiveness Classes for Tumacacori EMA.

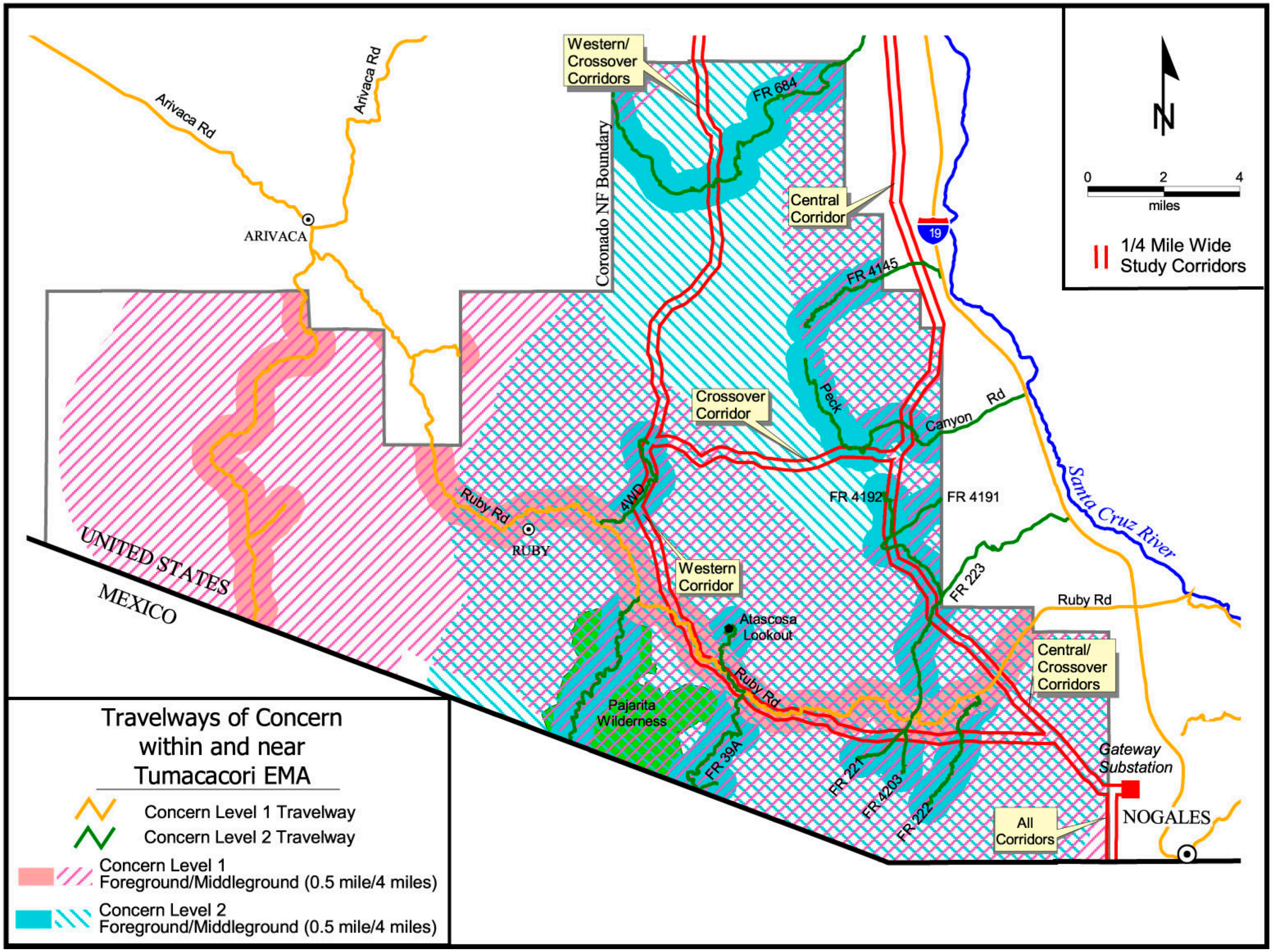


Figure 3.2–3. Travelways of Concern Within and Near Tumacacori EMA.

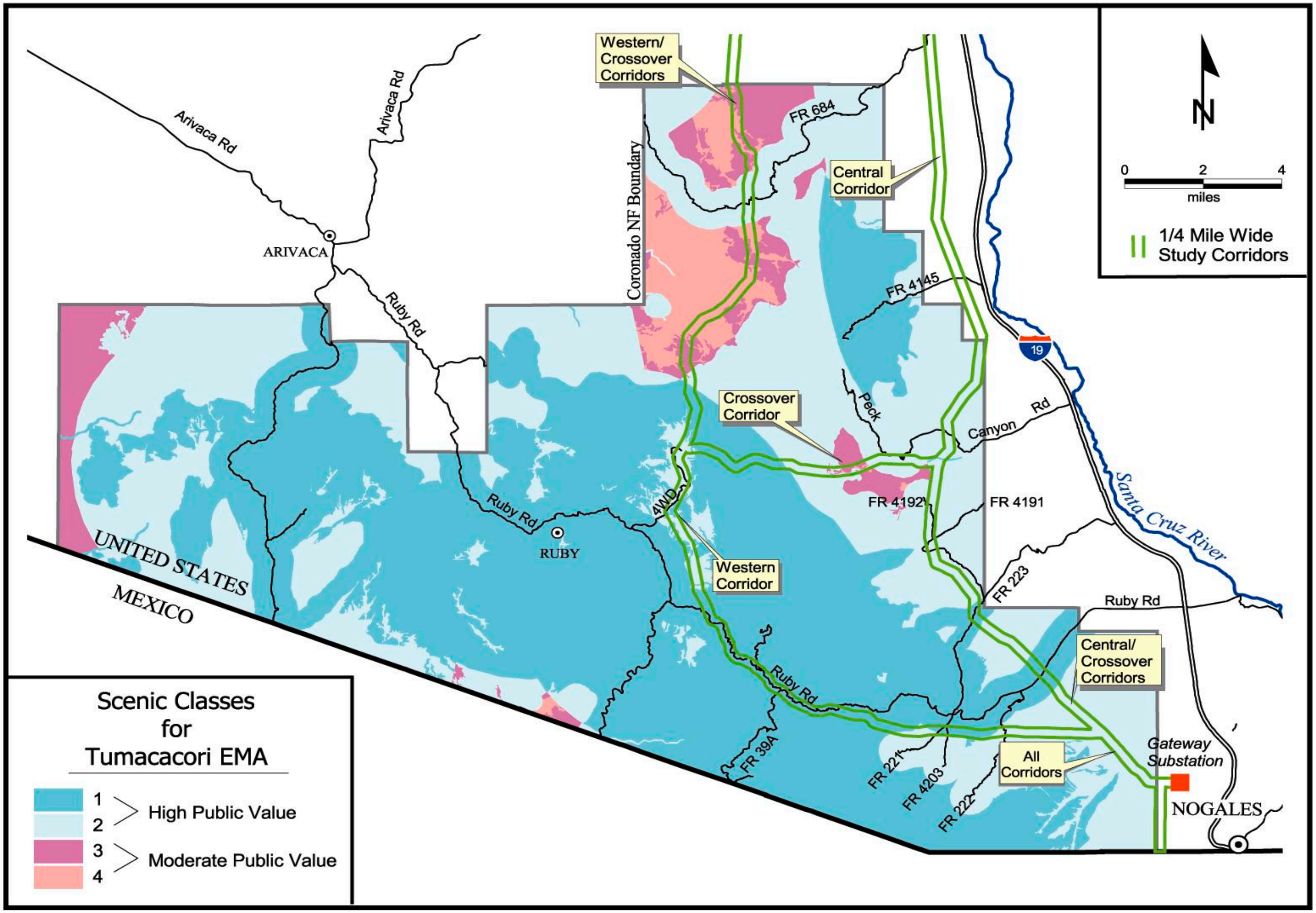


Figure 3.2–4. Scenic Classes for Tumacacori EMA.

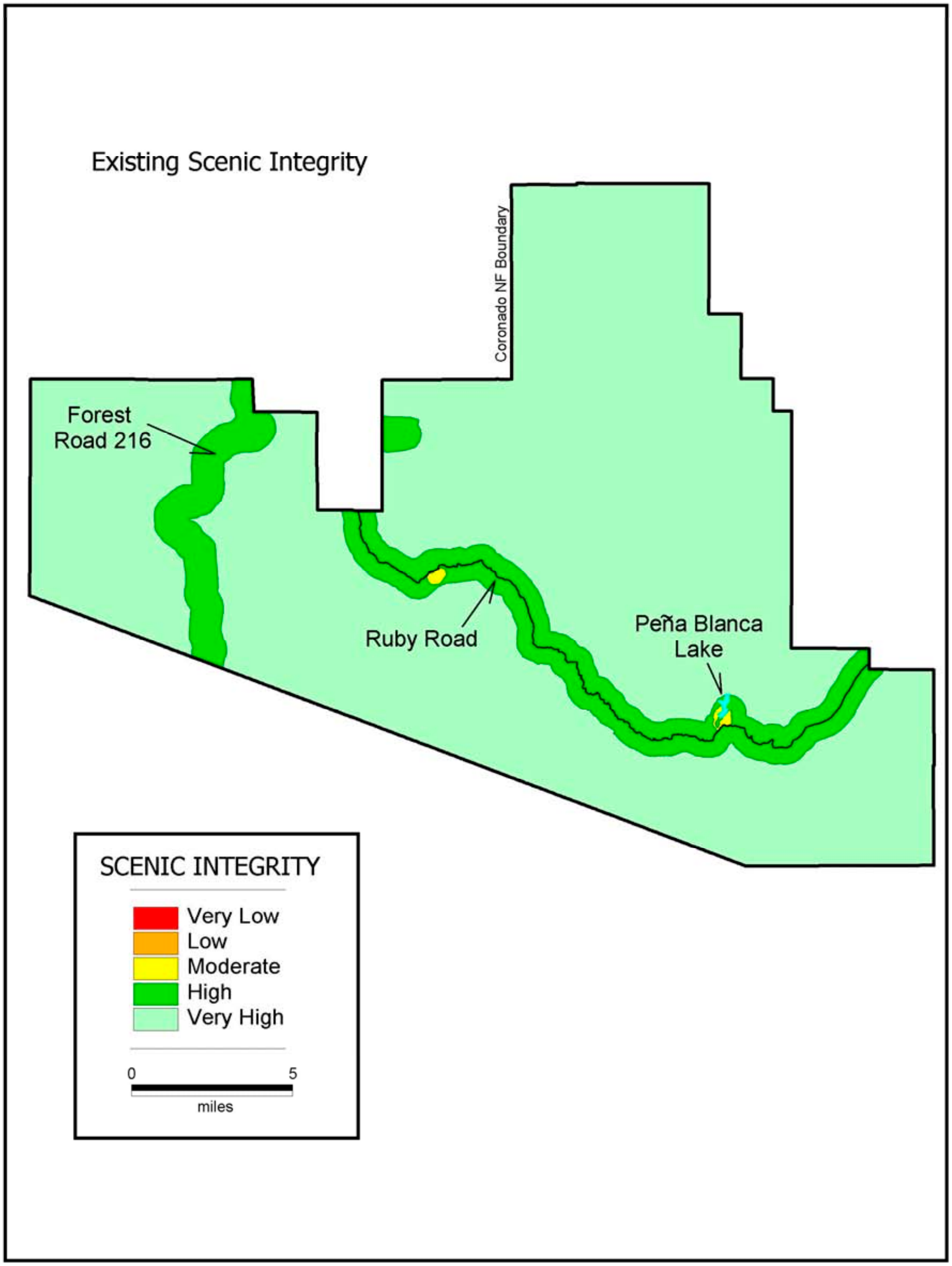


Figure 3.2–5. Coronado National Forest Existing Scenic Integrity.

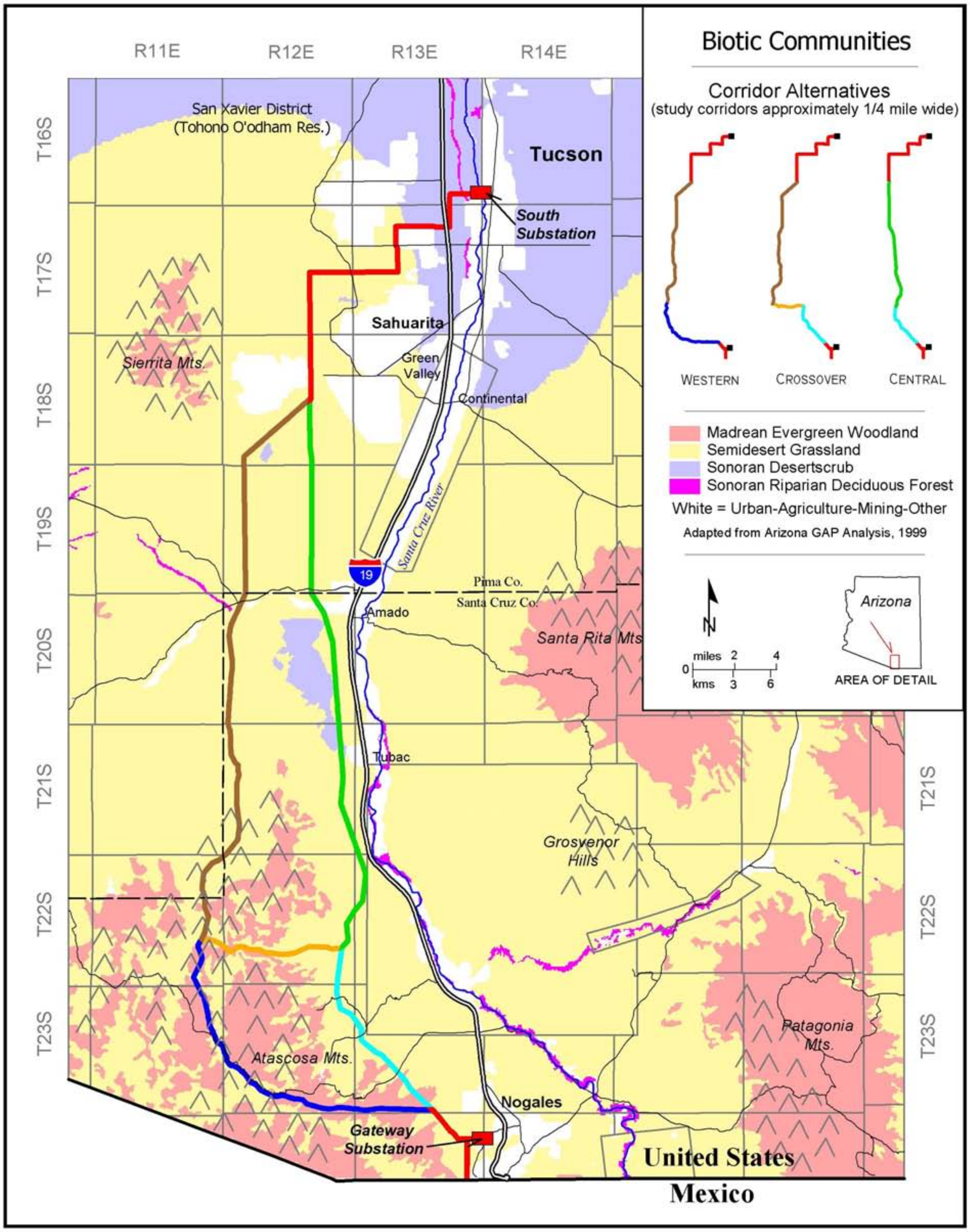
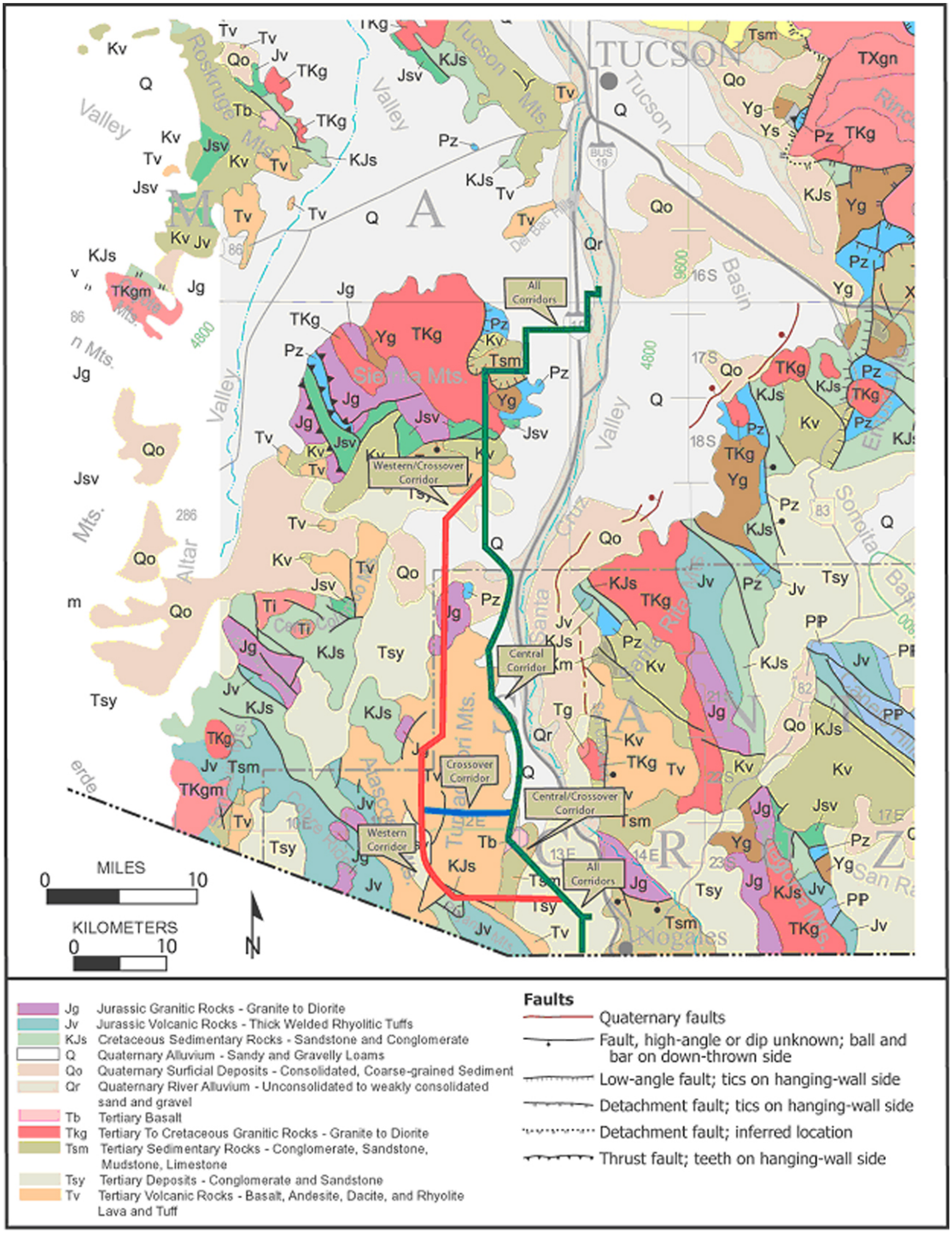


Figure 3.3–1. Biotic Communities in the Proposed Project Area.



Source: Richard 2000

Figure 3.6–1. Geology of the Proposed Project Area.

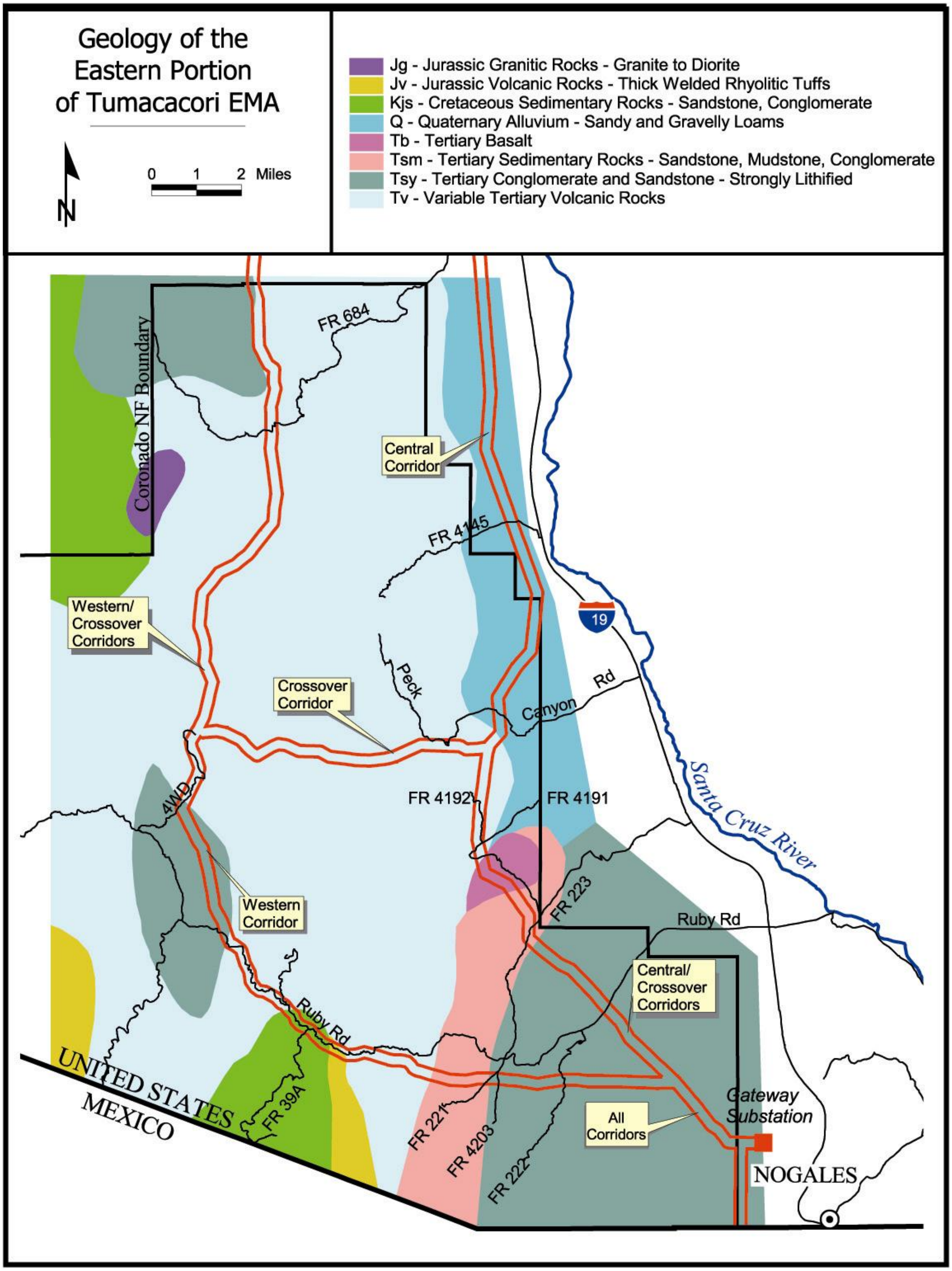


Figure 3.6–2. Geology of the Proposed Project Area on the Coronado National Forest.

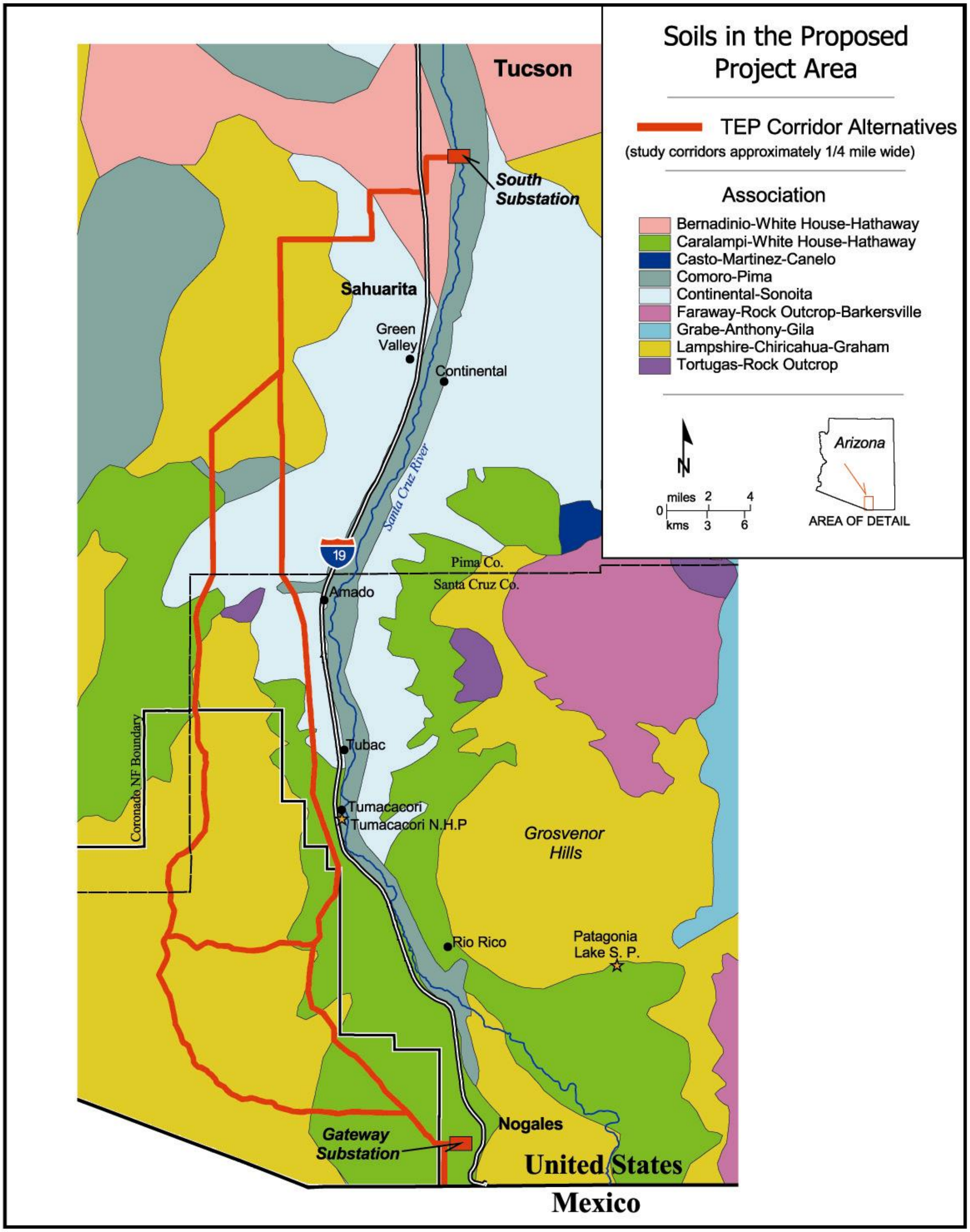


Figure 3.6–5. Soil Associations in the Proposed Project Area.

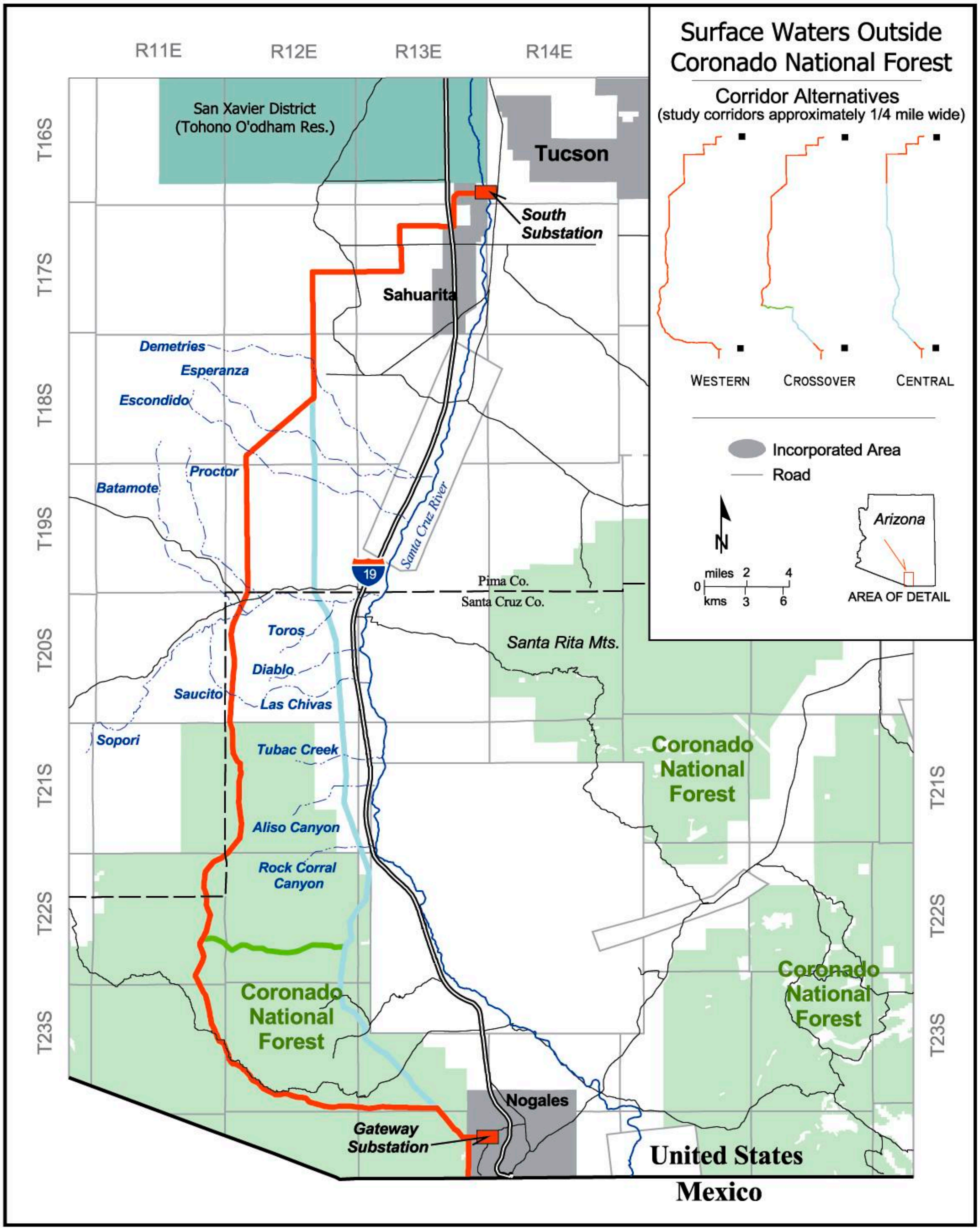


Figure 3.7–1. Surface Waters Outside the Coronado National Forest.

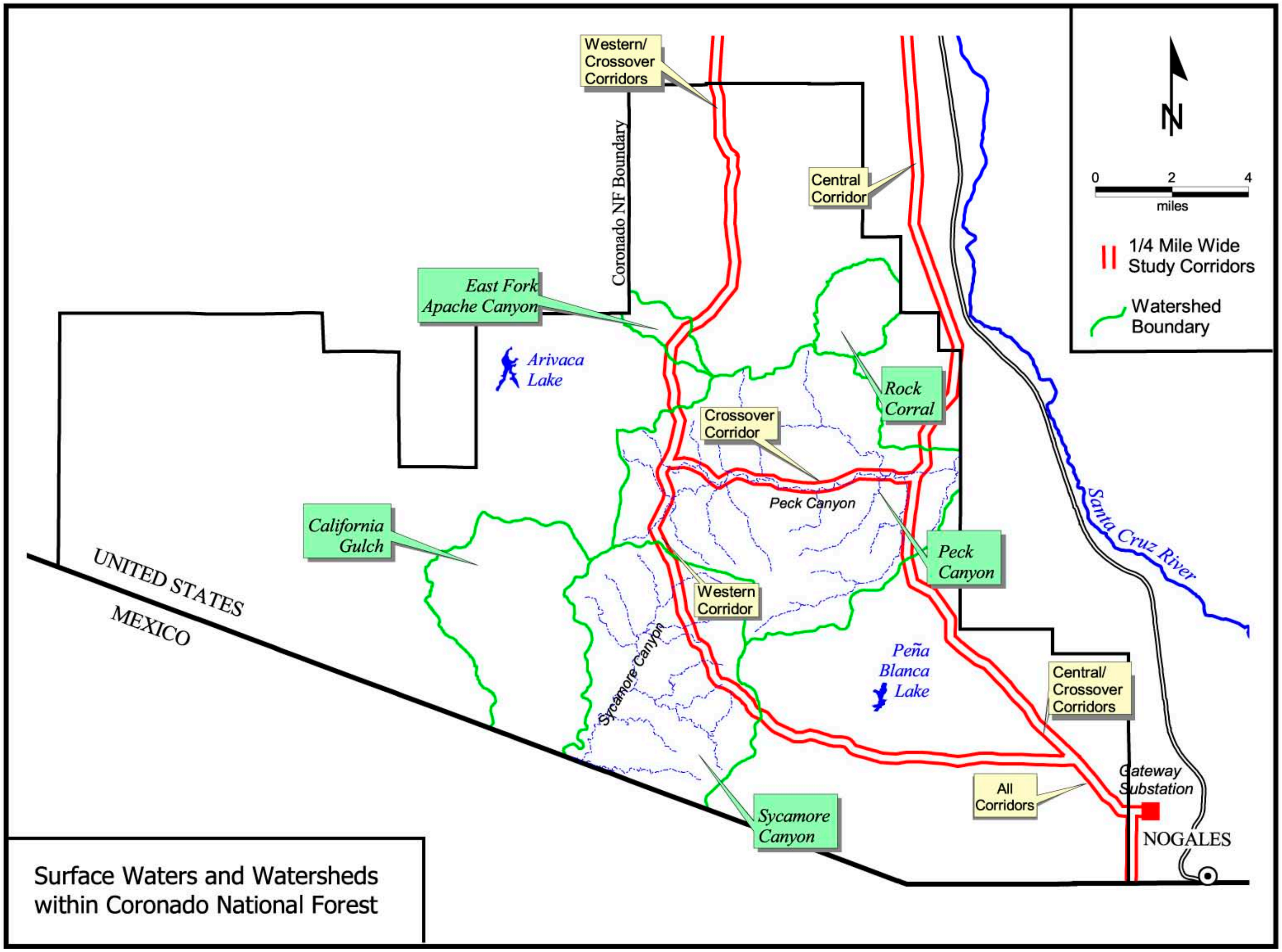


Figure 3.7–2. Surface Waters and Watersheds Within the Coronado National Forest.

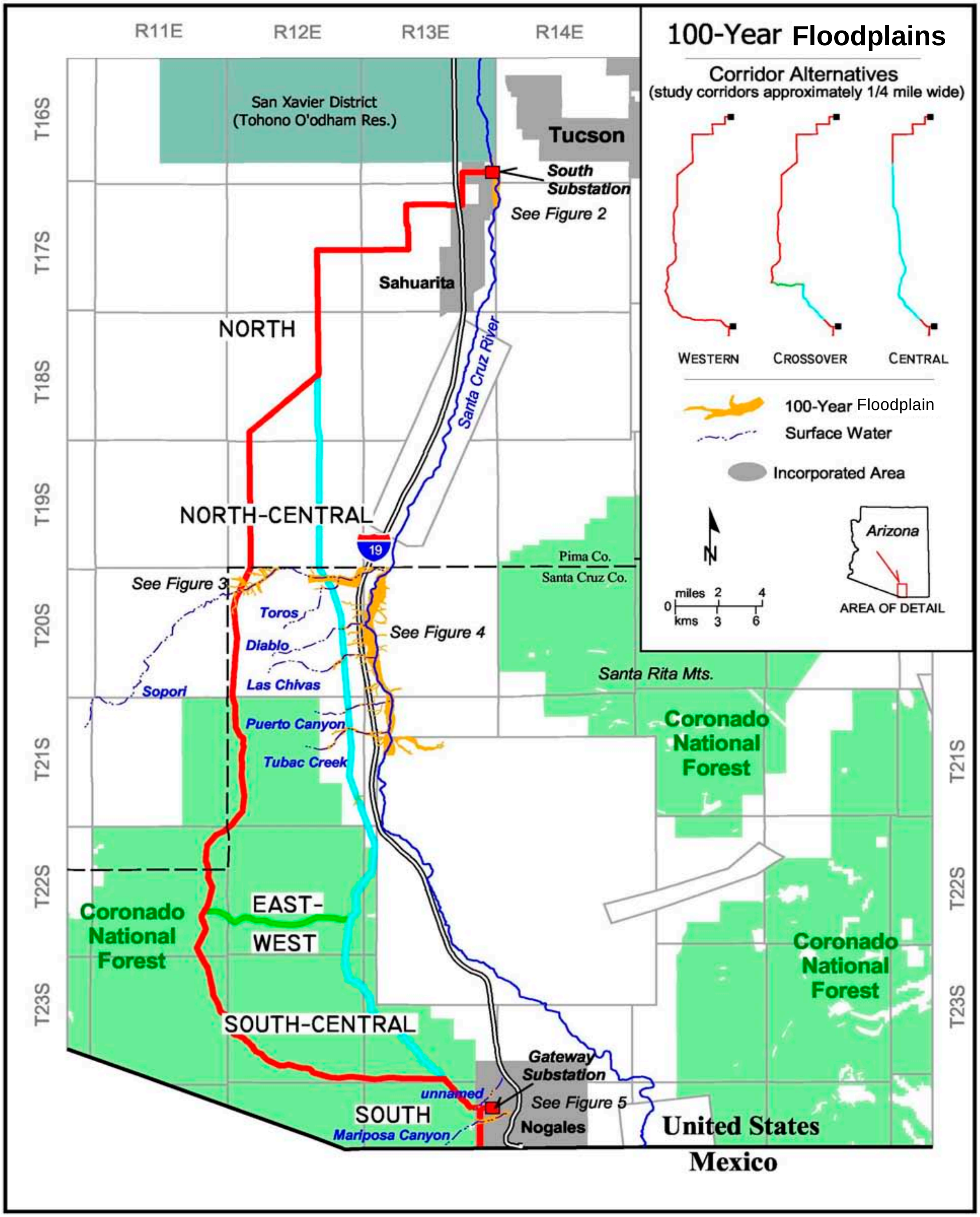


Figure 3.7–3. 100-year Floodplain and Associated Surface Waters Crossed by the Corridor Alternatives.

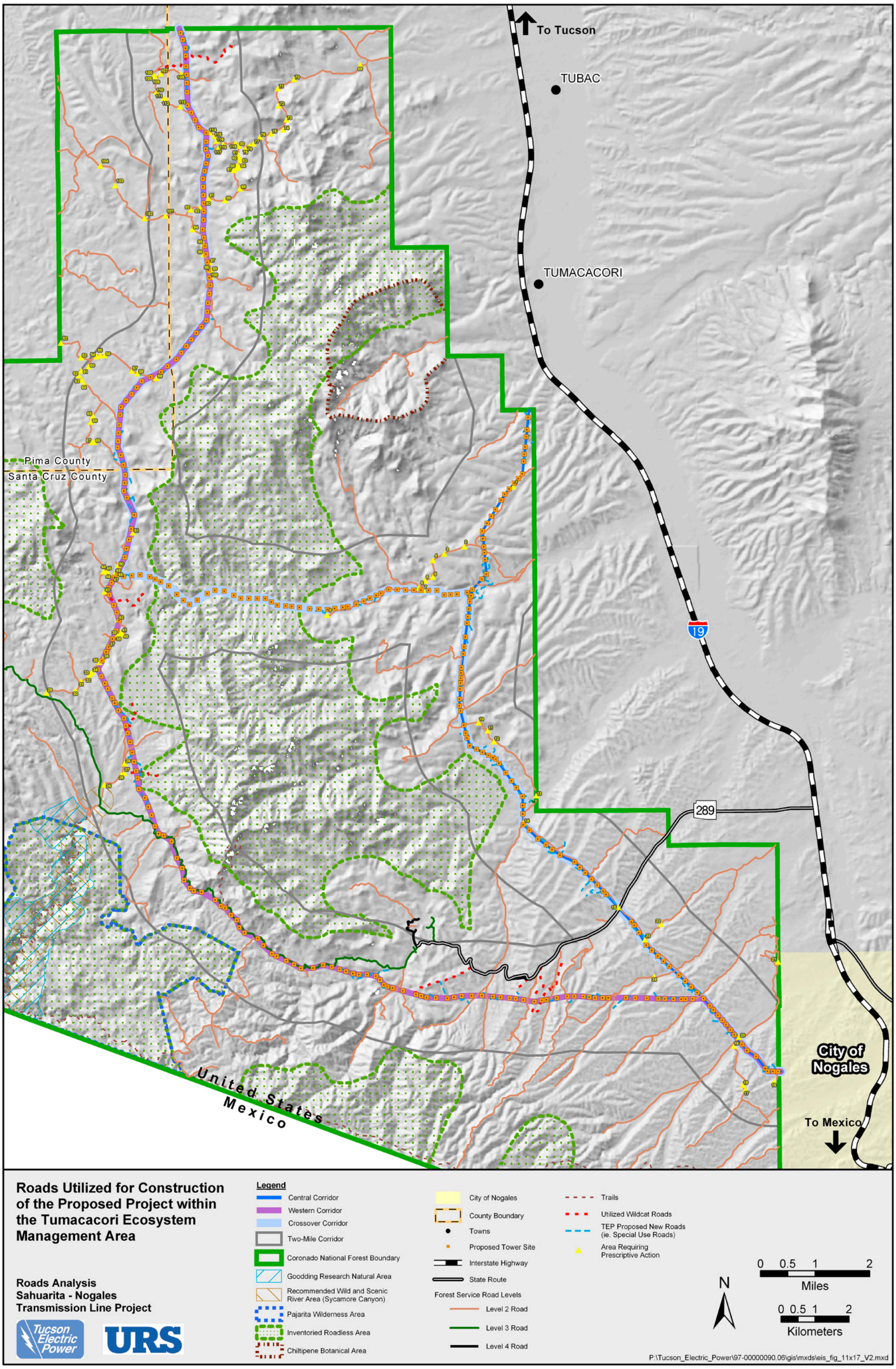
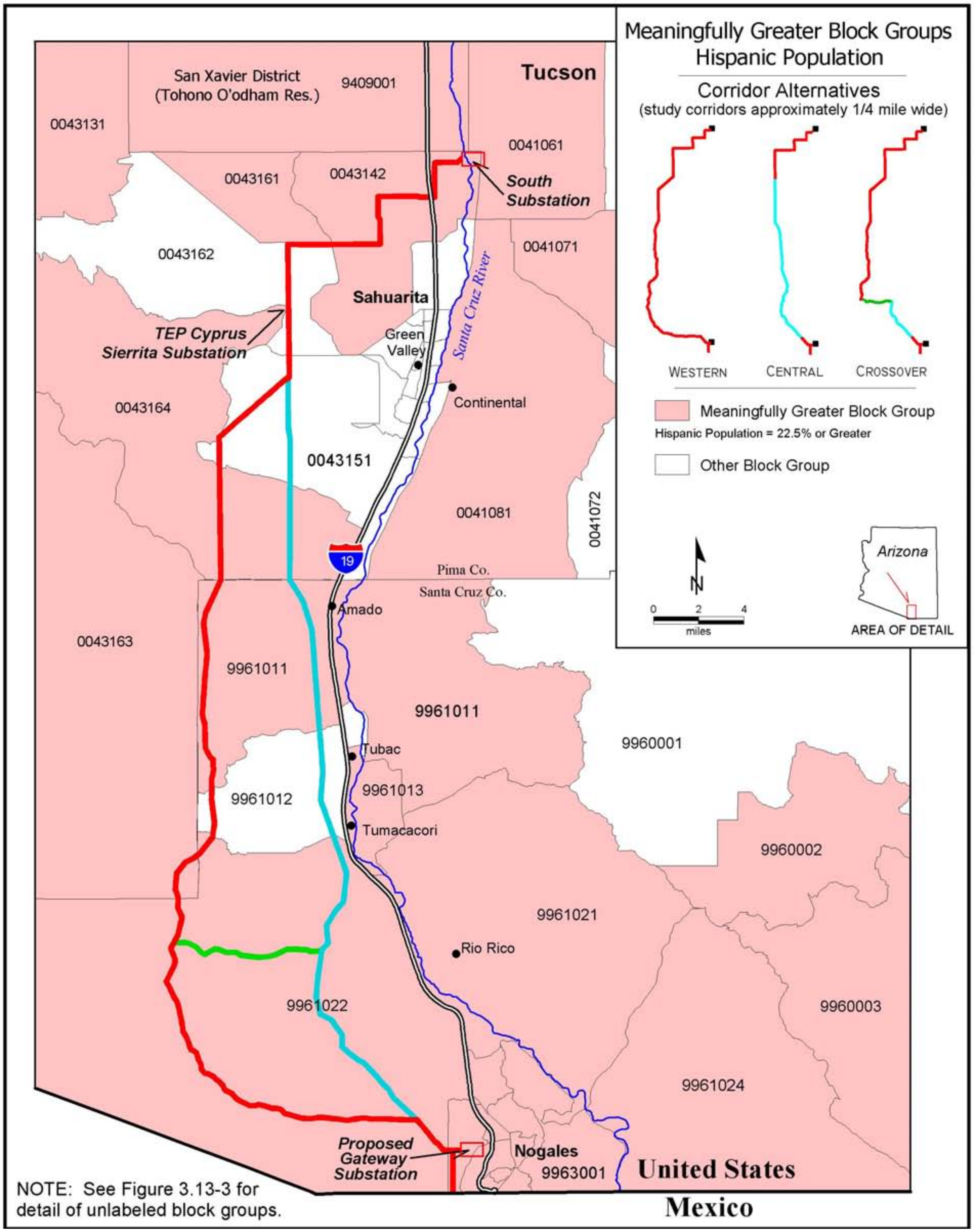
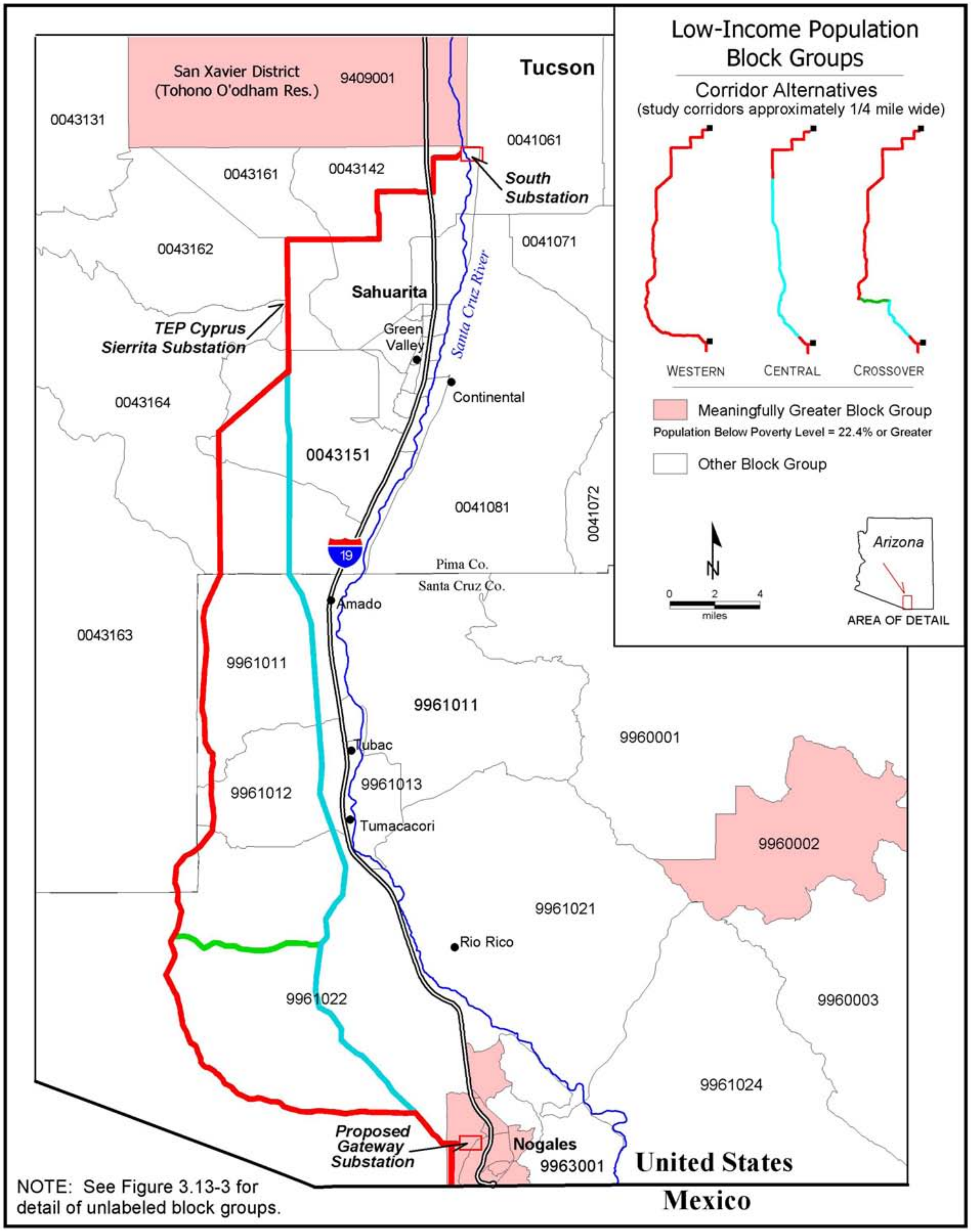


Figure 3.12–1. Roads Within the Tumacacori EMA.



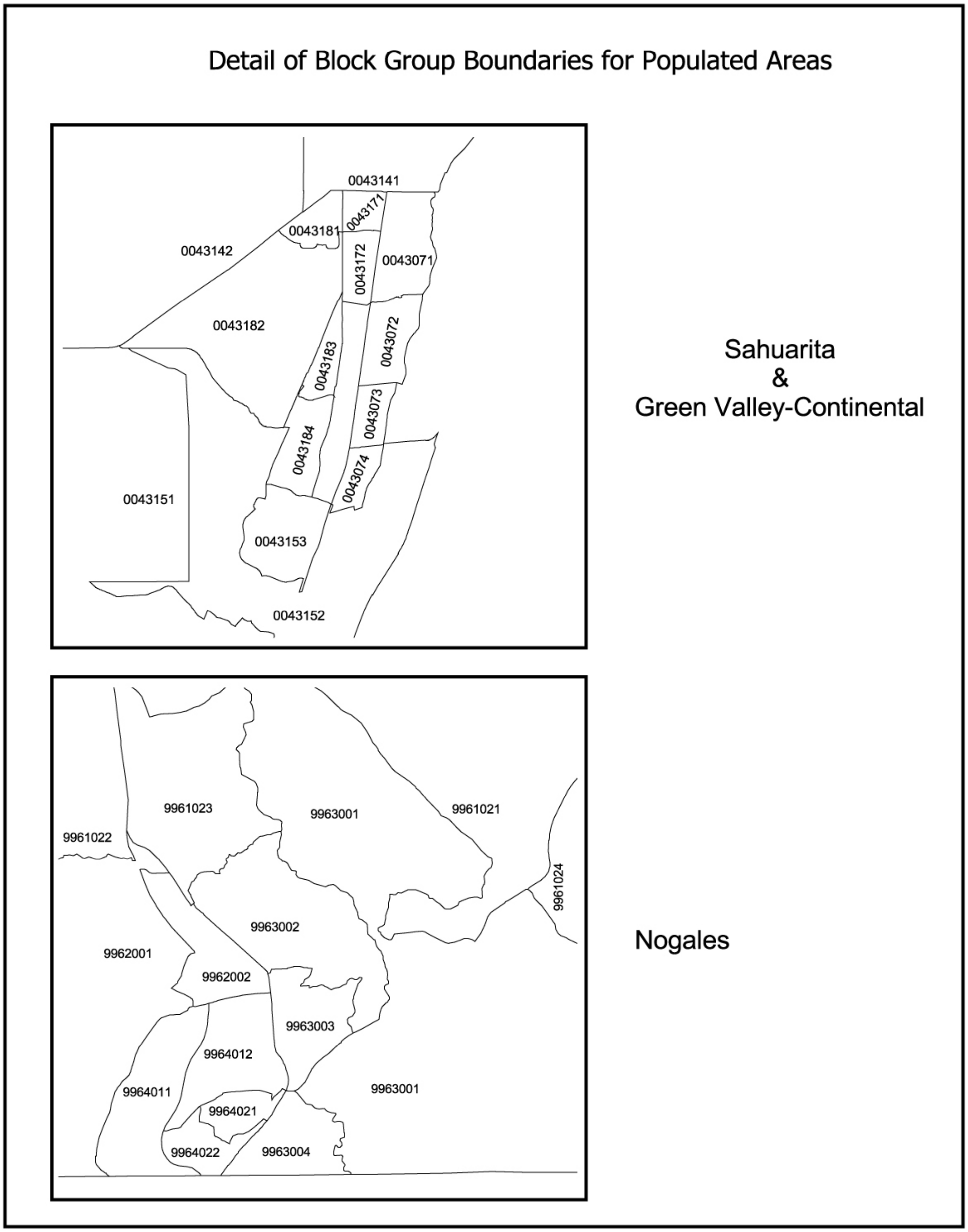
Source: Census 2000d.

Figure 3.13–1. Meaningfully Greater Minority Populations.



Source: Census 2000d.

Figure 3.13–2. Low-Income Populations.



Source: Census 2000d.

Figure 3.13–3. Detail of Block Group Boundaries for Populated Areas.

This chapter describes the potential environmental effects, or impacts, of Tucson Electric Power Company (TEP) constructing the proposed project in one of its three proposed transmission corridors, and also describes the No Action Alternative. The Council on Environmental Quality's (CEQ's) regulations require that an Environmental Impact Statement (EIS) contain a description of the environmental effects (both positive and negative) of the proposed alternatives. CEQ's regulations (40 CFR 1508.8) distinguish between direct and indirect effects. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are reasonably foreseeable effects caused by the action that occur later in time or farther in distance. Both direct and indirect effects are addressed in this chapter.

CEQ's regulations also require that an EIS contain a description of the cumulative impacts (40 CFR 1508.7) of the proposed alternatives. CEQ's regulations define cumulative impacts as those that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts are addressed in Chapter 5 of this Draft EIS.

This chapter presents information on the potential environmental effects on land use and recreation, visual resources, biological resources, cultural resources, socioeconomics, geology and soils, water resources, air quality, noise, human health and environment, infrastructure, transportation, and minority and low-income populations.

4.1 LAND USE AND RECREATION

This section discusses the potential effects of the proposed project on land use and recreation in the project vicinity. The methodology for determining impacts is presented, along with a description of the impacts for each alternative.

4.1.1 Land Use

Methodology

The land use resource impact analysis consists of an evaluation of the effects caused by the construction and operation of the proposed alternatives on specific land use resources and recreational resources within the vicinity of the project. Impacts to land use are determined relative to the context of the affected environment for each alternative described in Section 3.1.

To determine if an action may cause a significant impact, both the land area displaced by the transmission line right-of-way (ROW) and the compatibility of transmission line ROW with land use plans are considered. Land use impacts associated with construction of new access roads and improvement to existing roads are described in Section 4.12, Transportation. The context for the project is the area along each corridor from Sahuarita to Nogales, continuing south to the international border. Special consideration is given to any unique characteristics of the area (for example, recreational opportunities or resource conservation zones), and the degree to which the project may adversely affect such unique resources. The land use evaluation includes both temporary land use impacts during construction and permanent changes to land use resources.

Impacts Common to the Western, Central and Crossover Corridors

The following discussion of potential land use impacts applies to all three proposed corridors. Information specific to the Western, Central, and Crossover Corridors is described separately following the general discussion.

The existing TEP South Substation in Sahuarita, located as shown in Figure 1.1–4, would be upgraded and expanded approximately 100 ft (30 m) beyond the existing fenceline, impacting an area of an estimated 1.3 acres (0.53 ha). A new Gateway Substation, with a total graded area of approximately 18 acres (7.3 ha) would be constructed west of Nogales, Arizona, located as shown in Figure 1.1–4. For the Gateway and South Substations, the equipment area would be fenced with a locked gate, and the area outside the fence would be revegetated with native plants following construction. The existing gravel parking area at the South Substation, and a new gravel parking area at the Gateway Substation, would serve as the construction staging areas (TEP 2001). In addition, one estimated 0.5-acre (0.2-ha) fiber-optic regeneration site would be required, which would be placed on private land in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita, for any proposed corridor. A temporary construction laydown yard of approximately 80 acres (32 ha) would be sited near the Arivaca Road and Interstate 19 (I-19) interchange on previously disturbed land, and three temporary 3-acre (1.2-ha) staging areas would also be required, as described in Section 2.2.3, Transmission Line Construction. Temporary line tensioning and pulling sites ranging from 0.5 to 1.5 acres (0.2 to 0.6 ha) would also be required along the corridor, as described in Sections 2.1.1 through 2.1.3 for each corridor.

The proposed project would utilize primarily self-weathering steel tubular monopoles, depicted in Figure 1.1–1. Dulled, galvanized steel lattice tower structures, depicted in Figure 1.1–2, would be used in specified locations for engineering reasons of to minimize overall environmental impacts (for example, to soils or potential archeological sites), in accordance with Arizona Corporation Commission (ACC) Decision No. 64356 (ACC 2002) (as explained in Section 2.2.3). Monopoles occupy less acreage at the foundation than lattice towers. However, the typical span between lattice tower structures is 1,000 to 1,200 ft (305 to 355 m), compared to 800 to 900 ft (244 to 275 m) between monopoles, thus requiring fewer lattice tower structures to support a given distance of transmission line route. For the proposed project, the distance between transmission line structures would be between 600 and 1,200 ft (183 and 366 m), with spans generally shorter at the substations and interconnection points. Three slight variations of the monopole (the tangent structure, the turning structure, and the dead-end structure) that are visually very similar to the monopole in Figure 1.1–1 would be used at various points along the route based on the turning angle of the transmission line and the elevation change between towers. Likewise, a slight variation of the lattice tower structure (the turning structure) that is visually similar to Figure 1.1–2 would be used at various points along the corridor.

The final footprint of each monopole is 25 ft^2 (2.3 m^2); the final footprint of each lattice tower is approximately 3,600 ft^2 (334 m^2). The tower construction site required for each monopole is an approximately 100 ft (30 m)-radius circle, and for each lattice structure is a 200 by 400 ft (61 by 122 m) area, more than double the construction area required for monopoles. Assuming that primarily monopoles are used, the approximate number of structures and land displaced by structures and structure construction sites has been estimated for each proposed corridor. These estimates, listed in Table 4.1–1, are broken down to distinguish land use impacts on the Coronado National Forest and Federal lands managed by the Bureau of Land Management (BLM) separately, and are described in the text for each corridor. The area to be disturbed by access roads, transmission line tensioning and pulling sites, fiber-optic splicing sites, and laydown yards is addressed separately in Section 4.12, Transportation, and is not reflected in the structure site disturbance estimates in Table 4.1–1.

Table 4.1–1. Approximate Structure Land Use.[a]

	Number of Structures	Structure Construction Site Area (acres)	Final Structure Footprint Area (acres)
For Entire Corridor			
Western Corridor	429	309	0.25
Central Corridor	373	269	0.21
Crossover Corridor	431	311	0.25
On the Coronado National Forest			
Western Corridor	191	138	0.11
Central Corridor	102	74	0.06
Crossover Corridor	196	141	0.11
On BLM Land			
Western, Central, and Crossover Corridors	8	5	0.004

[a] Land use area does not include structure access roads. See Section 4.12, Transportation.

Northern Portion. Several areas along the common northern area of all three corridors have unique designations in local land use plans. The Pima County Comprehensive Plan (Pima 2003) indicates a Resource Productive Zone intermixed with Low Intensity Rural in the area west of I-19 near Sahuarita. Resource Productive Zones designate cultivated ranching and mining lands for their productive capabilities. Approximately 6 mi (10 km) north of Arivaca Road, the corridors cross a Resource Conservation Zone designed to protect open land space for environmental quality, public safety, recreation, and cultural heritage. Given the limited area of land to be used by the proposed project, the proposed project would not be expected to interfere with these unique land uses.

The proposed corridors do not cross any Indian reservations or lands reserved under treaty rights by Native American nations, tribes, or communities. The San Xavier District of the Tohono O'Odham Nation is located approximately 1 mi (1.6 km) north of the proposed corridors as they exit the South Substation.

The BLM lands crossed by the proposed project are designated as disposal land under the current Resource Management Plan. The land crossed by the proposed project would need to be redesignated to a utility corridor as described in Section 1.2.2, Federal Agencies' Purpose and Need and Authorizing Actions. TEP applied to BLM for ROW rights on an estimated 19 acres (7.7 ha) of land. This ROW would run immediately adjacent and parallel to existing transmission lines as described in Section 3.11, Infrastructure.

Coronado National Forest. TEP has not finalized the precise placement of the 125-ft (38-m) ROW within the 0.25 mi (0.40 km)-wide study corridors. These sitings would involve input from cultural, biological, and visual specialists, after each agency has issued a Record of Decision (ROD), to identify and minimize impacts to each area of land to be disturbed. However, TEP has stipulated that the structure locations, construction areas, and proposed access roads for the Western and Central Corridors would not enter into inventoried roadless areas (IRAs). In addition, TEP has stipulated that the structure locations, construction areas, and proposed access roads for all three corridors would not enter the following specially designated areas within the Tumacacori Ecosystem Management Area (EMA) (as shown in Figure 3.1–1): Pajarita Wilderness, Chiltipene Botanical Area, and Peña Blanca Lake Recreation Area.

A large portion of the Tumacacori EMA (approximately 164,000 acres [66,400 ha]) is classified by the U.S. Department of Agriculture Forest Service (USFS) as able to support livestock grazing, some of which is currently under permit for livestock grazing. A majority of this capable rangeland is in satisfactory condition, a measure of the health of the vegetation and soil relative to their combined potential to produce a sound and stable biotic community. Both short-term and long-term effects could occur to livestock grazing from the proposed project. In the short-term, the operations of permittees could be disrupted by construction equipment and activities. In the long-term, the forage base on livestock lands would be reduced by up to an estimated 0.11 acres (0.04 ha) occupied by support structure bases, plus land converted to access roads. New traffic and human use patterns could also cause disturbance to grazing operations.

Nogales Border Area. TEP has committed that it would avoid construction of project structures within the 60 ft (18 m)-wide reserved lands along the U.S.-Mexico border. TEP's proposed project design is for the transmission line to cross the U.S.-Mexico border using monopole structures located at least 400 ft (120 m) away from the U.S.-Mexico border (TEP 2003). Thus, TEP would not construct project structures that could limit access to the international boundary monuments and markers. Section 3.1, Land Use, describes U.S. Border Patrol activities in the vicinity of the U.S.-Mexico border near the proposed project. U.S. Department of Energy (DOE) has contacted the U.S. Border Patrol regarding potential impacts to ongoing activities in the vicinity of the U.S.-Mexico border. A copy of DOE's consultation letter is included in Appendix A; no response has been received as of the printing of this Draft EIS.

In the U.S.-Mexico border area, TEP expects that the transmission line would be strung by helicopter. All construction activities would be coordinated with the appropriate agencies on each side of the border. At a minimum, TEP expects the U.S. Border Patrol to be included. TEP anticipates that this effort would be coordinated with the Mexican proponent for the project, and does not anticipate any ground disturbing activities within the reserved strip of land (a total of 120 ft [36.6 m]) along the international border. The preliminary design of the project has the last U.S. pole on top of a hill and the first pole on the Mexico side also on top of a hill to adequately span the border (TEP 2003).

Impacts to specific land uses within the corridor would be mitigated by the precise siting of the ROW. Since the length of the ROW for this project would not be fenced or otherwise separated from adjacent lands, except as required by land owners and managers, and primarily monopoles would be used, the land area affected by the ROW would be minimized. Access roads, as discussed in Section 4.12, Transportation, would need to be constructed, and certain access roads would remain for ongoing access by TEP. The long-term impacts of access roads would be to increase the acreage of the affected lands, and create the potential for biological impacts, such as the distribution of noxious weeds, and other soil, water, recreation, and visual impacts (URS 2003b), as summarized for each resource area within this EIS.

During construction, temporary impacts to land uses within the ROW may occur due to movement of workers and materials through the area. Construction noise and dust, as well as temporary disruption of traffic flow on local roads, may also temporarily affect residents, recreationalists, and farmers in the area immediately adjacent to the ROW. Coordination among TEP, its contractors, and landowners and managers regarding access to the ROW and construction scheduling would minimize any such disruptions.

4.1.1.1 *Western Corridor*

For the Western Corridor, there would be an estimated 429 support structures, with 191 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be approximately 309 acres (125 ha) for the entire Western Corridor, 138 acres (56 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.25 acres (0.1 ha) for the entire Western Corridor, 0.11 acres (0.04 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land.

The section of the Western Corridor that joins the El Paso Natural Gas Company (EPNG) pipeline ROW and exits the Coronado National Forest an estimated 2 mi (3.2 km) to the southeast is within an existing Forest Transportation System and Utilities Corridor. USFS advises that the rest of the Western Corridor on the Coronado National Forest, an estimated 27 mi (43 km), would require a Forest Plan (USFS 1986) amendment in order to implement the alternative. The Western Corridor would not pass through any IRAs.

4.1.1.2 *Central Corridor*

For the Central Corridor, there would be an estimated 373 support structures, with 102 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be an estimated 269 acres (109 ha) for the entire Central Corridor, 74 acres (30 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.21 acres (0.09 ha) for the entire Central Corridor, 0.06 acres (0.02 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land. Table 4.1–1 shows that the Central Corridor displaces less land than the other alternatives for the transmission line structures.

The Central Corridor is not within an existing Forest Transportation System and Utilities Corridor, where the Central Corridor deviates from the EPNG pipeline ROW to avoid an IRA for approximately 2 mi (3.2 km). USFS advises that a Forest Plan amendment would be needed before the implementation of the alternative.

4.1.1.3 *Crossover Corridor*

For the Crossover Corridor, there would be approximately 431 support structures, with 196 of these on the Coronado National Forest, and 8 of these on Federal lands managed by BLM. The total structure construction site area would be an estimated 311 acres (126 ha) for the entire Crossover Corridor, 141 acres (57 ha) on the Coronado National Forest, and 6.5 acres (2.6 ha) on BLM land. The total land area occupied by the final footprint of the structures would be an estimated 0.25 acres (0.1 ha) for the entire Crossover Corridor, 0.11 acres (0.05 ha) on the Coronado National Forest, and 0.005 acres (0.002 ha) on BLM land.

The Crossover Corridor is not within an existing Forest Transportation System and Utilities Corridor, except where it follows or crosses the EPNG pipeline ROW. USFS advises that the rest of the Crossover Corridor on the Coronado National Forest, an estimated 20 mi (32 km), would require a Forest Plan amendment in order to implement the alternative. The Crossover Corridor would pass through approximately 3 mi (4.8 km) of an IRA in Peck Canyon, as shown in Figure 3.1-1.

4.1.1.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission lines and the associated facilities as proposed in this EIS. There would be no land use impacts associated with the No Action Alternative. Current land use trends would be expected to continue in accordance with local land use plans.

4.1.2 Recreation

The following discussion of impacts to recreational resources applies to all three proposed corridors. A discussion of impacts specific to the Western, Central, and Crossover Corridors on the Coronado National

Forest is presented separately. This allows the USFS Recreation Opportunity Spectrum (ROS) tool for recreation planning and management to be used (USFS 1990).

Impacts to recreation activities in the vicinity of the proposed project outside the Coronado National Forest would be generally similar to impacts to recreation within the Coronado National Forest, as described in the following sections. Activities include hiking, biking, birding, photography, rock climbing, horseback riding and off-highway vehicle use. The Central Corridor crosses recreational trails where it parallels just outside the Coronado National Forest boundary for approximately 7 mi (11 km) east of the Tumacacori Mountains. The primary impact to each of these recreation activities would be a change in the visual setting for areas where the proposed project is visible as described in Section 4.2, and potential biological impacts to birds and other wildlife of interest, as described in Section 4.3.

On national forest land, maintaining a broad spectrum of ROS classes is very important to provide visitors with choices. The ROS includes matrices for each of the seven setting indicators that establish the limits of acceptable change of a given indicator within each ROS class. For example, Table 4.1–2 shows the matrix for one of seven ROS indicator matrices (the one for Visitor Management), which indicates what level of information facilities and regimentation (control) is appropriate for each ROS class for Visitor Management. According to this matrix, in a Semi-Primitive Non-Motorized area, low regimentation is "fully compatible," subtle on-site regimentation is "normal," noticeable on-site regimentation is "inconsistent" with the area, and obvious and numerous regimentation is "unacceptable."

Table 4.1–2. Example of ROS Indicator Matrix for Visitor Management.

	Low Regimentation. No onsite controls or information facilities.	Subtle onsite regimentation and controls. Very limited information facilities.	Onsite regimentation and controls are noticeable but harmonize with the natural environment. Simple information facilities.	Regimentation and controls obvious and numerous but harmonize. More complex information facilities.	Regimentation and controls obvious and numerous. Sophisticated information exhibits.
Primitive	Norm	Inconsistent			
Semi-Primitive Non Motorized		Norm	Inconsistent	Unacceptable	
Semi-Primitive Motorized		Norm	Inconsistent		
Roaded Natural			Norm	Inconsistent	
Rural	Fully Compatible			Norm	Inconsistent
Urban					Norm

Compatibility of Changes in Setting Indicators with ROS Area Classifications

Each setting indicator has a matrix, such as the one shown in Table 4.1–2, that establishes what conditions are fully compatible, normal, inconsistent, or unacceptable within a given ROS area classification. These terms are defined as follows:

- **Fully Compatible or Normal** – conditions that meet or exceed expectations within an ROS area classification.
- **Inconsistent** – conditions that are not generally compatible with the norm, but may be necessary under some circumstances to meet management objectives.
- **Unacceptable** – conditions that, under any circumstance, do not fall within the maintenance of a given class. Where unacceptable conditions are unavoidable, a change in the ROS setting will often result, which must be handled appropriately in the USFS *National Environmental Policy Act* (NEPA) planning process.

In evaluating potential impacts on recreation, changes in access to the area would affect a number of the setting indicators. As described in Sections 3.12 and 4.12, Transportation, numerous unclassified roads (wildcat roads) are present along each corridor. The proposed new roads for the project are spur roads off of existing roads, in the range of 500 to 1,000 ft (152 to 305 m) in length for each segment. Following construction, roads to fiber-optic splicing sites would be administratively closed using methods to include heavy pipe posts with a locked gate or chain, or a locked pipe barricade. All other roads, which would not be required for ongoing project maintenance, would have boulders, natural impediments, or trenches across the travelway for long-term closure, and would be revegetated at least in the initial portion of the roadway visible from connecting roads to effectively obscure signs of the roadway, in consultation with USFS. In addition to administrative and long-term closure of TEP's proposed roads, TEP is working with USFS to identify potential existing roads for obliteration and permanent closure, such that 1 mi (1.6 km) of existing road would be closed for every 1 mi (1.6 km) of proposed road used in the long-term maintenance of the proposed project. The roads to be closed by TEP would be preliminarily identified by USFS prior to issuance of a ROD, and identified as such within the ROD (URS 2003a). The USFS ROS impacts analysis that follows reflects the above information regarding project access.

4.1.2.1 *Western Corridor*

This section describes the potential impacts of the Western Corridor on recreational resources, within the framework of the ROS setting indicators.

Western Corridor Roaded Natural Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–3. The table shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, which would have changes introduced by the proposed project that are inconsistent with the current area classification.

Western Corridor Roaded Modified Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–4. This table shows that the predicted setting indicator impacts for Remoteness is inconsistent with the current Roaded Modified Area classification. The Facilities and Site Management and Naturalness impacts from the proposed project would be unacceptable within the current Roaded Modified classification.

Table 4.1–3. Impacts to Setting Indicators in Roaded Natural Areas in the Western Corridor.

ROS Setting Indicator	Impact of the Western Corridor	Change Compatible with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Where visible, the proposed project would be evidence of human activity, thus decreasing Remoteness.	Yes (Normal)
Naturalness	Project towers, transmission lines, and roads would impact Scenic Integrity.	Yes (Normal)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Inconsistent)
Social Encounters	Would remain moderate to high.	Yes (Normal)
Visitor Impacts	Subtle site hardening would occur on new access roads.	Yes (Normal)
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area.

Table 4.1–4. Impacts to Setting Indicators in Roaded Modified Areas in the Western Corridor.

ROS Setting Indicator	Impact of the Western Corridor	Change Compatible with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Would be evidence of human activity where visible between Ruby Road and the Pajarita Wilderness, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would decrease from high to very low where visible along Ruby Road.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Minor increase based on limited new roads for recreationalists.	Yes (Normal)
Visitor Impacts	Impacts or visitor use would not change.	NC
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area.

Western Corridor Semi-Primitive Motorized Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–5. This table shows that the predicted setting indicator impacts for Remoteness and Naturalness are not consistent with the current Semi-Primitive Motorized Area classification. Retaining access roads in addition to those leading to fiber-optic splicing sites would decrease the Naturalness to unacceptable. The Facilities and Site Management impacts are unacceptable within the current classification of the area.

Table 4.1–5. Impacts to Setting Indicators in Semi-Primitive Motorized Areas in the Western Corridor.

ROS Setting Indicator	Impact of the Western Corridor	Change Compatible with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity in the immediate area of some recreationalists, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would decrease from very high to moderate and low with minimum access roads, or to moderate, low, and very low with full access roads.	No (Inconsistent) for limited access, No (Unacceptable) for full access
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	May slightly increase along tower access roads.	Yes (Normal)
Visitor Impacts	Impacts of visitor use would not change.	NC
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area.

Western Corridor Semi-Primitive Non-Motorized Area. The Western Corridor passes within 0.25 mi (0.41 km) of a Semi-Primitive Non-Motorized Area. Semi-Primitive Non-Motorized settings are usually at least 0.5 mile (0.8 km) away from all roads, and thus the potential impacts to this setting have been analyzed. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–6. This table shows that the predicted setting indicator impact for Remoteness is inconsistent with the current Semi-Primitive Non-Motorized Area classification.

4.1.2.2 *Central Corridor*

This section describes the potential impacts of the Central Corridor on recreational resources, within the framework of the ROS setting indicators. As evidenced in the analysis below, the ROS impacts of the Central Corridor are reduced because of the existing access to the EPNG pipeline ROW that provides access to the Central Corridor, thus limiting the need for new project access. For each ROS setting, the potential impact to the setting indicators and recreational uses are described below:

Central Corridor Roaded Natural Area. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–7. The table shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, which would have inconsistent changes introduced by the proposed project, and Naturalness, which would have unacceptable changes introduced by the proposed project.

Table 4.1–6. Impacts to Setting Indicators in Semi-Primitive Non-Motorized Areas Near the Western Corridor.

ROS Setting Indicator	Impact of the Western Corridor	Change Compatible with ROS Class?
Access	Construction and maintenance roads to support towers within 0.5 mi of the SPNM Area could increase foot traffic off the roads into the SPNM Area.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity within 0.5 mi of the SPNM Area, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would remain very high.	NC
Facilities and Site Management	No new materials would be introduced into SPNM Areas.	NC
Social Encounters	May slightly increase to the extent that increased footpaths develop into the SPNM Area.	Yes (Normal)
Visitor Impacts	No site hardening would occur from occasionally used footpaths in the SPNM Area.	NC
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area; SPNM = Semi-Primitive Non-Motorized.

Central Corridor Semi-Primitive Motorized Areas. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–8. This table shows that the predicted setting indicator impacts are compatible with the Semi-Primitive Motorized Area classification, except for Remoteness and Naturalness, which would have inconsistent changes, and Facilities and Site Management, which would have unacceptable changes introduced by the proposed project.

Central Corridor Semi-Primitive Non-Motorized Area. The Central Corridor passes within 0.25 mi (0.41 km) of a Semi-Primitive Non-Motorized Area. Semi-Primitive Non-Motorized settings are usually at least 0.5 mi (0.8 km) away from all roads, and thus the potential impacts to this setting have been analyzed. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–9. This table shows that all of the predicted setting indicator impacts are compatible with the Semi-Primitive Non-Motorized Area classification, except for Remoteness, which would have changes introduced by the proposed project that are inconsistent with the current area classification.

Table 4.1–7. Impacts to Setting Indicators in Roaded Natural Areas in the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Change Compatible with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Where visible, the proposed project would be evidence of human activity, thus decreasing Remoteness.	Yes (Normal)
Naturalness	Would change to very low at the Ruby Road crossing.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Inconsistent)
Social Encounters	Would remain moderate to high.	Yes (Normal)
Visitor Impacts	Subtle site hardening would occur on new access roads.	Yes (Normal)
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area.

Table 4.1–8. Impacts to Setting Indicators in Semi-Primitive Motorized Areas in the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Change Compatible with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Project would introduce nearby sights and occasional sounds (maintenance crews) of human activity.	No (Inconsistent)
Naturalness	Would decrease to moderate and low.	No (Inconsistent)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Increase in social encounters limited to occasional maintenance crews.	NC
Visitor Impacts	Impacts of visitor use would not change.	NC
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area.

Table 4.1–9. Impacts to Setting Indicators in Semi-Primitive Non-Motorized Areas Near the Central Corridor.

ROS Setting Indicator	Impact of the Central Corridor	Change Compatible with ROS Class?
Access	Given existing access to the pipeline ROW, few new project access roads would be needed in the brief section within 0.5 mi of the SPNM Area, resulting in few new foot trails into the SPNM Area.	Yes (Normal)
Remoteness	Would introduce sights and occasional sounds (maintenance crews) of human activity within 0.5 mi of the SPNM Area, thus decreasing Remoteness.	No (Inconsistent)
Naturalness	Would remain very high.	NC
Facilities and Site Management	No new materials would be introduced into SPNM Areas.	NC
Social Encounters	Limited likelihood of new footpaths into the SPNM Area.	Yes (Normal)
Visitor Impacts	No site hardening would occur from limited new footpaths into the SPNM Area.	NC
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area; SPNM = Semi-Primitive Non-Motorized.

4.1.2.3 *Crossover Corridor*

This section describes the potential impacts of the Crossover Corridor on recreational resources, within the framework of the ROS setting indicators. For each ROS setting, the potential impact to the setting indicators and recreational uses as follows:

Crossover Corridor Roaded Natural Area. The impacts of the Crossover Corridor on setting indicators upon crossing Ruby Road through the Roaded Natural Area would be the same as described above for the Central Corridor's crossing of Ruby Road. Table 4.1–7 shows that all of the predicted setting indicator impacts are compatible with the Roaded Natural Area classification, except for Facilities and Site Management, which would have inconsistent changes introduced by the proposed project and Naturalness which would have unacceptable changes introduced by the proposed project.

Crossover Corridor Semi-Primitive Motorized Areas. The impacts of the proposed project on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–10. The predicted setting indicator impacts for Remoteness and Naturalness are inconsistent, and the impacts for Facilities and Site Management are unacceptable within the current Semi-Primitive Motorized Area classification.

Crossover Corridor Semi-Primitive Non-Motorized Area. The Crossover Corridor and its potential new access roads pass through Semi-Primitive Non-Motorized land in Peck Canyon. The potential impacts on setting indicators and the compatibility of this change with the existing ROS class are described in Table 4.1–11. This table shows that the predicted setting indicator impacts for Remoteness, Naturalness, and Facilities and Site Management are unacceptable for the current Semi-Primitive Non-Motorized Area classification for the current Semi-Primitive Non-Motorized Area classification.

Table 4.1–10. Impacts to Setting Indicators in Semi-Primitive Motorized Areas in the Crossover Corridor.

ROS Setting Indicator	Impact of the Crossover Corridor	Change Compatible with ROS Class?
Access	Permanent access roads would be closed to public access; nonetheless, some increase in foot and all-terrain vehicle traffic may occur.	Yes (Normal)
Remoteness	Project would introduce nearby sights and occasional sounds (maintenance crews) of human activity.	No (Inconsistent)
Naturalness	Would decrease to moderate to low.	No (Inconsistent)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Increase in social encounters limited to occasional maintenance crews.	NC
Visitor Impacts	Impacts of visitor use would not change.	NC
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area.

Table 4.1–11. Impacts to Setting Indicators in Semi-Primitive Non-Motorized Areas in the Crossover Corridor.

ROS Setting Indicator	Impact of the Crossover Corridor	Change Compatible with ROS Class?
Access	Helicopter access would be used.	NC
Remoteness	Would introduce nearby sights and occasional sounds (maintenance crews) of human activity in and around Peck Canyon.	No (Unacceptable)
Naturalness	Would decrease from very high to very low.	No (Unacceptable)
Facilities and Site Management	Project towers and transmission lines would introduce synthetic materials.	No (Unacceptable)
Social Encounters	Limited likelihood of new footpaths into the SPNM Area.	Yes (Normal)
Visitor Impacts	No change.	NC
Visitor Management	No additional visitor management would occur.	NC

NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area; SPNM = Semi-Primitive Non-Motorized.

4.1.2.4 *ROS Impacts Summary for Western, Central, and Crossover Corridors*

Table 4.1–12 summarizes the impact of each corridor on the setting indicators. For the Access, Social Encounters, Visitor Impacts, and Visitor Management setting indicators, the proposed project in any corridor would be compatible with the current ROS area classification. Because permanent access roads constructed for the project would be gated or otherwise blocked so they are not open for public use, the recreational access to the area, and associated social encounters and impacts from visitors would not be significantly affected by the proposed project, and additional visitor management would not be necessary.

Table 4.1–12. ROS Impacts Summary for the Western, Central, and Crossover Corridors on the Coronado National Forest.

	Western Corridor (30.0 mi on CNF)				Central Corridor (15.1 mi on CNF)*			Crossover Corridor (29.7 mi on CNF)*		
Setting Indicator	**Roaded Natural (1.7 mi)**	**Roaded Modified (7.0 mi)**	**Semi-Primitive Motorized (21.3 mi)**	**Semi-Primitive Non-Motorized (passes within 0.5 mi of area)**	**Roaded Natural (1.1 mi)**	**Semi-Primitive Motorized (14 mi)**	**Semi-Primitive Non-Motorized (passes within 0.5 mi of area)**	**Roaded Natural (1.1 mi)**	**Semi-Primitive Motorized (25.2 mi)**	**Semi-Primitive Non-Motorized (3.3 mi)**
Access	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	NC
Remoteness	Compatible	Inconsistent	Inconsistent	Inconsistent	Compatible	Inconsistent	Inconsistent	Compatible	Inconsistent	Unacceptable
Naturalness	Compatible	Unacceptable	Inconsistent to Unacceptable	NC	Unacceptable	Inconsistent	NC	Unacceptable	Inconsistent	Unacceptable
Facilities and Site Management	Inconsistent	Unacceptable	Unacceptable	NC	Inconsistent	Unacceptable	NC	Inconsistent	Unacceptable	Unacceptable
Social Encounters	Compatible	Compatible	Compatible	Compatible	Compatible	NC	Compatible	Compatible	NC	NC
Visitor Impacts	Compatible	NC	NC	NC	Compatible	NC	NC	Compatible	NC	NC
Visitor Management	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

*Central and Crossover Corridors do not go through the Roaded Modified area.
NC = No significant change to the setting indicator as a result of the proposed project within this ROS Area; CNF = Coronado National Forest.
There would be no change to any setting indicators under the No Action Alternative.

For the Naturalness, Remoteness, and Facilities and Site Management setting indicators, most or all of the proposed project in any corridor would be either inconsistent or unacceptable within the current ROS area classification. Identifying the differences between corridors in terms of changes that fall into the unacceptable range, as outlined below, helps distinguish the ROS impacts among alternatives. In addition, the total mileage of each alternative on the Coronado National Forest (Western Corridor: 30.0 mi [48.2 km], Central Corridor: 15.1 mi [24.3 km], Crossover Corridor: 29.7 mi [47.8 km]) is a factor in the magnitude of the ROS impacts.

The Western Corridor would have an unacceptable impact on Naturalness where it runs adjacent to Ruby Road for an estimated 6 mi (10 km) southwest of the Atascosa Mountains. Naturalness would become very low in this section of the Western Corridor.

The Crossover Corridor would have a higher impact on Remoteness than the other alternatives, as an estimated 3.3 mi (5.3 km) of the Crossover Corridor at Peck Canyon would have unacceptable impacts on Remoteness. The Crossover Corridor would also have an unacceptable impact on Naturalness within Peck Canyon, and for a brief stretch as it crosses Ruby Road then continues over nearby ridgetops.

The Central Corridor would have an unacceptable impact on Naturalness where it crosses Ruby Road, in the same location as the Crossover Corridor.

The following language was provided by USFS (USFS 2002c). The Central Corridor would minimize the total mileage on national forest land and would impact three setting indicators (Remoteness, Naturalness, and Facilities and Site Management) in an inconsistent or unacceptable way. The Western and Crossover Corridors would impact the same three setting indicators on national forest land as the Central Corridor. The Crossover Corridor is the only alternative with major impacts to a Semi-Primitive Non-Motorized area (an estimated 3 mi [5 km] through the Peck Canyon IRA). The Western and Crossover Corridors would have higher total mileage on national forest lands than the Central Corridor. Accordingly, the Western and Crossover Corridors would have greater overall impacts to ROS settings on the Coronado National Forest than the Central Corridor.

4.1.2.5 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no impacts from the proposed project on recreation. Current recreation activities described in Section 3.1.2, Recreation, would continue.

4.2 VISUAL RESOURCES

This section discusses the potential effects on visual resources in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line proposed project. The methodology for determining impacts is presented, along with a description of the impacts for each alternative. The terminology and concepts used for the proposed project's potential impacts on national forest, Bureau of Land Management (BLM), state, and private land are consistent with the U.S. Department of Agriculture Forest Service (USFS) Scenery Management System (SMS), as described in Section 3.2. The potential impacts for the Coronado National Forest and lands outside of the Coronado National Forest including BLM land are discussed separately, concluding with a summary of visual impacts. Unless otherwise noted, Figure 3.1–1 identifies locations on the Coronado National Forest, and Figure 1.1–4 identifies locations outside the Coronado National Forest.

Methodology

The following project-level SMS steps have been taken for evaluation of visual impacts of the proposed project on the Coronado National Forest. The same steps were taken for evaluation of visual impacts outside of the Coronado National Forest, including Federal lands managed by BLM, except for those items related to scenic classes (for example, in step 2 below), which have not been established for lands outside the national forest system.

1. Description of the physical changes associated with the proposed project, such as transmission line support structures, access roads, conductor wires, clearing required for the right-of-way (ROW), and substations. This description is supported by photo simulations selected to represent what the alternatives would look like from the most likely viewing areas. For the project on national forest land, the most likely viewing areas are Concern Level 1 (primary) and Concern Level 2 (secondary) travelways, and recreational use areas, determined in consultation with USFS. For the project on private and BLM lands, the most likely viewing areas are from residences and major roads (Interstate-19 [I-19]) in nearby towns such as Sahuarita, Green Valley, Amado, and Tubac. The photo simulations portray the range of visual impacts, from wide-open views of the project in the foreground, to partially blocked views of the project, to background views of the project where it is difficult to detect in the landscape. Two maps for each corridor (on and off the national forest land) depicting the project visibility from travelways and use areas, based on site visits and elevation mapping software, provide a key to understanding the visibility of the project and the location of each photo simulation.

2. Project-level verification of the Scenic Class ratings presented in Figure 3.2–4. The Scenic Class ratings were originally determined by USFS on a Coronado National Forest-wide scale, then verified through field visits to the proposed project area. The Scenic Attractiveness and Concern Level 1 and 2 viewsheds were also verified. The most significant impacts of a proposed project are where the project contrasts with a landscape in an area where scenic resources are relatively important (for example, in Scenic Class 1 or 2 Areas).

3. Evaluation of how the Scenic Integrity would change if the proposed project were implemented, including the potential impacts from proposed access roads and support towers.

4. Discussion of short-term construction impacts, and proposed short-term and long-term visual mitigation measures and the expected effectiveness of these mitigation measures.

Physical Changes Associated with the Proposed Project

Long-term impacts to visual resources from the proposed project would occur from the introduction of transmission line support structures, access roads, transmission line wires, and clearing required for the ROW. TEP anticipates that a majority of the structures would be self-weathering steel single poles (monopoles), depicted in Figure 1.1–1, with a low reflectance steel material that self-oxidizes, or rusts, to form a reddish-brown protective surface coating, similar in appearance to wood poles of other electrical lines. TEP would use dulled, galvanized steel lattice structures (Figure 1.1–2) in locations where their use would minimize environmental impacts (including visual), in accordance with Arizona Corporation Commission (ACC) Decision No. 64356.

From a visual impact perspective, the primary advantage of monopoles over lattice towers is that monopoles require very little ongoing maintenance following construction, which would allow the obliteration and revegetation of all but a few critical access roads. Another disadvantage of the lattice towers is that self-weathering steel is not an option, as the joints on lattice towers could collect moisture that would interfere with the protective coating that prevents corrosion. Galvanized or painted finishes can be used on lattice towers to darken and reduce shine, but the galvanizing process shortens the life of the finish and painted towers require more access for ongoing maintenance. On the other hand, the primary advantage of lattice towers is that under certain conditions they tend to blend better into the background when viewed from a distance against mountains or vegetation. Also, lattice towers can be spaced farther apart thus requiring fewer towers, although the overall height and breadth of the lattice towers would be greater for increased span lengths.

Because the photo simulations have shown the importance of minimizing access roads to mitigate visual impacts, the advantage of the monopoles in requiring fewer access roads has made them the preferred support structure option of TEP (and USFS on national forest land) for the proposed project in terms of minimizing visual impacts. The recommendation from USFS for monopoles on national forest lands is given provided that all non-critical access roads (see Section 4.12, Transportation) are obliterated and revegetated following construction. An additional consideration that favors monopoles is that they create less contrast with the natural environment in the foreground when viewed against the sky, such as at road crossings, compared to the very urban, structural look of lattice towers.

The proposed project would utilize conductors (transmission line wires) with a non-specular (not shiny) surface. Non-specular conductors are dipped in an acid bath that takes the shine off the conductors, reducing their visibility. The typical height of the structures would be 140 ft (43 m). The span length between structures would range from 600 to 1,200 ft (183 to 366 m). The support structures would create vertical lines in the landscape, much more pronounced for monopoles than for lattice towers, and the conductors would create horizontal lines that would be visible depending on viewing distance and lighting conditions. Structures located so that viewers would see land or vegetation (such as a mountain) behind the structure rather than sky (that is, skylined) would create less of a visual impact. The text box on the following page describes preparation of the photo simulations to accurately depict the project visibility.

Access roads, which would require a clearing of vegetation and potential reshaping of land contours, would introduce a light-colored linear feature into the landscape. Access roads are most visible during the summer months when monsoon rains turn the landscape green, creating a strong contrast with the light-colored roadways. A number of the photo simulations in this Environmental Impact Statement (EIS) were taken in August, thus depicting a worst-case scenario (most visible) for the access roads.

Preparation of the Photo Simulations

Computer Aided Design (CAD) equipment and Global Positioning Systems (GPS) were used to prepare photo simulations. This allows life-size modeling and ensures a high degree of visual accuracy in the photo simulation. This translates to using real world scale and coordinates (that is, what the viewer would see if they were looking at the view from the location of the camera) to locate facilities, other site data, and the actual camera locations corresponding to three dimensional (3-D) simulation viewpoints. The degree of accuracy of the CAD equipment is absolute; the accuracy for the GPS location data is to within approximately 3.3 ft (1 m).

A CAD site map was imported as a background reference. Microstation CAD drawings of proposed structures and conductors were placed on top of the site map to register and orient the correct locations of photo simulation viewpoints. The 3-D model of the proposed structures and conductors was generated in real world scale. The GPS camera positioning information was then referenced to the 3-D data set.

A 35-mm camera with a 50-mm lens was used consistently throughout the process, with a matching electronic camera lens to allow for viewing of the computer-generated model in the same way that the proposed project would be viewed in the field.

Next, the photographic negative was scanned into the 3-D database and loaded as an environment within which the view of the 3-D model is generated. To generate the correct view relative to the actual photograph, the electronic camera was placed at a location (within the computer) identical to where the photograph was taken. This was supported by the GPS location. Then, the 3-D wire frame model was displayed so that proper alignment, scale, angle, and distance could be verified.

When all lines of the wire frame model exactly matched the photograph, the camera target position was confirmed. To complete this phase, the sun angle was set, materials and textures were applied, and the composite image was rendered through a computer image process known as Ray Tracing. Any additional filters required for appropriate atmospheric conditions, such as blur, focus, and haze were applied at this time.

The photo simulations developed for this project were designed to be viewed 14 in (36 cm) from the viewer's eye. This distance portrays the most realistic life-size image from the location of the simulations viewpoints.

It should be noted that an infinite number of variations related to camera angle, viewer location, distance, and atmospheric conditions exist. The simulations developed for this project incorporated additional mitigating factors such as structure color, structure placements, and use of non-specular (not shiny) conductors. Variations in mitigation measures applied to the simulations, when coupled with camera angle, viewer location, and atmospheric conditions can exponentially increase the variations of even "typical" viewing conditions. The simulations developed for this project captured a variety of viewing conditions under different atmospheric conditions. Dependent on the angle of the sun and viewer, cloud cover, backdropping available, type of facility simulated, and distance from the project, the facility features (such as conductors, cross arms, roads, etc.) may be more or less visible within each simulation (URS 2003b).

4.2.1 Western Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Western Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Western Corridor in some areas, while partially or completely blocking views of the Western Corridor in other areas. Figure 4.2–1 shows the visibility of the Western Corridor on the Coronado National Forest from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Western Corridor; blue for partially-blocked, intermittent views of the Western Corridor; and green where the Western Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–1, illustrated by photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby national forest lands are Ruby Road, Arivaca Road, and I-19. The Western Corridor would not be visible from an estimated 48 mi (77 km) of Concern Level 1 roads (sections shaded green, including all of I-19). There would be partially-blocked, intermittent views of the Western Corridor from approximately 5 mi (8 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Western Corridor from approximately 9.0 mi (15 km) of Concern Level 1 travelways (shaded in red).

Peña Blanca Lake Recreation Area is Concern Level 1, based on its popularity for recreation. As shown in Figure 4.2–1, the proposed project would not be visible from the lakeshore. Visual Simulation 1 (All Visual Simulations are located at the end of Section 4.2 [URS 2002]) shows that the Western Corridor would be difficult to see from Upper Thumb Picnic Area overlooking Peña Blanca Lake. The view from Upper Thumb Picnic Area represents the worst-case view of the proposed project from Peña Blanca Lake Recreation Area. In this view, the proposed project would be in the middleground to background and would not be skylined.

A typical view from Ruby Road west of the Calabasas Group Area (east of Peña Blanca Lake) is depicted in Visual Simulation 2, in which the proposed project is visible in the foreground, partially shielded by terrain and set against the backdrop of a mountain. The most visible portion of the Western Corridor would be along Ruby Road west of Peña Blanca Lake, especially in an estimated 4-mi (6-km) stretch along Ruby Road, where the project would be highly visible in the immediate foreground. This worst-case visibility from Ruby Road is depicted in Visual Simulation 3. This alignment was developed by TEP in coordination with USFS as a means of protecting the viewshed from Ruby Road looking south towards the Pajarita Wilderness. While siting the transmission line immediately adjacent to Ruby Road in this segment has a maximum visual impact along Ruby Road, it protects the viewshed to the south for the public (including photographers) and eliminates the need for highly visible access roads in this portion of the project area. Visual Simulation 4 depicts the view of Castle Rock looking southeast from Ruby Road. The Western Corridor is partially visible in the middleground, screened by topography. Both the typical and worst-case scenarios from Ruby Road depicted in these simulations are within Scenic Class 1 Areas, which have high public value as described in Section 3.2.

The other wide-open view of the Western Corridor would be where it crosses Ruby Road, as depicted in Visual Simulation 5. After crossing Ruby Road, the Western Corridor continues north along the west side of the Tumacacori Mountains, extending through the foreground, middleground, and background distance zones to viewers on Ruby Road, as shown in Visual Simulation 6, depicting monopoles with minimum access roads that would be required for this type of structure. For comparison purposes, Visual Simulation 7 shows the same view as in Visual Simulation 6, but with lattice towers and the access roads that would be required for lattice towers.

The remaining views of the Western Corridor from Concern Level 1 roads would be partially obscured views of the project from Ruby Road, and views of the proposed project on national forest land in the background distance zone from Arivaca Road. (See the next subsection, Outside of the Coronado National Forest, which describes the impact of the proposed project as it crosses overhead of Arivaca Road, not on national forest land). By siting proposed pole locations in areas of lower elevation between ridgetops, the visibility of the Western Corridor from Ruby Road east of Peña Blanca Lake is reduced to several locations with open views of the area. Visual Simulation 8 shows an example of terrain and vegetation shielding looking towards the Calabasas Group Area from Ruby Road (east of Peña Blanca Lake), showing the side profile of a viewer, a proposed structure location, and a hill between the viewer and the structure.

The Concern Level 2 travelways in the proposed project are secondary travelways that intersect either Ruby Road, Arivaca Road, or I-19, and receive a moderate amount of use. As shown in Figure 4.2–1, the Western Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 14 mi [22 km]), would be partially blocked from the segments highlighted in blue (7.5 mi [12 km]), and would not be visible from the segments highlighted in green (39 mi [63 km]). The Western Corridor crosses five Concern Level 2 roads and would dominate views in the foreground at each of these crossings. The Western Corridor would be visible from portions of the road leading to the Pajarita Wilderness, but would be mostly obscured by terrain from the Pajarita Wilderness, and specifically from Sycamore Canyon. The project would be also highly visible from higher elevations on trails leading to Atascosa Lookout.

The existing Scenic Integrity of the Tumacacori Ecosystem Management Area (EMA) is depicted in Figure 3.2–5. Construction of the proposed project within the Western Corridor would reduce the Scenic Integrity of a 1.0-mi (1.6-km) wide strip of land along the length of the Western Corridor within the Tumacacori EMA, as depicted in Figure 4.2–2. The portion of the Western Corridor west of the Tumacacori Mountains would change from Very High to a combination of Moderate, Low, and Very Low, depending on the amount of access roads selected and the proximity to Concern Level 2 roads where the proposed project would be in the foreground. Where the Western Corridor crosses and remains south of Ruby Road, the Scenic Integrity would change from High to Very Low. The Scenic Integrity of Peña Blanca Lake Recreation Area and Ruby Road to the east would not change, and the Scenic Integrity where the Western Corridor joins the El Paso Natural Gas Company (EPNG) pipeline and exits national forest land would change from Very High to Moderate. In terms of area, the Scenic Integrity of approximately 13,870 acres (5,613 ha) would be lowered from High or Very High to Moderate or Low, and 4,641 acres (1,878 ha) would be lowered from Very High to Very Low. The existing Scenic Integrity of the Pajarita Wilderness would not change. The reduced acreages of Scenic Integrity on the Coronado National Forest are presented in this EIS as one measure of visual impact. The USFS Scenery Management System (SMS) does not provide guidance on the significance of visual impacts. The lead and cooperating agencies will consider the information in this visual analysis in their issuance of a Record of Decision (ROD).

Mitigation of long-term visual impacts is ongoing in TEP's project development process. Mitigation includes the precise siting of the ROW at lower elevations between ridgetops, to the extent feasible, to avoid skylining of the structures. The project design process incorporates minimizing the mileage of construction access roads and maintenance roads needed following construction. Existing access roads or trails would be used where feasible, as described in the Section 4.12, Transportation. The type of structure to be used (monopoles or lattice towers) would be selected to minimize overall environmental impacts, including visual, biological, cultural, and other impacts, as determined by an outside party such as USFS in accordance with ACC Decision No. 64356.

These mitigation measures would lessen the overall visual impact of the project, but would not fully eliminate the visual impact. Mitigation measures would be least effective along Ruby Road west of Peña Blanca Lake, where the transmission line would be in the immediate foreground for travelers on Ruby Road. A previous alignment of the Western Corridor originally considered by TEP was to site the ROW an estimated 0.5 mi (0.8 km) south of Ruby Road, between the road and Pajarita Wilderness. For this alignment, the high vantage point of Ruby Road prevented siting the Western Corridor behind terrain features, and the additional impact of access roads in this area added significantly to the visual impacts. Thus, TEP worked in consultation with USFS to realign the Western Corridor immediately adjacent to Ruby Road, in order to minimize impacts to the pristine viewshed south towards the Pajarita Wilderness, and to minimize the need for new access roads to the structures. While the previous alignment would have kept the transmission line out of the immediate foreground of viewers on Ruby Road, the modified alignment along Ruby Road preserves the pristine viewshed of the Pajarita Wilderness (including opportunities for photography), and parallels an existing linear modification to the landscape (Ruby Road).

A short-term visual impact would be generated during construction from dust and equipment. Dust control measures such as watering of access roads would be implemented by TEP to minimize impacts, as discussed in Section 4.8, Air Quality Impacts. Access used for construction that would not be used for ongoing operation and maintenance would be restored to near pre-construction conditions (see Section 4.12, Transportation).

Outside of the Coronado National Forest. An estimated 35.5 mi (57.1 km) of the Western Corridor is outside of the Coronado National Forest. The landscape of the northern portion of the Western Corridor (common with the Central and Crossover Corridors), including 1.25 mi (2.01 km) of lands managed by BLM, is characterized by desert grasslands, a low density of residences and commercial establishments, multiple mine tailings piles and electrical transmission lines (refer to Figure 3.11–1 showing existing utilities). A key factor in evaluating the visual impacts in this area is the visibility of the proposed project from residences and travelways, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the proposed project in some areas, while partially or completely blocking views of the proposed project in other areas. Figure 4.2–3 shows the visibility of the Western and Crossover Corridors along I-19 and in the areas shaded around I-19 that contain the highest density of residences. The map is shaded to indicate the visibility of the Western and Crossover Corridors as follows: red for wide-open views; blue for partially-blocked, intermittent views; and green for areas from which the Western and Crossover Corridors are not visible. The following is a discussion of the project visibility as depicted in Figure 4.2–3, illustrated by photo simulations from the locations indicated.

As the Western Corridor crosses I-19 and continues southwest, residents, travelers, and recreationalists would have intermittent views of the proposed project in the foreground and middleground, with views from many areas in lower terrain obscured by the hills and mine tailings piles in the area. The views of the Western Corridor in Sahuarita, Nogales, and on BLM land, would be in areas already containing development. Visual Simulation 9 shows a foreground view of the proposed project from Mission Road adjacent to BLM land, with TEP's existing and proposed transmission lines. As the Western Corridor separates from the Central Corridor, the Western Corridor (together with the Crossover Corridor) would continue to be almost entirely obscured from view from I-19 by mine tailings piles and natural foothills, but would be visible in the foreground from Arivaca Road as it passes overhead. This worst-case foreground view of the Western (and Crossover) Corridor is depicted in Visual Simulation 10, and represents a point of maximum impact in this central portion of the project. Because the characteristic desertscrub vegetation in the project vicinity is low to the ground, this would result in the proposed project being maximally visible where not obscured by the terrain. However, the vegetation clearing required for the ROW and access roads would have a reduced impact in this type of relatively low vegetation. Figure 4.2–4 shows a visual assessment of the entire project area strictly based on residential density and topography, with areas visible to higher numbers of residents indicated in pink.

Based on the human alterations to the natural landscape, such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Western Corridor, the existing Scenic Integrity of the landscape, including BLM land, is Moderate to Low (the mine tailings piles and transmission lines dominate some areas of the landscape). The Scenic Integrity of this area would not be lowered as result of the proposed project. In the vicinity of the Pima-Santa Cruz County line, the existing Scenic Integrity is High, and would change as a result of the Western Corridor to Moderate to Low, depending on the feasibility of siting the support structures in low terrain.

Mitigation measures and short-term visual impacts would be as described above for the Western Corridor on national forest land. In relatively flat landscapes such as the BLM land, it is not possible to site towers between ridgetops to minimize their visibility. However, structure type would be selected as described above.

4.2.2 Central Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Central Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Central Corridor in some areas, while blocking views of the Central Corridor in other areas. Figure 4.2–5 shows the visibility of the Central Corridor from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Central Corridor; blue for partially-blocked, intermittent views of the Central Corridor; and green where the Central Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–5, illustrated by photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby national forest lands are Ruby Road, Arivaca Road, and I-19. The Central Corridor would not be visible from approximately 56 mi (90 km) of Concern Level 1 travelways (sections shaded green, including most of Ruby Road). There would be partially-blocked, intermittent views of the Central Corridor from approximately 3.0 mi (4.8 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Central Corridor from approximately 3.0 mi (4.8 km) of Concern Level 1 travelways (shaded in red).

The primary Concern Level 1 travelway from which the Central Corridor on national forest land would be visible is Ruby Road where it is crossed by the Central Corridor. The Central Corridor is visible in the foreground as it crosses Ruby Road, within a Scenic Class 1 area. Given that the towers at this location are skylined and in the foreground for viewers on Ruby Road as shown in Visual Simulation 11, monopoles are currently recommended at this location by USFS as they create less of a contrast with the natural environment in this setting. For comparison purposes, Visual Simulation 12 depicts the same location with lattice towers. Because ridges follow both sides of Ruby Road at the crossing point, the transmission line would disappear over the ridges to either side rather than extending into the middleground. Although views of the Central Corridor on the national forest land from Arivaca Road would be in the background distance zone, refer to the next subsection, outside of the Coronado National Forest, which describes the impact of the proposed project as it crosses overhead of Arivaca Road, not on national forest land. The Central Corridor is not visible from Peña Blanca Lake Recreation Area, Calabasas Group Area, or White Rock Campground, all located along Ruby Road west of the crossing of the Central Corridor.

The Concern Level 2 travelways from which portions of the Central Corridor would be visible are roads connecting to Ruby Road and I-19, as shown in Figure 4.2–5. The Central Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 13 mi [21 km]), would be partially blocked from the segments highlighted in blue (9.8 mi [16 km]), and would not be visible from the segments highlighted in green (37 mi [60 km]). A number of Concern Level 2 roads, such as Rock Corral Canyon (Figure 3.7–2), extend into the foothills and provide intermittent open vantage points of the Central Corridor. From more elevated viewpoints, segments of the Central Corridor are evident in foreground, middleground, and background where it crosses the tops of ridges and foothills, all within a Scenic Class 2 area. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area, with views of the Central Corridor in the background as shown in Visual Simulation 13.

The existing Scenic Integrity of the Tumacacori EMA is depicted in Figure 3.2–5. Construction of the proposed project within the Central Corridor would reduce the Scenic Integrity of a 1-mi (1.6-km) wide strip of land along the length of the Central Corridor within the Tumacacori EMA, as depicted in Figure 4.2–6. The Scenic Integrity in the viewshed east of the Tumacacori Mountains would change from Very High to a combination of Moderate and Low, with Low Scenic Integrity where the Central Corridor crosses Concern Level 2 roads in the foreground. Where the Central Corridor crosses Ruby Road, the Scenic Integrity would change from High to Very Low, and south of this crossing the Scenic Integrity would change from Very High to Moderate. In terms of area, the Scenic Integrity of an estimated 8,992 acres (3,639 ha) would be lowered from Very High to Moderate or Low, and 676 acres (274 ha) would be lowered from High to Very Low at the Ruby Road crossing. The existing Scenic Integrity of Peña Blanca Lake Recreation Area and the Pajarita Wilderness would not change.

Short-term construction impacts, and proposed short-term and long-term visual mitigation measures for the Central Corridor would be the same as described for the Western Corridor in Section 4.2.1.

Outside of the Coronado National Forest. Approximately 42 mi (68 km) of the Central Corridor is outside of the Coronado National Forest. The landscape of the northern portion of the Central Corridor (common with the Western and Crossover Corridors), including 1.25 mi (2.01 km) of land managed by BLM, is characterized primarily by desert grasslands, a low density of residences and commercial establishments, multiple mine tailings piles and electrical transmission lines. For discussion and simulation of this common portion of the Central Corridor, refer to Section 4.2.1, Western Corridor.

The Central Corridor parallels I-19 within approximately 1.0 mi (1.6 km) near Amado, Tubac, and Tumacacori, passing adjacent to areas of low intensity residential development, before entering the national forest land. Figure 4.2–7 shows the visibility of the Central Corridor along I-19 and in the areas shaded around I-19 that contain the highest density of residences. The map is shaded to indicate the visibility of the Central Corridor as follows: red for wide-open views; blue for partially-blocked, intermittent views; and green for areas from which the Central Corridor is not visible. The following is a discussion of the project visibility as depicted in Figure 4.2–7, illustrated by photo simulations from the locations indicated.

Upon separating from the Western Corridor, the Central Corridor would be intermittently visible and blocked by the elevated terrain that runs directly along the west side of I-19, with some open views from nearby residences in Amado, Tubac, and Tumacacori depending on the terrain setting of each individual house. The Central Corridor would be visible in the foreground from Arivaca Road as it passes overhead. This worst-case foreground view of the Central Corridor is depicted in Visual Simulation 14.

Northwest of Tubac, at the Burro Inn, the Central Corridor would be visible in the foreground, partially with a partial backdrop of mountains given the terrain of the area, as shown in Visual Simulation 15. As the Central Corridor passes near Tubac, it would be mostly screened by topography from the Barrio de Tubac subdivision on the east side of I-19, as shown by Visual Simulation 16. The worst-case view of the Central Corridor from residences would occur in Tubac near Piedra Drive. To mitigate the visual impacts to the extent practicable in this location (and for the entire length of the project), TEP considered different pole types and finishes, as shown in Visual Simulation 17. This simulation shows that the lattice towers have an overbearing structural look when viewed against the sky such as would be the case for nearby residents. The monopoles introduce a simpler, narrower change to the landscape in a color similar to wooden utility poles that better blends with the surrounding environment. Thus, the self-weathering steel monopoles in Visual Simulation 17 was selected by TEP to minimize visual impacts for residential locations such as this one in Tubac.

Because the characteristic desert grassland vegetation in the project vicinity is low to the ground, the proposed project would be maximally visible where not obscured by the terrain. However, the vegetation clearing required for the ROW and access roads would have a reduced impact in this type of relatively low vegetation. Figure 4.2–4 shows a visual assessment of the entire project area strictly based on residential density and topography, with areas visible to higher numbers of residents indicated in pink.

Given the human alterations to the natural landscape such as utilities, multiple expansive mine tailings piles, and buildings in the northern portion of the Central Corridor, the existing Scenic Integrity of the landscape, including BLM land, is Moderate to Low (the mine tailings piles and transmission lines dominate some areas of the landscape). Upon separating from the Western Corridor, the Scenic Integrity is Moderate, as the landscape appears slightly altered due to residences, commercial establishments, and roads in the area connecting with I-19. The Scenic Integrity of the vicinity of the Central Corridor outside of the national forest land would not change as a result of construction of the Central Corridor.

Mitigation measures and short-term visual impacts would be as described above for the Central Corridor on national forest land. In relatively flat landscapes such as the BLM land, it is not possible to site towers between ridgetops to minimize their visibility. However, structure type would be selected as described above.

4.2.3 Crossover Corridor

Coronado National Forest. A key factor in evaluating the visual impacts of the Crossover Corridor is the visibility of the proposed support towers and access roads from travelways and recreation areas utilized by the public, and the distance zone in which the proposed project would be visible. The terrain of the area provides wide-open views of the Crossover Corridor in some areas, while blocking views of the Crossover Corridor in other areas. Figure 4.2–8 shows the visibility of the Crossover Corridor from Concern Level 1 and 2 travelways, with each travelway shaded as follows: red for wide-open views of the Crossover Corridor; blue for partially-blocked, intermittent views of the Crossover Corridor; and green where the Crossover Corridor is not visible from the travelway. The following is a discussion of the project visibility as depicted in Figure 4.2–8, as illustrated by the photo simulations from the locations indicated.

The Concern Level 1 travelways on or nearby national forest lands are Ruby Road, Arivaca Road, and I-19. The Crossover Corridor would not be visible from approximately 75 mi (120 km) of Concern Level 1 travelways (sections shaded green, including most of Ruby Road). There would be partially-blocked, intermittent views of the Crossover Corridor from approximately 40 mi (65 km) of Concern Level 1 travelways (shaded in blue), and there would be wide-open views of the Crossover Corridor from approximately 7.9 mi (13 km) of Concern Level 1 travelways (shaded in red).

The Concern Level 1 roads from which portions of the Crossover Corridor on the national forest land would be visible are Ruby Road, I-19, and Arivaca Road, as shown in Figure 4.2–8 by the road segments highlighted in red. The Crossover Corridor would be visible in two locations from Ruby Road: (1) along the west side of the Tumacacori Mountains where the Crossover Corridor turns east into Peck Canyon, the Crossover Corridor would be visible in the far middleground, set against mountains rather than skylined, with partial shielding provided by the terrain, and (2) the Crossover Corridor would be visible in the foreground as it crosses Ruby Road, the same as depicted in Visual Simulations 11 and 12. The Crossover Corridor is not visible from Peña Blanca Lake Recreation Area. From Arivaca Road, views of the Crossover Corridor on national forest land would be in the background distance zone (but refer to the next subsection outside of the Coronado National Forest, for the impact of the proposed project as it crosses overhead of Arivaca Road, not on national Forest land). From I-19, the Crossover Corridor would be just visible from Peck Canyon, in the same view as the Central Corridor shown in Visual Simulation 13, set against the backdrop of the Tumacacori Mountains and foothills. This view of the Crossover Corridor from I-19 is in a Scenic Class 2 area.

The Concern Level 2 travelways from which portions of the Crossover Corridor would be visible are roads connecting to Ruby Road and I-19, as shown in Figure 4.2–8. The Crossover Corridor would be visible from the segments of Concern Level 2 travelways highlighted in red (approximately 13 mi [21 km]), would be partially blocked from the segments highlighted in blue (16 mi [26 km]), and would not be visible from the segments highlighted in green (20 mi [32 km]). A Concern Level 2 road connects Ruby Road to the west end of Peck Canyon, from which the Crossover Corridor would be in the foreground. A number of Concern Level 2 roads also extend into the foothills from I-19 and provide intermittent open vantage points of the Crossover Corridor. From more elevated viewpoints, segments of the Crossover Corridor are evident in foreground, middleground, and background where it crosses the tops of ridges and foothills, all within a Scenic Class 2 area. San Cayetano Elementary School at Peck Canyon and I-19 is also a Concern Level 2 area, with views of the Crossover Corridor in the background as shown in Visual Simulation 13. Within Peck Canyon, there are recreational trails as described in Section 3.1.2, Recreation, from which the Crossover Corridor would be in the foreground, though none of these have been identified as Concern Level 2 travelways.

The existing Scenic Integrity of the Tumacacori EMA is depicted in Figure 3.2–5. Construction of the proposed project within the Crossover Corridor would reduce the Scenic Integrity of a 1-mi (1.6-km) wide strip of land along the length of the Crossover Corridor within the Tumacacori EMA, as depicted in Figure 4.2–6. The Scenic Integrity in the viewshed east of the Tumacacori Mountains would change from the existing Very High to a combination of Moderate and Low, with Low Scenic Integrity where the Crossover Corridor crosses Concern Level 2 roads and would thus be in the foreground. Where the Crossover Corridor crosses Ruby Road, the Scenic Integrity would change from High to Very Low, and south of this crossing the Scenic Integrity would change from Very High to Moderate. In terms of area, the Scenic Integrity of an estimated 18,060 acres (7,307 ha) would be lowered from Very High to Moderate or Low, and 676 acres (274 ha) acres would be lowered from Very High to Very Low at the Ruby Road crossing. The existing Scenic Integrity of Peña Blanca Lake Recreation Area and the Pajarita Wilderness would not change.

Short-term construction impacts, and proposed short-term and long-term visual mitigation measures for the Crossover Corridor would be the same as described for the Western Corridor in Section 4.2.1.

Outside of the Coronado National Forest. An estimated 35.5 mi (57.1 km) of the Crossover Corridor is outside of the Coronado National Forest. The Crossover Corridor outside of national forest land is identical to the Western Corridor, and thus the impacts would be identical to the Western Corridor in this overlapping segment, as described in Section 4.2.1. Mitigation measures and short-term visual impacts would also be as described above for the Western Corridor on national forest land.

4.2.4 Summary of Visual Impacts

Coronado National Forest. The areas of land that would have reduced Scenic Integrity as a result of construction and operation of the proposed project for each action alternative are as shown in Table 4.2–1. As stated previously, the reduced acreages of Scenic Integrity on the Coronado National Forest are presented in this EIS as one measure of visual impact. The USFS SMS does not provide guidance on the significance of visual impacts. The lead and cooperating agencies will consider the information in this visual analysis in their issuance of a ROD.

From approximately 9.0 mi (14 km) of Concern Level 1 travelways (out of a total of 62 mi [99 km]) on and nearby the Tumacacori EMA, the Western Corridor would be in wide-open view on national forest lands. From approximately 3.0 mi (4.8 km) of Concern Level 1 travelways on and nearby the Tumacacori EMA, the Central and Crossover Corridors would each be in wide-open view on national forest lands.

Table 4.2–1. Summary of Reduced Scenic Integrity on the Coronado National Forest

Western Corridor		Central Corridor		Crossover Corridor	
Change	**Acres**	**Change**	**Acres**	**Change**	**Acres**
From Very High or High to Moderate or Low	13,870	From Very High to Moderate or Low	8,992	From Very High to Moderate or Low	18,060
From High to Very Low	4,641	From High to Very Low	676	From High to Very Low	676
Total Reduced Scenic Integrity:	18,511	Total Reduced Scenic Integrity:	9,668	Total Reduced Scenic Integrity:	18,736

The following text was provided by USFS (USFS 2002c). The Central Corridor would minimize the total mileage on national forest land resulting in reduced Scenic Integrity of an estimated 9,668 acres (3,912 ha) on national forest land. The Western and Crossover Corridors would have higher total mileage on national forest lands than the Central Corridor, and the Western and Crossover Corridors would result in an estimated 18,511 to 18,736 acres (7,491 to 7,582 ha) of reduced Scenic Integrity on national forest lands. Accordingly, the Western and Crossover Corridors would have greater overall visual impact on the Coronado National Forest than the Central Corridor.

Outside of the Coronado National Forest. The proposed project outside of the Coronado National Forest would cross an estimated 36 mi (51 km) of land for the Western and Crossover Corridors, and an estimated 42 mi (68 km) of land for the Central Corridor. With the exception of a reduction in Scenic Integrity associated with the Western and Crossover Corridors near the Pima and Santa Cruz County line, the existing Moderate to Low Scenic Integrity would not be reduced for the area crossed by each corridor outside of the Coronado National Forest, including the BLM land. The Central Corridor has the longest length outside of the Coronado National Forest, and would be intermittently visible to more residents than the other corridors given its closer proximity to the towns of Amado, Tubac, and Tumacacori.

4.2.5 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. The existing landscape and Scenic Integrity, as described in Section 3.2, Visual Resources, would be expected to continue, subject to visual impacts from potential development in the project area (see Chapter 5, Cumulative Impacts).

4.3 BIOLOGICAL RESOURCES

This section discusses the potential effects of the construction and operation of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project within each alternative corridor. The methodology for determining impacts is presented, followed by a description of the impacts from each alternative.

Methodology

The biological resource impact analysis consists of an evaluation of the effects generated by the construction and operation of a proposed action, for all land jurisdictions on specific biological resources (for example, vegetation communities). Additional analysis of the U.S. Department of Agriculture Forest Service (USFS) and Bureau of Land Management (BLM) land has been included to assist those agencies in evaluating impacts to unique or specific resources under their administration. This additional analysis is not appropriate for resources outside of their jurisdiction because their authority only covers land under their administration. Impacts to biological resources are described relative to the affected environment in Section 3.3.1.

To determine if an action may cause a significant impact, both the context of the proposed action and the intensity of the impact are considered. For actions such as those proposed in this document, the context is the locally affected area and significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of any unique characteristics of the area (for example, presence of special-status species) and the degree to which the proposed action may adversely affect such unique resources. Impacts would be significant if the proposed action or alternatives change the biological resources in the long term.

4.3.1 Biodiversity

Biodiversity in the area results from the convergence of the climatic zones, topographic relief (range of elevations), variable geology, and precipitation patterns (Wildlands Project 2000). The proposed project would not alter these factors on a scale that would cause a regional decline in biodiversity. Potential impacts to species listed by the U.S. Fish and Wildlife Service (USFWS), USFS, BLM, or the Arizona Game and Fish Department (AGFD) are provided in the remainder of Section 4.3.

4.3.1.1 *Western, Central, and Crossover Corridors*

Impacts to biodiversity for the three proposed corridors would be similar. Individual plant and animal species whose occurrences are considered rare in the proposed corridors may be directly or indirectly impacted through the construction, maintenance, and/or operation of the proposed powerline. No decline in the biodiversity of the region is anticipated as a result of the three proposed corridors.

4.3.1.2 *No Action Alternative*

No impacts to biodiversity would result under this alternative. Existing biodiversity would continue as described in Section 3.3.1.

4.3.2 Vegetation and Wildlife

Impacts to vegetation would be similar under all action alternatives. Potential impacts to vegetation and wildlife, as a result of the construction of the transmission line include loss or disturbance to existing native plant communities and potential adverse effects to wildlife including some mortality of individual wildlife, interference with breeding, loss of habitat, and loss of forage plants. Impacts would result from construction of temporary access roads and lay down yards, construction of poles and permanent access roads, clearing of vegetation, and line maintenance. Impacts to vegetation were calculated based on preliminary siting of access roads that are approximately 12 ft (3.7 m) wide and a 100 ft (30 m) radius around each pole location (see Section 4.12, Transportation, for discussion on revegetation with native species). Short-term disturbances of previously undisturbed biological habitats from the construction of the transmission line and substations could cause long-term reductions in the biological productivity of an area. These long-term effects tend to be more pronounced in arid areas such as the proposed project area where biological communities recover very slowly from disturbances. Refer to Figure 3.3–1 for a map of the vegetation types in the following sections.

4.3.2.1 *Western Corridor*

Potential impacts to vegetation in the Western Corridor are summarized in Table 4.3–1.

Table 4.3–1. Estimated Area of Vegetation Communities Potentially Disturbed in the Western Corridor.

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	165	102	8	55
Madrean Evergreen Woodland	95	95	0	0
Sonoran Riparian Deciduous Forest	0.14	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	NA	0.6	NA	NA
Total	**382.14**	**197.6**	**8**	**177**

[a] Source: Roads Analysis (URS 2003a).

USFS Classified Riparian. Impacts to USFS Classified Riparian only apply to riparian vegetation on lands administered by USFS because this classification system is unique to that agency. Impacts to USFS Classified Riparian areas are based on those identified in the Roads Analysis for the proposed project (URS 2003a). Under this alternative, an estimated 0.6 acres (0.2 ha) of dry desert riparian habitat would be impacted. No impacts to deciduous riparian or evergreen riparian are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on national forest lands.

Wildlife. Impacts to wildlife as a result of construction would include mortality of smaller species such as rodents, reptiles, and amphibians. Additional impacts to wildlife include the loss of food, cover, and breeding sites. The construction of new access roads would also increase public access into new areas which may result in disturbances to wildlife and their habitat by human use. Construction of the line in the Western Corridor would be unlikely to impede the movements of animals because they would not present major barriers. However, construction of access roads, pole sites, and lay down areas would alter microclimatic conditions on either side. These impacts are unlikely to substantially reduce wildlife populations in the region because of the relatively small areas impacted. Additional impacts would include the potential for mortality of birds and bats resulting from collisions with the lines. Impacts to birds are discussed further in Section 4.3.4.

4.3.2.2 *Central Corridor*

Potential impacts to vegetation in the Central Corridor are summarized in Table 4.3–2.

Table 4.3–2. Estimated Area of Vegetation Communities Potentially Disturbed in the Central Corridor.

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	109	67	8	34
Madrean Evergreen Woodland	38	38	0	0
Sonoran Riparian Deciduous Forest	0	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	NA	0.1	NA	NA
Total	**269**	**105.1**	**8**	**156**

[a] Source: Roads Analysis (URS 2003a).

USFS Classified Riparian. Under this alternative, an estimated 0.1 acres (0.04 ha) of dry desert riparian habitat would be impacted. No impacts deciduous riparian or evergreen riparian are anticipated. This is considered to be a minor impact because only a relatively small percentage of this vegetation would be disturbed compared to the overall amount present on USFS system lands.

Wildlife. Impacts to wildlife would generally be the same as those listed above under Section 4.3.2.1. However, differences in the impacts to wildlife could vary as a result of different amounts of vegetation types disturbed in each corridor.

4.3.2.3 *Crossover Corridor*

Potential impacts to vegetation in the Crossover Corridor are summarized in Table 4.3–3.

USFS Classified Riparian. Under this alternative no impacts to USFS Classified Riparian are anticipated.

Table 4.3–3. Estimated Area of Vegetation Communities Potentially Disturbed in the Crossover Corridor.

Vegetation Type	Entire Corridor (acres)	Coronado National Forest[a] (acres)	Lands Administered by the BLM (acres)	All Other Land Ownership (acres)
AZ Upland/Sonoran Desertscrub	119	0	0	119
Semidesert Grassland	97	66	8	23
Madrean Evergreen Woodland	72	72	0	0
Sonoran Riparian Deciduous Forest	0	0	0	0
Disturbed (agriculture, urban, or unvegetated)	3	0	0	3
USFS Classified Riparian	NA	0	NA	NA
Total	**291**	**138**	**8**	**145**

[a] Source: Roads Analysis (URS 2003a).

Wildlife. Impacts to wildlife would be the same as those listed above under Section 4.3.2.1. However, differences in the impacts to wildlife could vary as a result of different amounts of vegetation types disturbed in each corridor.

4.3.2.4 *No Action Alternative*

There would be no impact to vegetation and wildlife associated with the No Action Alternative. Existing conditions would continue as described in Section 3.3.2.

4.3.3 Special Interest Species

Harris Environmental Group prepared draft Biological Assessments per the USFWS Section 7 Handbook (USFWS 1998) contained in Appendices D, E, and F of this Environmental Impact Statement (EIS) for the Western, Central, and Crossover Corridors, respectively (HEG 2003a, 2003b, 2003c). All of the action alternatives would have the potential to impact species listed under the *Endangered Species Act* (ESA), as amended. Therefore, the U.S. Department of Energy (DOE) has initiated consultation with USFWS under Section 7(a)(2) of the ESA. The formal consultation process between DOE, USFS, BLM, and USFWS will begin when DOE tenders its biological assessment of the alternatives to the USFWS. During formal consultation USFWS will: (1) review all relevant information provided by DOE, USFS, and BLM; (2) evaluate the current status of the listed species and critical habitat; (3) evaluate the effects of the action and cumulative effects on the listed species or critical habitat; and (4) formulate a biological opinion as to whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

Upon completion of the review and evaluation, USFWS will discuss the findings in the biological opinion with DOE, USFS, BLM, and TEP. USFWS will identify the availability of any reasonable and prudent alternatives, including mitigation, that DOE, USFS, BLM, and TEP can implement to avoid “take” (harm or harassment of a threatened or endangered species) as defined in the ESA.

The main impact on special interest species would result from the destruction or alteration of a species habitat and the increase in human activity. Additionally, the increased potential for wildfires as a result of sparks from vehicles is a potential impact common to all of the action alternatives (HEG 2003a, 2003b, 2003c). Wildfires that start as a result of the proposed project have the potential to impact one or more special-status species, including threatened and endangered species. Additionally, ground disturbances could facilitate the establishment of nonnative species, such as Lehman’s lovegrass, which could alter the natural fire regime. “Wildfires could remove ground cover that is important in dissipating rainfall energy and reducing erosion” (HEG 2003a, 2003b, 2003c). Increased erosion as a result of wildfires could harm all of the fish and frog species listed in Table 4.3–4.

For threatened and endangered species, three types of effects determinations were made:

1. *No effect* determinations were not quantified because there are no effects. No effect means that there are absolutely no effects of the project, positive or negative, on a species.

2. *May affect/not likely to adversely affect* determinations mean that all impacts are beneficial, insignificant, or discountable. Such determinations require concurrence from the USFWS. These determination were not quantified because “based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur” (USFWS 1998).

3. *May affect/likely to adversely affect* determinations were evaluated according to the primary action causing the indirect adverse effect (for example, erosion from roads increasing sediment load into watersheds). While this may not realistically reflect the magnitude of effect to individual species, the consistency of evaluation across the three corridors allows for comparisons between them. This determination means that there is at least one adverse effect of the proposed action and requires formal consultation with the USFWS.

Table 4.3–4 summarizes the determination of effects for all species considered in the Biological Assessments for all of the corridors. These determinations were made based on contact with the USFWS, USFS, BLM, and AGFD regarding all species potentially affected by the project. Determinations were made after reviewing the current status of each species, the environmental baseline of each alternative, and the effects of the proposed actions (including the cumulative effects) (HEG 2003a, 2003b, 2003c). Species for which it was determined that the project “may affect” are discussed below in Sections 4.3.3.1 to 4.3.3.3. Detailed discussions are included in the Biological Assessments (see Appendices D, E, and F) appended to this EIS.

Table 4.3–4. Effects Determination of Threatened and Endangered Species Potentially Occurring in Pima and Santa Cruz Counties, Arizona.

Species	Western Corridor	Central Corridor	Crossover Corridor
Plants			
Canelo Hills Ladies' Tresses	No Effect	No Effect	No Effect
Huachuca Water Umbel	No Effect	No Effect	No Effect
Kearney's Blue Star	No Effect	No Effect	No Effect
Nichol's Turk's Head Cactus	No Effect	No Effect	No Effect
Pima Pineapple Cactus	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mammals			
Jaguar	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Jaguarundi	No Effect	No Effect	No Effect
Lesser Long-nosed Bat	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mexican Gray Wolf	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Sonoran Pronghorn	No Effect	No Effect	No Effect
Ocelot	No Effect	No Effect	No Effect
Birds			
Bald Eagle	No Effect	No Effect	No Effect
Brown Pelican	No Effect	No Effect	No Effect
Cactus Ferruginous Pygmy-owl	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**	**May affect, likely to adversely affect**
Mexican Spotted Owl	**May affect, *not* likely to adversely affect**	No Effect	**May affect, *not* likely to adversely affect**
Masked Bobwhite	No Effect	No Effect	No Effect
Mountain Plover	No Effect	No Effect	No Effect
Northern Aplomado Falcon	No Effect	No Effect	No Effect
Southwestern Willow Flycatcher	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Amphibians			
Chiricahua Leopard Frog	**May affect, likely to adversely affect**	No Effect	**May affect, *not* likely to adversely affect**
Sonoran Tiger Salamander	No Effect	No Effect	No Effect
Fish			
Desert Pupfish	No Effect	No Effect	No Effect
Gila Top Minnow	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**	**May affect, *not* likely to adversely affect**
Loach Minnow	No Effect	No Effect	No Effect
Sonora Chub	**May affect, likely to adversely affect; may affect, not likely to adversely modify critical habitat**	No Effect	No Effect
Spikedace	No Effect	No Effect	No Effect
Gila Chub	No Effect	No Effect	No Effect

Source: HEG 2003a, b, and c.

With the exception of Sonora chub (see Section 3.3), no impacts to critical habitat, either proposed or currently designated at the time this Draft EIS is published, would occur under any of the alternatives. Any potential effects on threatened and endangered species are provided below. Detailed information about these species is presented in the Biological Assessments (see Appendices D, E, and F).

Harris Environmental Group (HEG 2003a, 2003b, 2003c) evaluated potential impacts to USFS Sensitive species to determine if there is: (1) a downward trend in population numbers, or (2) a downward trend in habitat capability that would reduce a species' existing distribution. With the exception of supine bean, the potential impacts under the Western, Central, and Crossover Corridor Alternatives would not result in a downward trend in population numbers or a downward trend in habitat capability. This determination was made by reviewing each species population, distribution, and habitat requirements and the proposed impacts. Generally, no downward population or habitat trends are expected for one or more of the following reasons:

- Other viable populations are present outside of the corridors but within the Tumacacori Ecosystem Management Areea (EMA) of the Coronado National Forest, or within other mountains in southern Arizona;
- Only a small percentage of the total population would potentially be impacted;
- Minimal suitable habitat is present in the corridor;
- Only a small percentage of foraging habitats would potentially be impacted;
- Some of the plant species are adapted to disturbed habitat; or
- The only known populations are outside of the corridors.

Harris Environmental Group determined that current information regarding supine bean is too limited to determine if potential impacts would cause any downward population or habitat trends. Therefore, further consultation with USFS and, if necessary, surveys would be conducted to avoid impacts. Table 4.3–5 summarizes the potential impacts to USFS Sensitive Species under each alternative.

No surveys for USFS Sensitive Species, BLM Sensitive Species, Wildlife of Special Concern, or plants listed by the Arizona Department of Agriculture (ADA) have been conducted. Therefore, the presence of these species was assumed in all areas containing potential habitat (HEG 2003a, 2003b, 2003c).

Table 4.3–5. Impacts to Forest Service Sensitive Species.

Common Name	Present in Corridor	Effects Determination By Corridor
Plants		
Alamos Deer Vetch	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Arid Throne Fleabane	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Arizona Giant Sedge	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Bartram's Stonecrop	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Crossover & Central - No effects are anticipated.

Table 4.3–5. Impacts to Forest Service Sensitive Species (*continued*).

Common Name	Present in Corridor	Effects Determination By Corridor
Beardless Chinch Weed	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Broad-leaf ground cherry	Central, Crossover	All - No effects are anticipated.
Catalina Beardtongue	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Crossover & Central - No effects are anticipated.
Chiltepin	All	Western - No effects are anticipated. Crossover & Central - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Chihuahuan Sedge	Western Crossover	Western & Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central - No effects are anticipated.
Chiricahua Mountain Brookweed	All	All - Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability.
Foetid Passionflower	All	All - Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability.
Gentry Indigo Bush	All	All - Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability.
Large-Flowered Blue Star	All	All - Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability.
Lumholtz Nightshade	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Mock-Pennyroyal	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Nodding Blue-eyed Grass	All	All - No effect is anticipated.
Pima Indian Mallow	Central, Crossover	Western - No effect is anticipated. Central - No effect on population status and is not likely to result in a trend towards Federal listing. Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Santa Cruz Beehive Cactus	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Santa Cruz Star Leaf	All	Western & Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central - No effect on population status and is not likely to result in a trend towards Federal listing.
Santa Cruz Striped Agave	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Seeman Groundsel	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central & Crossover - No effect on population status and is not likely to result in a trend towards Federal listing.
Sonoran Noseburn	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Superb Beardtongue	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Supine Bean	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability. Given recent population trends, additional surveys may be warranted upon selection of a preferred alternative. USFS would be consulted prior to impacting any known populations.

Table 4.3–5. Impacts to Forest Service Sensitive Species (*continued*).

Common Name	Present in Corridor	Effects Determination By Corridor
Sweet Acacia	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Three-nerved scurf-pea	Crossover	Western & Central - No effect on population status and is not likely to result in a trend towards Federal listing. Crossover - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Thurber Hoary Pea	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Thurber's Morning-glory	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Virlet Paspalum	All	All - No effect on population status and is not likely to result in a trend towards Federal listing.
Weeping Muhly	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Wiggins Milkweed Vine	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Wooly Fleabane	All	Western - May impact individuals but not likely to result in trend toward listing or loss of population viability. Central & Crossover - No effect on population status and is not likely to result in a trend towards Federal listing.
Mammals		
Cave Myotis	All	All - Forage habitat may be disturbed but not likely to result in trend toward listing or loss of population viability.
Southern Pocket Gopher	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.
Birds		
American Peregrine Falcon	All	All - Not likely to impact nesting sites and not likely to result in trend toward listing or loss of population viability.
Five-Stripped Sparrow	Western Crossover	Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability.
Northern Gray Hawk	All	All - No effect on population status and is not likely to result in a trend towards Federal listing.
Yellow-billed Cuckoo	All	All - Minimal or no effects are anticipated. Not likely to result in trend toward listing or loss of population viability assuming impacts to riparian vegetation are avoided or minimized.
Reptiles/Amphibians		
Giant Spotted Whiptail	All	All - No effect on population status and is not likely to result in a trend towards Federal listing.
Lowland Leopard Frog	All	All - No effect on population status and is not likely to result in a trend towards Federal listing.
Mexican Garter Snake	All	Western - No effect on population status and is not likely to result in a trend towards Federal listing. Central & Crossover - May impact individuals if riparian areas are impacted. Not likely to result in a trend towards Federal listing.
Western Barking Frog	All	All - No effect on population status and is not likely to result in a trend towards Federal listing.
Invertebrates		
Arizona Metalmark	All	All - May impact individuals but not likely to result in trend toward listing or loss of population viability.

Source: HEG 2003a, b, and c.

Arizona Department of Agriculture Species. On private lands, such as those within the proposed project area, salvage of species on the ADA List of Protected Native Plants (State of Arizona 1997) is not required for private landowners. Under state law, landowners have the right to destroy or remove plants growing on their land including all cacti, yucca, and other succulent species. Because the proposed project is a Federal action, the ADA would be notified if plants within the ROW would be removed and later transplanted or permanently destroyed. An ADA Notice of Intent (NOI) to clear land is required 20 to 60 days prior to the destruction of any plants. Further study would be performed as needed upon precise siting of the ROW within the Western Corridor.

4.3.3.1 *Western Corridor*

Impacts to 10 of the 27 species listed by USFWS would occur under this alternative and are detailed in the Biological Assessment (Appendix D). A summary of impacts to these species are discussed below.

Cactus Ferruginous Pygmy-owl (Endangered). Construction of the Western Corridor may affect, and is likely to adversely affect cactus ferruginous pygmy-owls (HEG 2003a). Although no cactus ferruginous pygmy-owls are known to occur in surveyed areas in the Western Corridor, habitat for this species is present (see section 3.3.3.1). A preliminary assessment of construction-related impacts indicates the following cactus ferruginous pygmy-owl habitat types would be altered: 34 acres (9 ha) of Sonoran Desertscrub, 46 acres (18 ha) of Desert Riparian Scrub, and 3 acres (1 ha) of Deciduous Riparian. According to the Harris Environmental Group (HEG 2003a), "short term noise disturbance and human activity associated with construction may temporarily discourage cactus ferruginous pygmy-owl use of habitat within and immediately adjacent to the proposed right-of-way." Further impacts include modification of habitat due to clearing vegetation and building project structures and an increase in human activities as a result of new access. Due to these potential impacts, construction of the Western Corridor may affect, and is likely to adversely affect, cactus ferruginous pygmy-owls (HEG 2003a).

To minimize potential adverse impacts to cactus ferruginous pygmy-owls, construction activities during breeding season would only occur following additional surveys, and the Conservation Measures outlined in Section 1.4 of the Biological Assessment (HEG 2003a) would be used. If these measures were employed, impacts to cactus ferruginous pygmy-owls would not be expected to rise to the level of take.

According to Harris Environmental Group (HEG 2003a), "No take of CFPO [cactus ferruginous pygmy-owl] is anticipated for the following reasons: (1) construction activities during breeding season would only occur following protocol surveys; (2) the Conservation Measures outlined in Section 1.4 (of the Biological Assessment) will minimize disturbance to potential habitat and prevent disturbance to nesting CFPO within the action area should any be detected in the future."

Chiricahua Leopard Frog (Threatened). Construction of the Western Corridor may affect, and is likely to adversely affect Chiricahua leopard frogs (HEG 2003a). No direct impacts to Chiricahua leopard frog habitat (i.e., stock tanks or other aquatic habitats) would occur under this alternative because no construction activities would occur in these habitats. Individuals could be present, however, on land some distance away from these areas, and construction traffic could result in fatalities from vehicle collisions. Other indirect impacts could occur from removal of vegetation due to construction that could increase surface runoff and sediment into Chiricahua leopard frog habitat. Additional impacts may include the spread of the chytrid fungus, known to cause mortality in frogs, into areas that are not currently accessible by vehicle. Due to these potential impacts, construction of the Western Corridor may affect, and is likely to adversely affect, Chiricahua leopard frogs (HEG 2003a).

To minimize potential adverse impacts to Chiricahua leopard frogs: (1) no construction activities would occur within occupied streams, stock tanks, or other Chiricahua leopard frog habitat; (2) BMPs would be implemented to minimize erosion; and (3) equipment cleaning stations would be established at appropriate sites to prevent the spread of disease. If these measures were employed, impacts to Chiricahua leopard frogs would not be expected to rise to the level of take.

Gila Topminnow (Endangered). Construction of the Western Corridor may affect, but is not likely to adversely affect Gila topminnows (HEG 2003a). No direct effects to Gila topminnows are anticipated because no construction would occur within occupied habitat. The closest populations are about 12 mi (19 km) east of any of the corridors (see section 3.3.3.1). Some indirect effects to topminnow habitat are possible due to erosion that could result from project construction. Increased surface runoff and sediment transport into Gila topminnow habitat in the Santa Cruz River watershed could occur. Any such effects would be relatively small due to the distance of the proposed project from occupied habitat; BMPs to minimize sediment transport would also be used (HEG 2003a). Due to the real but limited potential for impacts to Gila topminnow, construction of the Western Corridor may affect, but is not likely to adversely affect, this species (HEG 2003a). Any such effects would not be expected to rise to the level of take.

Jaguar (Endangered). Construction of the Western Corridor may affect, but is not likely to adversely affect jaguars (HEG 2003a). Impacts to jaguars may result from noise disturbance associated with construction activities, especially during early morning or late evening hours. However, these impacts would be widely distributed because of the linear nature of the project. Additional impacts would result from habitat modification and fragmentation, and subsequently impacts to prey species, due to the construction of roads and poles. The primary prey of jaguars include deer, which have relatively large home ranges. The proposed project would be unlikely to result in a decline in the regional deer population. In the event that remote monitoring of the Arizona-Mexico border to be undertaken by the Jaguar Conservation Team documents a female jaguar or cubs within the Tumacacori EMA, consultation with USFWS would be reinitiated (HEG 2003a).

Lesser Long-nosed Bat (Endangered). Construction of the Western Corridor may affect and is likely to adversely affect lesser long-nosed bats (HEG 2003a). According to the Biological Assessment (HEG 2003a), "indirect effects to lesser long-nosed bats may result from disturbance (removal) of agaves and saguaro cacti during construction of temporary access roads or the installation of poles." Agaves and saguaro are distributed in patches and the loss of significant numbers of either species may alter foraging patterns, roost selection, or reduce individual survivorship. These impacts, however, would be widely distributed and relatively minor because of the linear nature of the project. Furthermore, forage plants would be transplanted, thereby further lessening impacts, although there could be some impacts from transplantation failure. Any resulting project impacts to lesser long-nosed bats would not be expected to rise to the level of take.

Mexican Gray Wolf (Endangered). Construction of the Western Corridor may affect, but is not likely to adversely affect lesser Mexican gray wolves (HEG 2003a). The proposed action would not affect individual Mexican gray wolves because the species is not present in the project area, and there are no plans by USFWS to re-introduce it to the region. A small amount of potential wolf habitat would be permanently affected, however, by project construction. In the event any Mexican gray wolves moved into or through the project area, they could be impacted by project effects on their prey or by project operations such as patrols by helicopter (HEG 2003a). Any such effects should be small because the project is unlikely to reduce prey on a regional basis, and operational disturbances would be infrequent. Nevertheless, because there could be future impacts due to the project, construction of the Western Corridor may affect, but is not likely to adversely affect, Mexican gray wolves.

Mexican Spotted Owl (Threatened). Construction of the Western Corridor may affect, but is not likely to adversely affect Mexican spotted owls (HEG 2003a). Direct effects on Mexican spotted owls could result from disturbance by construction activities that could discourage nesting in suitable habitat. The greatest likelihood of noise disturbance would be from use of helicopters during construction of the transmission lines (HEG 2003a). To minimize potential for disturbance from construction, no construction would occur within 1 mi (1.6 km) of the two Protected Activity Centers identified south of Ruby Road (see section 3.3.3.1) during the breeding season of March 1 to August 31 (HEG 2003a). In addition, construction during non-breeding season would be short term. Surveys would be performed in advance of construction in Sycamore Canyon where Mexican spotted owls have been reported but where there are no Protected Activity Centers. Should the species be present, USFWS would be consulted for further guidance.

A short section of access road [0.07 mi (0.113 km)] would be constructed within one of the Protected Activity Centers. Associated impacts should be minor because the only deciduous vegetation present is not of sufficient size to function as structural Mexican spotted owl habitat, and no trees greater than 9 inches (23 cm) in diameter at breast height would be removed (HEG 2003a).

Therefore, the construction-related activities outlined above may affect non-breeding Mexican spotted owls, but would not be likely to adversely affect the species, because construction would occur during a non-critical life stage, would be short term, and should not affect structural habitat function.

Pima Pineapple Cactus (Endangered). Construction of the Western Corridor may affect, and is likely to adversely affect Pima pineapple cacti (HEG 2003a). Construction of the Western Corridor may affect, and is likely to adversely affect, Pima pineapple cacti through hindering seedling establishment (HEG 2003a). Although no individual Pima pineapple cacti would be directly impacted because the locations of poles and access roads would be modified to avoid sensitive areas (HEG 2003a), indirect impacts could occur. These would include new access roads to Pima pineapple cacti populations, thereby exposing these populations to illegal collection. Any adverse effects to this species would be mitigated by purchase of mitigation bank credits (HEG 2003a).

Southwestern Willow Flycatcher (Endangered). Construction of the Western Corridor may affect, but is not likely to adversely affect southwestern willow flycatchers (HEG 2003a). Construction of the Western Corridor may affect, but is not likely to adversely affect, southwestern willow flycatchers (HEG 2003a). No direct effects are anticipated because no breeding habitat would be altered under this alternative. Indirect impacts may result from disturbance of approximately 0.14 acres (0.06 ha) of Deciduous Riparian habitat that may be used by migratory individuals (HEG 2003a) for temporary roosting or foraging. Disturbed cottonwood and willow habitat within this area would be mitigated at a 2:1 ratio. Thus, this disturbance would be unlikely to adversely affect the species because it would be small in area and temporary in nature.

Sonora Chub (Threatened). Construction of the Western Corridor may affect, but is not likely to adversely affect the Sonora chub (HEG 2003a). No individuals would be directly impacted under this alternative because no construction activities would occur within occupied streams. Construction of the Western Corridor may, however, affect, and is likely to adversely affect, the Sonora chub indirectly through the transport of sediments into Casita Spring and upper Sycamore Canyon. These indirect effects would not be expected to rise to the level of take because BMP erosion control measures would be used to minimize sediment transport (HEG 2003a).

Similarly, no critical habitat for Sonora chub would be directly impacted by project construction. The project is located 1 mi (1.6 km) upstream of Sycamore Creek and Hank and Yank Spring, the closest designated critical habitat. There would be no adverse modification or destruction of Sonora chub critical habitat because of the distance from project structures, and because BMPs would be in place to minimize erosion (HEG 2003a).

USFS Sensitive Species. Construction of the transmission line in the Western Corridor may impact 33 USFS Sensitive Species (Table 4.3–5). Individuals of all 40 species potentially occurring in the Western Corridor may be impacted. However, with the exception of supine bean, these impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2003a). Surveys for supine bean are recommended to determine potential impacts under this alternative. Should this species be present in the Western Corridor, TEP would consult with USFS to determine appropriate mitigation to avoid impacts that would result in a trend toward listing under the ESA or loss of population viability.

BLM Sensitive Species. Individuals of all 12 BLM Sensitive Species (see Section 3.3.3.1) potentially occurring in the Western Corridor could be impacted. Specific impacts have not been evaluated because of insufficient survey information. However, these impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2003a).

Wildlife of Special Concern In Arizona. Individuals of all 12 Wildlife of Special Concern in Arizona species (see Section 3.3.3.1) potentially occurring in the Western Corridor could be impacted. Specific impacts have not been evaluated because of insufficient survey information. However, these impacts are not likely to result in trend toward listing or loss of population viability (HEG 2003a).

Arizona Department of Agriculture Plants. Construction of the transmission line in the Western Corridor may impact all of the five plant species listed by the ADA (see Section 3.3.3.1) potentially occurring there. Specific impacts have not been evaluated because of insufficient survey information. These impacts are not likely to result in trend toward listing under the ESA or loss of population viability.

4.3.3.2 *Central Corridor*

Impacts to 7 of the 27 species listed by USFWS would occur under this alternative. Impacts to six of the following species would be the same as those described under Section 4.3.3.1 cactus ferruginous pygmy-owl, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, and Pima pineapple cactus. Impacts to southwestern willow flycatcher are described below.

Southwestern Willow Flycatcher (Endangered). Construction of the Central Corridor may affect, but is not likely to adversely affect southwestern willow flycatchers (HEG 2003b). Construction of the Central Corridor may affect, but is not likely to adversely affect, southwestern willow flycatchers (HEG 2003b). Similar to the impacts described in Section 4.3.3.1, no direct effects to breeding habitat would be anticipated because no breeding habitat would be altered under this alternative. Indirect impacts would be unlikely to result from disturbance of Deciduous Riparian habitat where the proposed transmission line crosses Peck Canyon. This habitat is patchy and lacks surface water; thus, it likely would not be used as habitat by migratory individuals of this species (HEG 2003b).

The Central Corridor would pass within 0.5 mi (0.8 ha) of the Santa Cruz River where migratory southwestern willow flycatchers have been documented (HEG 2003b). It is possible that noise from helicopter flights associated with construction activities would disturb southwestern willow flycatchers using suitable habitat along the Santa Cruz River. Any increase in noise would, however, be short term and minimal because of ambient noise levels from nearby Interstate 19. Therefore, the species would not likely be adversely affected (HEG 2003b).

USFS Sensitive Species. Construction of the transmission line in the Central Corridor may impact 25 USFS Sensitive species (Table 4.3–5). Impacts would be similar to those listed under Section 4.3.3.1.

BLM Sensitive Species. Impacts to BLM Sensitive Species would be similar to those described under Section 4.3.3.1 (HEG 2003b).

Wildlife of Special Concern In Arizona. Impacts to Wildlife of Special Concern in Arizona would be similar to those described under Section 4.3.3.1 (HEG 2003b).

Arizona Department of Agriculture Plants. Construction of the transmission line in the Central Corridor may impact six plant species listed (see Section 4.3.3.2) by the ADA as potentially occurring there. These impacts are not likely to result in trend toward listing under the ESA or loss of population viability.

4.3.3.3 *Crossover Corridor*

Impacts to 9 of the 27 species listed by USFWS would occur under this alternative. Impacts to the following nine species would be the same as those described under Section 4.3.3.1: cactus ferruginous pygmy-owl, Chiricahua leopard frog, Gila topminnow, jaguar, lesser long-nosed bat, Mexican gray wolf, Mexican spotted owl, Pima pineapple cactus, and southwestern willow flycatcher.

USFS Sensitive Species. Construction of the transmission line in the Central Corridor may impact 28 USFS Sensitive Species potentially occurring there (see Table 4.3–5). Impacts would be similar to those listed under Section 4.3.3.1.

BLM Sensitive Species. Impacts to BLM Sensitive species would be similar to those described under Section 4.3.3.1 (HEG 2003b).

Wildlife of Special Concern In Arizona. Construction of the transmission line in the Western Corridor may impact all of the 12 Wildlife of Special Concern in Arizona species potentially occurring there. These impacts are not likely to result in trend toward listing under the ESA or loss of population viability (HEG 2003a).

Arizona Department of Agriculture Plants. Impacts would be the same as those described under Section 4.3.3.2.

4.3.3.4 *No Action Alternative*

There would be no impact to special-status species associated with the No Action Alternative. The existing conditions as described in Section 3.3.3 would continue.

4.3.4 Migratory Birds and Raptors

Local movements of birds are difficult to predict since they vary seasonally and annually and are often linked to climatic conditions. For this reason, the number of potential collisions with towers and/or transmission lines cannot be specifically quantified or predicted. Habitat adjacent to specific portions of each of the corridors determines bird abundance and the species present within that portion of the corridor (SWCA 2002a). The estimated acreage of vegetation available to migratory birds is provided in Section 3.3.1.

Some mortality resulting from bird collisions within the transmission line corridor is considered unavoidable. However, anticipated mortality levels are not expected to result in long-term loss of population viability in any individual species or lead to a trend toward listing under the ESA for any of the proposed corridors because mortality levels are anticipated to be low and spread over the life of the transmission line. Electrocution is not expected to be a substantial hazard because the lines would be spaced wider than the largest local raptor's (golden eagle) wing span. Furthermore, TEP would follow the guidelines outlined in *Suggested Practices for Raptor Protection on Powerlines: the State of the Art in*

1996 (APLIC 1996). None of the towers are anticipated to require lights for aircraft avoidance, which has been associated with nighttime collisions (Kerlinger 2000).

Additional impacts to birds listed under the *Migratory Bird Treaty Act* would include impacts to vegetation, an important habitat component. Some areas would be cleared entirely to facilitate construction; in other areas, vegetation may be crushed but left onsite; and in other areas, relatively minimal disturbance would occur due to helicopter placement of towers. At the conclusion of construction, temporary access roads would be closed and revegetated; however, maintenance of the transmission line would require some permanent access roads. In addition, some tall trees and shrubs may need to be removed in portions of the corridor to allow maintenance access.

4.3.4.1 *Western, Central, and Crossover Corridors*

Potential direct effects to migratory birds as a result of the proposed project could include:

- Increased anthropogenic (manmade) noise and visual disturbances during construction
- Disturbance to and loss of foraging, cover, and nesting habitats related to removal of vegetation during construction
- Direct mortality due to collisions with equipment during construction and during maintenance activities after construction is complete

Potential indirect effects to migratory birds as a result of the proposed project under any of the action alternatives could include:

- Increased probability of mortality or harm due to collisions with towers and lines
- Temporary loss of prey during construction
- Reduction in the amount of foraging, cover, and nesting habitats for various species
- Permanent degradation and fragmentation of habitat for various species related to construction of the line and potential for introduction and colonization by nonnative species
- Displacement of some species (including prey base species) which could result in increased competition for resources in nearby populations
- Increased perch site for raptors during nesting and hunting and increase in potential nest platforms. This may lead to an imbalance in the prey base due to increased utilization by one or more raptor speices. Additionally, some studies have confirmed that some species (grassland birds) abandon habitat within 1 mi (1.6 km) or more of tall artificial structures.

4.3.4.4 *No Action Alternative*

There would be no impact to migratory birds and raptors associated with the No Action Alternative.

4.3.5 Coronado National Forest Management Indicator Species

Implementation of the proposed project has the potential to adversely impact Management Indicator Species (MIS) that occur within the Tumacacori EMA of the Coronado National Forest by both direct and indirect impacts. Potential direct impacts include direct mortality or harm and removal of foraging, cover, and breeding habitats during construction. Indirect impacts include degradation of habitats including an increase in fragmentation, displacement of wildlife into nearby populations resulting in increased competition for resources, and an increased probability of roadkills and tower strikes by bird species.

4.3.5.1 *Western, Central, and Crossover Corridor*

The proposed project is not expected to result in any downward population trends for MIS. Table 4.3–6 provides a summary of the potential habitat acreage that may be impacted.

4.3.5.4 *No Action Alternative*

No impacts to MIS would occur under the No Action Alternative. Existing conditions described in Section 3.3.5 would continue.

4.3.6 Invasive Species

Colonization of land by invasive species typically occurs gradually and inconspicuously. By the time that public awareness develops, the effects are often irreversible and resources may be irretrievably committed, productivity lowered and biodiversity reduced (BLM 1994, Nelson 1995). The expansion of the range of invasive species is largely caused by human activities, which disturb native ecosystems (Sheley 1994, BLM 1994, Harrod 1994). Vegetation removal and ground-disturbing activities create opportunities for colonization by alien plants (Orians 1986, Bazzaz 1983). Additionally, the transportation of seeds can occur inadvertently through human activities or livestock grazing (Nelson 1995). Colonization of invasive species may result in significant ecological effects by disrupting the natural functions and values of an ecosystem.

4.3.6.1 *Western, Central, and Crossover Corridors*

All action alternatives would require clearing of land for access roads, tower pads, and lay down areas, as described in Section 4.1, Land Use. Impacts of the alternatives are described by the area of anticipated new disturbance associated with construction of new access roads, poles, and lay down pads. New disturbances would provide a potential point of entry onto the landscape, which could lead to colonization of undisturbed surrounding land. Measures outlined in the Invasive Management Plan (see the Biological Assessments in Appendices D, E, and F of this EIS) would minimize the introduction and spread of invasive species.

4.3.6.2 *No Action Alternative*

No new ground disturbance would occur; therefore, no invasive species would colonize any of the proposed routes as a result of the No Action Alternative. Existing conditions described in Sections 3.3.6 would continue.

Table 4.3–6. Comparison of Potential Impacts to Habitat Within Coronado Forest Lands for Management Indicator Species for Each Alternative.[a]

Alternative	Cavity Nesters	Riparian Species	Species Needing Diversity	Species Needing Herbaceous Cover	Game Species
Western Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 95 acres of Madrean evergreen woodland, 0.6 acres of desert riparian scrub, and 3 acres of deciduous riparian habitats.	Disturbance or loss of an estimated 0.6 acres of desert riparian scrub and approximately 3 acres of deciduous riparian habitats.	Conversion of approximately 95 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 95 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.
Central Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 38 acres of Madrean evergreen woodland, 0.1 acres of desert riparian scrub, and 0.05 acres of deciduous riparian habitats.	Disturbance or loss of an estimated 0.1 acres of desert riparian scrub and an estimated 0.05 acres of deciduous riparian habitats.	Conversion of approximately 38 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 38 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.
Crossover Corridor	Estimated maximum permanent loss of habitat that has potential to support cavity nesters is as follows: 72 acres of Madrean evergreen woodland.	Disturbance or loss of approximately 20 acres of desert riparian scrub and an estimated 4.1 acres of deciduous riparian habitats.	Conversion of approximately 72 acres of Madrean Evergreen Woodland to grass and forb dominated habitats. No overall loss of diversity is anticipated.	Conversion of approximately 72 acres of Madrean Evergreen Woodland to grass and forb dominated habitats.	Potential increases in forage and decrease in cover and uninterrupted travel corridors due to conversion of woodlands to grass and forb-dominated habitats.

[a] Estimates of potential impact are based on an estimated 125-ft (38-m) wide construction corridor. In some areas, access would be attained through the use of helicopters, and placement of the towers would require fewer disturbances to habitat.

4.4 CULTURAL RESOURCES

This section discusses the potential adverse effects on cultural resources associated with the construction and operation of the proposed action and each alternative. This section also addresses potential Native American concerns.

4.4.1 Archaeological and Historical Sites

This section discusses the potential adverse effects on archaeological and historical sites associated with the construction of transmission lines and associated access roads within the three alternative corridors. Record searches were conducted at the Arizona State Museum and using AZSITE, the on-line database of archaeological projects and sites within Arizona. This search determined the number and type of previously documented archaeological and historical sites within the three alternative corridors. The U.S. Department of Agriculture Forest Service (USFS) provided information on known sites within the study corridors on the Coronado National Forest. The U.S. Department of Energy (DOE) determined the degree to which each of the corridors had been previously surveyed for archaeological and historical sites using AZSITE and data provided by USFS. A large percentage of each corridor has not been previously surveyed for the presence of cultural resources and it is highly likely that additional cultural resources exist that have not been recorded. Upon precise siting of the transmission line right-of-way (ROW) within any of the three proposed corridors (prior to construction activities), an intensive cultural resource inventory would be necessary of all areas of potential effect, both direct and indirect, including visual impacts, in Section 4.2, to National Register of Historic Places (NRHP)-eligible cultural resources outside the ROW.

Construction of transmission line structures and associated access roads has the potential to adversely affect archaeological and historical sites, based on the area of land disturbed, as described in Section 4.1, Land Use, and Section 4.12, Transportation. Access roads would be placed to avoid or minimize impacts to archaeological and historical sites. Upon precise siting of the transmission line ROW within the study corridor (prior to any construction activities), Tucson Electric Power Company (TEP) would take the necessary steps with all interested Native American tribes, all involved land agencies, the State Historic Preservation Officer (SHPO), the Advisory Council, if necessary, and any other involved agency to ensure that all cultural resources in the proposed project area are treated appropriately from the point of survey through mitigation.

Avoidance of cultural resources would be the primary means of mitigation. There is a high probability for mitigation through site avoidance, especially in upland areas away from the Santa Cruz River where site densities are generally higher. Where possible, transmission line structures, access roads, and other ground-disturbing activities would be located so as to avoid cultural resources and preserve them in place. In cases where avoidance would not be feasible, site-specific mitigation plans would be developed in consultation with interested Native American tribes, appropriate land agencies, the SHPO, and when necessary, the Advisory Council. These site-specific mitigation plans would detail the mitigation of adverse effects to significant cultural resources. Should construction activities result in the discovery of unanticipated cultural resources, construction activities at that location would be halted until the discovery could be evaluated by a professional archaeologist who would make recommendations on how the new discovery should be handled. Such recommendations could include avoidance, monitoring, testing, data recovery, or that no further work is necessary.

4.4.1.1 *Western Corridor*

Twenty-two previously identified archaeological and historical sites have been documented within the Western Corridor. As described in Section 3.4.1, less than 15 percent of the Western Corridor has been previously surveyed for cultural resources. Previous investigations have focused on areas along the Santa Cruz River where site densities are generally high. Although appreciably fewer studies have taken place in the mountainous areas of the Tumacacori and Atascosa Mountains (see Figure 1.1–4), it is likely that fewer sites are located in these areas. Archaeological site densities are usually higher along rivers and washes where a wider variety of resources were available and agriculture could have been practiced. Rivers and washes commonly served as important prehistoric and historical transportation corridors. Although less studied, the mountainous segment may contain Native American rock art sites, rock shelters, and shrines, as well as Historic Period ranching and mining related sites. Valleys between mountains are expected to contain a wide variety of prehistoric and historic sites. The Atascosa Lookout Tower, an historic property outside the ROW northeast of the Western Corridor in the Atascosa Mountains (see Figure 1.1–4), would have visual impacts as portions of the Western Corridor would be visible from this location, altering the visual character of the area (also see Section 4.2, Visual Impacts).

4.4.1.2 *Central Corridor*

Six archaeological and historic sites have been documented within the Central Corridor. As described in Section 3.4.1, less than 15 percent of the Central Corridor has been previously surveyed for cultural resources. Previous investigations have focused more on areas along the Santa Cruz River where site densities are generally high. Few previous archaeological studies have taken place along the central portion of this corridor south of Amado. Because the central portion of this corridor lies close to the Santa Cruz River, there is a high likelihood for the discovery of previously unrecorded sites.

Much of this alignment follows or crosses an existing EPNG pipeline alignment. Keeping construction activities to previously disturbed areas limits adverse impacts to cultural resources. The visual impacts to nearby historical sites such as the Tumacacori Mission Historic District in Tumacacori, the Tubac Presidio State Historic Park in Tubac, and the Juan Bautista de Anza National Historic Trail immediately adjacent to the Santa Cruz River in the proposed project area (see Figure 1.1–4) would be minimal. The I-19 area is already significantly altered from its previous state, and the proposed project would not reduce the Scenic Integrity of the area (see Section 4.2, Visual Impacts).

4.4.1.3 *Crossover Corridor*

Twenty-seven archaeological and historic sites have been documented within the Crossover Corridor. As described in Section 3.4.1, less than 15 percent of the Crossover Corridor has been previously surveyed for cultural resources. Previous investigations have focused on areas along the Santa Cruz River where site densities are generally high. Although appreciably fewer studies have taken place in the mountainous portions of this corridor, it is likely that fewer sites are located in these areas. Archaeological site densities are usually higher along rivers and washes where a wider variety of resources were available and agriculture could have been practiced. Rivers and washes commonly served as important prehistoric and historical transportation corridors. Peck Canyon, in particular, may contain a high density of sites. Although less studied, the mountainous segment may contain previously unrecorded Native American rock art sites, rock shelters, and shrines, as well as Historic Period ranching and mining related sites. The Crossover Corridor may be visible in the background (approximately 5 mi [8 km] away) from the Atascosa Lookout Tower, an historic property northeast of the Western Corridor in the Atascosa Mountains (see Figure 1.1–4). The visual impact on this location would be minimal as the character of the area would not be significantly altered (also see Section 4.2, Visual Impacts).

4.4.1.4 *No Action Alternative*

Under the No Action Alternative, no construction would occur. No archaeological and historical sites would be disturbed under this alternative. No additional archaeological surveys or Native American consultation would be undertaken in a systematic study of these areas in the foreseeable future. The Coronado National Forest and Bureau of Land Management (BLM) would still allow access to public lands, and that could result in the discovery and/or the destruction of cultural sites.

4.4.2 Native American Concerns

4.4.2.1 *Western Corridor*

Indian tribal representatives have expressed opposition to this corridor, but have not (to date) named specific locations of any traditional cultural properties (TCPs) or sacred sites. Several tribes (Tohono O'Odham Nation, Gila River Indian Community, Ak-Chin Indian Community, Salt River Pima Maricopa Indian Community and the Pascua Yaqui Tribe) have stated that they value the landscape through which the Western Corridor passes. Tribal consultations are ongoing (SWCA 2002c).

4.4.2.2 *Central Corridor*

The tribes have not identified any specific TCPs along this corridor to date. On the January 2002 site visit, representatives of several tribes (Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa Indian Community, and the Pascua Yaqui Tribe) stated that they would prefer that the project be constructed along the Central Corridor, if it was built at all. They view the Central Corridor as an already-disturbed area. None of the tribes wished to express approval of the project overall when stating this preference. Similar statements favoring the Central Corridor, if any is to be built, were made in January 2003 meetings and a site visit (February 4, 2003) with Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa, and Ak Chin Indian Communities. Tribal consultations are ongoing.

4.4.2.3 *Crossover Corridor*

This alternative has been presented to tribal representatives from the Tohono O'Odham Nation, Gila River Indian Community, Salt River Pima Maricopa and Ak-Chin Indian Communities (SWCA 2002c). Official tribal concerns have not yet been stated, and no specific TCPs have yet been identified along this corridor by any tribes consulted. Tribal consultations are ongoing.

4.4.2.4 *No Action Alternative*

Under the No Action Alternative no construction would occur. No archaeological and historical sites would be disturbed under this alternative. No additional archaeological surveys or Native American consultation would be undertaken in a systematic study of these areas in the foreseeable future. The Coronado National Forest and BLM would still allow access to public lands, which could result in the discovery and/or the destruction of cultural sites.

4.5 SOCIOECONOMICS

Any sudden influx of capital or employment, such as a large construction project, to a region will impact the existing socioeconomic environment to some degree. The response of socioeconomic factors, such as employment, income, population, housing, and community services are interrelated. This section describes the potential effects of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project on the existing socioeconomic environment of the region of influence (ROI) for Pima and Santa Cruz Counties.

Methodology

Socioeconomic impacts are addressed in both direct and indirect impacts. Direct impacts are changes that can be directly attributed to the proposed action, such as changes in employment and expenditures from the construction and operation of the proposed action. Indirect impacts to the ROI occur based on the direct impacts from the proposed action. For example, for this analysis, the term “direct jobs” refers to the employment created by the project and “direct income” refers to project workers’ salaries. The term “indirect jobs” refers to the jobs created in other employment sectors as an indirect result of new employment at the construction site and “indirect income” refers to the income generated by the new indirect jobs. Two factors indirectly lead to changes in employment levels and income in other sectors throughout the ROI: (1) the changes in site purchase and non-payroll expenditures from the construction and operation phases of the project, and (2) the changes in payroll spending by new employees. The total economic impact is the sum of the direct and indirect impacts.

The direct impacts estimated in the socioeconomic analysis are based on project summary data developed by the U.S. Department of Energy (DOE) in conjunction with TEP’s contractors and representatives. Total employment and earnings impacts were estimated using Regional Input-Output Modeling System multipliers developed specifically for the TEP Sahuarita-Nogales Transmission Line Project ROI by the U.S. Bureau of Economic Analysis (BEA). BEA is part of the U.S. Department of Commerce’s Economics and Statistics Administration and is responsible for providing Gross Domestic Product and economic accounts data for the country. These multipliers are developed from national input-output tables maintained by BEA and adjusted to reflect regional trading patterns and industrial structure. The tables show the distribution of the inputs purchased and the outputs sold for each industry for every county in the United States. The multipliers for this analysis were developed from the input-output tables for the two counties comprising the ROI. The multipliers are applied to data on initial changes in employment levels and earnings associated with the proposed project to estimate the total (direct and indirect) impact of the project on regional earnings and employment levels.

During the public scoping process for the Draft Environmental Impact Statement (EIS), several commentors expressed concern that existence of the proposed transmission line would negatively impact real property values. In this context, any decrease in property values would be perception-based impact, that is, an impact that does not depend on actual physical environmental impacts resulting directly from the proposed project, but rather upon the subjective perceptions of prospective purchasers in the real estate market at any given time. Courts have long recognized that such subjective, psychological factors are not readily translatable into quantifiable impacts. See, for example, *Hanly v. Kleindienst*, 471 F.2d 823, 833 n.10 (2d Cir. 1972), *cert. denied*, 412 U.S. 908, (1973). People do not act consistently in accordance with negative perceptions, and one person’s negative perception might be another’s positive. Also, perceptions of value may change over time, and perceptions of value are affected by a host of other factors that have nothing to do with the proposed project. Accordingly, any connection between public perception of a risk to property values and future behavior would be uncertain or speculative at best, and therefore would not inform decision making.

There have been studies of the impact of transmission lines and property values in other geographic areas. See, for example, discussion of these studies in the *Environmental Impact Statement for Schultz-Hanford Area Transmission Line Project* (DOE 2002). Based on these studies, DOE can conclude only that, at worst, it is possible that there might be a small negative economic impact of short duration to some properties from the project, and that the impact on value would be highly variable, individualized, and unpredictable. The studies at most conclude that other factors, such as general location, size of property, and supply and demand factors, are far more important criteria in determining the value of residential real estate.

Accordingly, while DOE recognizes that a given property owner's value could be affected by the project, DOE has not attempted to quantify theoretical public perceptions of property values should the proposed project be built.

The importance of the actions and their impacts is determined relative to the context of the affected environment, or project baseline, established in Section 3.5. The baseline conditions provide the framework for analyzing the importance of potential economic impacts that could result from the project.

4.5.1 Socioeconomic Impacts from the Western, Central, and Crossover Corridors

The construction costs of each of the three action alternatives would be roughly similar, approximately $70 million plus or minus $7 million. The labor costs would be approximately the same regardless of the alternative selected, and each route would require approximately the same average and peak workforce and the same period of time to construct (TEP 2003). The majority of the impacts to regional social and economic resources would be directly attributable to the size of the workforce and the total income earned. The number of jobs and amount of income indirectly created by a project is determined by the amount of new direct income spent within the ROI. The model analyzes the financial transfers associated with the action and provides the impacts in terms of income and employment. Therefore, the majority of the socioeconomic impacts from each alternative would be the same. The differences in overall project cost would affect the amount of tax revenue generated by each alternative. The greatest amount of tax revenue would be generated by the Crossover Corridor, while the Central Corridor would generate the least amount of tax revenue for local communities.

As discussed above, the majority of the socioeconomic impacts from each alternative would be the same. The construction of the proposed transmission line, the modification of the existing South Substation, and the construction of the new Gateway Substation would require an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. The project is currently scheduled to be completed 12 to 18 months after construction begins. The most recent data available indicate that the average annual salary for construction workers employed in electrical transmission line construction within the ROI was $38,327 (CBP 1999a). Total new direct income generated by the proposed transmission line construction would range from an estimated $1.7 million to $2.9 million. The final figure would depend on the duration of peak workforce employment. Should the average level of 30 individuals be used throughout, the amount of new direct income would be an estimated $1.7 million. For each month that peak construction levels of 50 individuals are employed, total new direct income would increase by an estimated $64,000. The scenario generating the greatest economic benefit to the ROI would be employment of peak construction levels for the 18-month duration of the project. In this scenario, an estimated $2.9 million in new direct income would be generated.

The average number of direct jobs created by the project, 30, would lead to the indirect creation of approximately 31 additional jobs in other sectors throughout the ROI for the duration of the project. The majority of these new indirect jobs would be created in the service and retail sectors of the local economy as most of the disposable income generated by the project would be spent in these sectors. Peak construction levels of 50 workers could increase the number of indirect jobs created to 52; however, the short duration of construction and the inherent temporary nature of the use of peak workforces would most likely keep the number of indirect jobs created closer to 31. These new indirect jobs would generate an additional $1.5 million in income during the 18-month construction period. New indirect income could reach a maximum of $2.6 million, should peak construction levels be used for the full duration of the project.

Depending on the length of time that peak construction levels are utilized, the total number of jobs created by construction of the TEP Sahuarita-Nogales Transmission Line Project would range from 61 to 102 jobs. The total income generated by the project would be at least $3.2 million with the maximum possible being $5.5 million. The additional revenue would benefit the region with an influx of capital.

Though the unemployment levels of the ROI are comparatively low at 3.2 percent, no difficulties would be experienced in filling the jobs generated by this project. The unemployment level for Santa Cruz County is 13.8 percent, which is very high, and the majority of the jobs could be filled from unemployed residents of this county. Also, the size of the workforce throughout the ROI shows that approximately 12,750 people are unemployed, which is sufficient to fill the maximum of 102 jobs that could be created by this project. Therefore, it is expected that no permanent influx of population to the ROI would be required to staff the jobs generated by this project. Since no population influx is expected to result, no new stresses would be applied to community services in the area. Existing services would be sufficient to accommodate any needs generated by this project.

Upon completion of the construction, the construction workforce would no longer be employed by this project and all indirect jobs that would be attributable to the project would no longer exist. This would not be a problem, however, for two reasons. The first is that it would be a return to current employment levels in the ROI with the exception of the extra revenue generated by the project. The second is that construction, by nature, is a temporary form of employment. Construction workers only work on a job until the project is completed and then they move on to the next project.

Operation of the facilities would require between one and five employees for maintenance, including repairs, and inspection of the facilities. The inspection and maintenance work would only occur on an occasional basis and the employees required would already be employed in this capacity within the company. No new jobs would be generated, therefore no socioeconomic impacts are expected from the operation of the facility.

The presence of a new transmission line in the Coronado National Forest would impact current uses to a certain degree. Presently, the U.S. Department of Agriculture Forest Service (USFS) generates revenue from the use of the forest and allocates 25 percent of that revenue to the State of Arizona under the 25 Percent Fund payments to states (PTS). USFS also provides Payment in Lieu of Taxes (PILT) to the state since Federal lands are not obligated to pay property taxes. The state then allocates the money to the counties based on the locations of the forests. Any impact to the forest that could affect the amount of revenue generated would affect the amount that counties receive from PTS and PILT. The proposed corridors would not reduce the amount of land available for timber use (USFS 2001b), the main source of revenue for the forests, but could potentially impact recreational use. This could have a minor influence on the overall revenue generated and slightly reduce the amount that Pima and Santa Cruz Counties receive from PTS and PILT.

New Transmission Line ROW and Access Roads

The TEP construction alternatives include acquiring easements for approximately 57 to 65 mi (92 to 105 km) of a new 345-kV transmission line right-of-way (ROW). The new ROW would either follow existing utility corridors or be routed in a new corridor location and would be 125 ft (38 m) in width. TEP would utilize existing access roads where possible; however, it is anticipated that additional access road easements would need to be acquired for each corridor.

Affected landowners would be offered market value established through the appraisal process for the transmission line and/or access road perpetual easements. The appraisal process takes all factors affecting value into consideration including the impact of transmission lines on property value. The appraisals may reference studies conducted on similar properties to add support to valuation considerations. The strength of any appraisal is dependent on the individual analysis of the property, using neighborhood-specific market data to determine market value.

TEP's transmission line easements would encumber the ROW area with land use limitations. Typical transmission line easements require the right to clear the ROW and to keep it clear of all trees, brush, vegetation, other structures, and fire and electrical hazards. The landowner can usually grow most crops with certain height restrictions or graze livestock. Tree and crop height and access to the ROW must be controlled to maintain safe distances.

The impact of introducing a new ROW for transmission towers and lines can vary dramatically depending on the placement of the ROW in relation to the property's size, shape, and location of existing improvements. A transmission line may diminish the utility of a portion of property if the line effectively severs this area from the remaining property (severance damage). Whether a transmission line introduces a negative visual impact is dependent on the placement of the line across a property as well as each individual landowner's perception of what is visually acceptable or unacceptable.

If the transmission line crosses a portion of the property in agricultural use such as pasture or cropland, little utility is lost between the towers, but 100 percent of the utility is lost within the base of the tower. Towers may also present an obstacle for operating farm equipment, and controlling weeds at tower locations. To the extent possible, new transmission lines are designed to minimize the impact to existing and proposed (if known) irrigation systems. If the introduction of a transmission line creates a need to redesign irrigation equipment or layout, TEP would compensate the landowner for this additional cost. These factors as well as any other elements unique to the property are taken into consideration to determine the loss in value within the easement area, as well as outside the easement area in cases of severance.

If TEP acquires an easement on an existing access road and the landowner is the only other user, market compensation is generally 50 percent of full fee value or something less than 50 percent if other landowners share the access road use. For fully improved roads, the appraiser may prepare a cost analysis to identify the value of the access road easement. If TEP acquires an easement for the right to construct a new access road and the landowner has equal benefit and need of the access road, market compensation is generally 50 percent of full fee value. If the landowner has little or no use for the new access road to be constructed, market compensation for the easement is generally close to full fee value. If TEP acquires an easement of Federal or state land, TEP would pay a usage fee.

4.5.2 Socioeconomic Impacts from the No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. No changes to the existing employment levels would occur beyond the existing trends (described in Section 3.5); no new income or tax revenue would be generated beyond existing trends; and no additional demands would be placed on community services in the ROI beyond existing trends as a result of the proposed project.

4.6 GEOLOGY AND SOILS

The geology and soil resource impact analysis consists of an evaluation of the potential effects generated by the construction and operation of the proposed project on specific geologic and soil resource attributes. Construction activities represent the principal means by which an effect to geologic resources (for example, limiting access to mineral or energy resources) and soil resources would occur. The principal element in assessing the effect on the geologic and soil resources is the amount and location of land disturbed during construction of the alternative, including proposed access roads, tower sites and construction areas, and project staging areas. The slope, depth below the ground surface to bedrock, and attributes of the soil within each corridor are evaluated to assess the potential construction techniques and the associated degree of land disturbance.

Methodology

Aerial and ground surveys of representative sections of each corridor were conducted to observe surficial soil and rock conditions (Terracon 2002). To determine if an action may cause a significant impact, both the context of the action and the intensity of the impact are considered. For actions such as those proposed in this document, the context is the locally affected area and significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of the relative land area disturbance based on the required construction technique, and on any unique characteristics of the area (for example, mineral resources), and the degree to which the proposed project may adversely affect such unique resources.

Geology. Impact analysis on the geologic resource by the proposed project involves the evaluation of potential effects to critical geologic attributes such as access to mineral and energy resources, destruction of unique geologic features, vibratory ground motion induced by seismic activity, subsidence induced by groundwater withdrawal, and mass movement or ground shifting induced by the construction of facilities associated with an alternative. The impact analysis includes the analysis of large-scale geological conditions such as earthquakes, volcanism, and geological resources. These conditions tend to effect broad expanses of land and typically are not restricted to smaller discrete areas of land.

Soil. Impact analysis on the soil resource by the proposed project involves the evaluation of potential effects to specific soil attributes, such as increasing the potential for erosion and compaction by construction activities. Unlike the large scale geologic conditions discussed above, effects to the soil resource occur on discrete areas of land. Surface erosion is most prevalent in areas where a highly erodible material is exposed to concentrated surface runoff.

4.6.1 Geology

4.6.1.1 *Western Corridor*

The placement of the transmission line structures and access roads would require some disturbance and removal of near-surface material, as described in Section 3.6, Geology and Soils. In siting the proposed access roads and tower locations, Tucson Electric Power Company's (TEP's) preliminary design of the project avoids prominent topographic features (such as the Castle Rock outcrop south of Peña Blanca Lake, located as shown in Figure 3.2–2). Avoiding such prominent topographic features prevents scarring of the land, and contributes to mitigation of potential visual impacts (see Section 4.2, Visual Impacts).

Because of the low relief (relatively flat landform) of most of the northern portion of the Western Corridor, the potential for slope failure would be insignificant. However, in the mountainous areas in the southern portion of the corridor (primarily in the Coronado National Forest), as discussed in Section

3.6.1, Geology, there is potential for ground failure (for example, a landslide) where the corridor crosses steep mountain ridges. Relatively intact bedrock, which is not subject to ground failure, is near to or exposed at the ground surface along the majority of the Western Corridor on the west side of the Tumacacori Mountains. These conditions should be suitable for supporting poles on a rock bolted base, in which small holes (less than 6 in [15 cm] in diameter) are drilled into the bedrock and the tower is attached with large bolts. To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected. The Western Corridor would cross limited areas where significant soil horizons would be encountered, which would require direct embedment poles. This type of pole installation requires excavation of a shaft wider than the pole using a caisson-drilling rig, and then subsequent backfilling around the pole. In soils with large cobbles (rocks) or soils that tend to collapse, a large pit is often excavated, in which the pole is placed. In such cases, a lean-concrete slurry may be required for backfill of the pit because soils with large cobbles are difficult to compact adequately (Terracon 2002). However, the total land area disturbed by either construction method is similar (an approximate 100-ft [30.5-m] radius).

Based on the Roads Analysis (URS 2003a) required by the U.S. Department of Agriculture Forest Service (USFS) for national forest land, the proposed roads that would be constructed by TEP for the Western Corridor would be on bedrock for approximately 53 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 47 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

No sand or gravel mining occurs within the Western Corridor and no active surface mines are crossed. No impact to geologic resource availability would be expected from implementation of the proposed project.

The Western Corridor is located adjacent to inactive mine tailing areas west of Sahuarita (Township 17 South, Range 13 East). Since the proposed corridor alignments are within currently existing electric transmission corridor alignments in the vicinity of the mine tailing areas, it is not expected that the mine tailing areas would be expanded into these areas in the future. Therefore, no impact to the tailing areas would be expected from implementation of the proposed project.

Although seismic risk is low to moderate, given the seismic history of the area, locations of active faults and typical recurrence intervals discussed in Section 3.1, it is unlikely that the proposed project would be threatened significantly. However, design of the proposed project would take local seismic risk into consideration to mitigate any potential damage.

4.6.1.2 *Central Corridor*

The potential impacts described above for the Western Corridor would also generally apply to the Central Corridor.

Similar to the Western Corridor, because of the low relief (relatively flat landform) of most of the northern portion of the Central Corridor, the potential for slope failure would be insignificant. A majority of the Central Corridor near and on the Coronado National Forest (approximately 10 mi [16 km] on Quaternary alluvium, as shown in Figure 3.6–1) has exposed soil at the surface rather than bedrock. Foundations for structures along the Central Corridor in these areas would most likely require direct embedment poles. The unconsolidated gravelly and cobbly soils would make excavation of the embedment zone (hole) challenging, requiring excavation of a large pit. A lean-concrete slurry would likely be required for backfill of the pit because soils with large cobbles are difficult to compact adequately. Where the southern portion of the Central Corridor intersects areas of relatively intact bedrock, rock bolting would be appropriate (Terracon 2002). To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected.

Based on the Roads Analysis (URS 2003a) required by USFS for national forest land, the proposed roads that would be constructed by TEP for the Central Corridor would be on bedrock for approximately 15 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 85 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

Similar to the Western Corridor, no impact to geologic resource availability or adjacent mine tailing areas west of Sahuarita would be expected from implementation of the Central Corridor. The design of the proposed project would take local seismic risk into consideration to mitigate any potential damage.

4.6.1.3 *Crossover Corridor*

The potential impacts described above for the Western Corridor would also generally apply to the Crossover Corridor.

In the vicinity of Peck Canyon and upon crossing other steep mountainous area, as discussed in Section 3.6.1, Geology, there is potential for ground failure in areas where bedrock is not exposed. Where the Crossover Corridor passes through Peck Canyon for approximately 7 mi (11 km), the majority of the land has bedrock exposed at the surface. It would be expected that these conditions would be suitable for supporting rock bolted poles (Terracon 2002). To ensure structure stability, TEP would conduct detailed geotechnical studies at the potential locations for tower structures to determine the suitability of specific areas, once a corridor has been selected.

Based on the Roads Analysis (URS 2003a) required by USFS for national forest land, the proposed roads that would be constructed by TEP for the Crossover Corridor would be on bedrock for approximately 53 percent of their length, and would be on unconsolidated alluvium (soil) for the remaining 47 percent of their length. Roads located on bedrock would be subject to neither erosion nor compaction and no impacts to the geologic environment would be expected. Potential impacts from roads constructed on unconsolidated alluvium are discussed in Section 4.6.2, Soils.

As for the Western Corridor, no impact to geologic resource availability or adjacent mine tailing areas west of Sahuarita would be expected from implementation of the Crossover Corridor. The design of the proposed project would take local seismic risk into consideration to mitigate any potential damage.

4.6.1.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this Environmental Impact Statement (EIS). Therefore, there would be no potential impact to geologic resources. Current geologic conditions as described in Section 3.6.1, Geology, would continue.

4.6.2 Soils

4.6.2.1 *Western Corridor*

The soils of the project area would be impacted in areas of proposed access roads, support structure sites, construction areas, and project staging areas, as described in Section 4.1, Land Use. No cultivated areas would be disturbed. The major impact would occur during construction. An increased potential for erosion and soil compaction would occur as large equipment, including heavy trucks and cranes as listed in Section 2.2, is used to install the transmission line. Clearing of the right-of-way (ROW), where necessary, would decrease vegetation cover and may increase erosional factors, while extended and continued use of large equipment may compact the soil. Compaction of the soil can lead to rutting of the road surfaces.

Based on the Roads Analysis (URS 2003a) required by USFS for national forest land, for the Western Corridor, the new temporary area of disturbance during construction would be approximately 197 acres (78.5 ha), and the new permanent area of disturbance would be approximately 29.3 acres (11.9 ha). Information regarding site-specific conditions where individual roads are planned would be used during design and construction of the new roads to calculate and minimize erosion. Only spot repairs would be necessary on existing Forest System roads, as shown in Figure 3.12–1. Repairs of existing roads would likely have a positive impact because the upgrades would reduce erosion potential. On new proposed access roads, these soils would be compacted from vehicles and erosion potential could increase over the non-developed condition. In areas where slopes are mild, soil erosion impacts are expected to be minor.

TEP is in consultation with USFS regarding development of BMPs for minimizing impacts (on geologic, soil, and water resources) from the proposed project, in accordance with the USFS “Soil and Water Conservation Practices Handbook” (USFS 1990). Specific BMPs would be identified after coordination with the Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, for the entire length of the selected corridor. TEP’s ongoing consultation with land owners and managers includes parameters for new road construction (URS 2003a). These road parameters include issues such as sideslopes, grades, water bars and rolling dips (to divert water off the roads), width, and road closure. Erosion control measures included in the BMPs would also address areas where slopes are such that soil erosion is a potential concern, and areas where wind related erosion is a concern.

The Western Corridor would cross soils considered to be prime farmland when irrigated. Although the exact placement of the structures cannot be determined at this time, much of the potential prime farmland soils would be spanned by the power line, as opposed to being directly converted to land within the structures footprint. As shown on Table 4.1–1, the estimated total footprint of the structures for the Western Corridor is 0.25 acres (0.1 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.25 acres (0.1 ha).

4.6.2.2 *Central Corridor*

The expected impacts to soil resources and erosion control mitigation for the Central Corridor would be similar to those discussed above for the Western Corridor. The Central Corridor would disturb an area cultivated as permanent pasture for an estimated 0.5 mi (0.8 km) near where it crosses Sopori Wash (see Figure 3.7–1). The primary difference from the Western Corridor would be in the area of land affected by construction and operation of the Central Corridor. For the Central Corridor on the Coronado National Forest, the new temporary area of disturbance during construction would be approximately 105 acres (42.5 ha), and the new permanent area of disturbance would be an estimated 23.1 acres (9.35 ha) (URS 2003a). Spot repairs of existing roads would likely have a positive impact, as erosion potential would be expected to decrease as a result of the upgrade. Specific BMPs would be identified after coordination with USFS and ADEQ, and before implementation of the project, for the entire length of the selected corridor.

The potential for impacts to prime farmland soils along the Central Corridor is the same as discussed in Section 4.6.2.1 for the Western Corridor. The estimated total footprint of the structures, as shown on Table 4.1–1, for the Central Corridor is 0.21 acres (0.08 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.21 acres (0.08 ha).

4.6.2.3 *Crossover Corridor*

The expected impacts to soil resources and erosion control mitigation for the Crossover Corridor would be similar to those discussed above for the Western Corridor. No cultivated areas would be disturbed. The primary difference would be in the area of land affected by construction and operation of the Crossover Corridor. For the Crossover Corridor on the Coronado National Forest, the new temporary area of disturbance during construction would be an estimated 238.4 acres (96.5 ha), and the new permanent area of disturbance would be an estimated 36.4 acres (14.7 ha) (URS 2003a). Spot repairs of existing roads would likely have a positive impact, as erosion potential would be expected to decrease as a result of the upgrade. Specific BMPs would be identified after coordination with USFS and ADEQ, and before implementation of the project, for the entire length of the selected corridor.

The potential for impacts to prime farmland soils along the Crossover Corridor is the same as discussed in Section 4.6.2.1 for the Western Corridor. The estimated total footprint of the structures, as shown on Table 4.1–1, for the Crossover Corridor is 0.25 acres (0.1 ha). Thus, the total acreage of prime farmland soils potentially affected by the structures is less than 0.25 acres (0.1 ha).

4.6.2.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. No cultivated areas or prime farmland soils would be disturbed and erosion and resultant sediment transport would continue naturally in undisturbed areas.

4.7 WATER RESOURCES

This section discusses the potential impacts of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line project to water resources in the project area for each alternative. The discussion is divided into potential impacts to surface water and groundwater.

4.7.1 Floodplains, Wetlands, and Surface Water

The following discussion of floodplains and wetlands applies to all three proposed corridors. Information specific to surface water impacts and floodplains and wetlands impacts in the Western, Central, and Crossover Corridors is presented separately following the general discussion.

As the proposed location for the transmission line structures for any of the three alternatives is over 400 ft (122 m) from the U.S.-Mexico border, surface drainage would not be affected and no increase in volume, peak runoff, or flow, in either direction across the border would occur from the proposed construction.

Floodplains and Wetlands. A Floodplains and Wetlands Assessment, per Title 10, *Code of Federal Regulations* (CFR), Part 1022, *Compliance with Floodplain/Wetlands Environmental Review Requirements*, has been conducted for the proposed project and is included in Appendix C of this Draft Environmental Impact Statement (EIS). A summary of potential impacts and mitigation follows; refer to Appendix C for more information.

The following discussion evaluates the potential impacts of each alternative to floodplains in the project area. No wetlands were found in the proposed corridors during field surveys and none have been identified by U.S. Department of Agriculture Forest Service (USFS) (USFS 2003). There may be small areas of wetlands within the proposed corridors that are associated with manmade stock ponds and impoundments. TEP would site the transmission line to avoid such areas. Therefore, no wetlands would be impacted by the proposed project. The discussion of impacts to floodplains is organized by geographic area in order to take advantage of geographic overlap between the three corridor alternatives: Western, Crossover, and Central. These geographic areas are the North Segment, North Central Segment, South Central Segment, East-West Segment, and South Segment (labeled on Figure 3.7–3). Common to all three corridor alternatives are the North Segment and the South Segment.

The following sources were used to determine the 100-year floodplain: Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), county soil survey maps, and consultation with the USFS Coronado National Forest. The FIRM maps indicate that the following tributaries occurring in the project area could be part of the 100-year floodplain: Sopori, Toros, Diablo, Las Chivas, and Mariposa Canyon Wash (see Figure 3.7–3). Additional unmapped floodplains may also occur in the project area. In those areas where the regulatory floodplains have not been delineated, the county engineer may require the project proponent to establish the regulatory floodplain and floodway limits through a hydrologic and hydraulic study prepared by an Arizona registered professional civil engineer.

All three proposed corridors involve some construction in floodplains. The four activities that would be conducted in floodplains are pole placement, the construction of pole laydown areas, access roads, and the South Substation expansion (located in the North Segment of all three corridors). For the purposes of this assessment, the following assumptions were made regarding these potential impacts: (1) the impact of individual pole placement would be 25 ft^2 (2.3 m^2) (see Table 4.1–1 for overall pole footprints); (2) pole laydown areas would each require about 1,850 ft^2 (172 m^2); (3) access roads would be 12 ft (3.7 m) wide; and (4) the South Substation expansion would require 58,500 ft^2 (5,440 m^2). Projected impacts to floodplains were based on maps provided by Electrical Consultants Inc. showing locations of poles, pole laydown areas, and access roads (ECI 2003).

As permanent structures in floodplains, the South Substation expansion and corridor access roads could directly impact floodplain functions and values by increasing flood elevation and frequency. An increase in flood elevation could result in an increase in downstream flood loss and a long-term negative impact on lives and property. Impacts resulting from pole placement and construction of laydown areas would be negligible. Neither activity would negatively impact flood elevation or flood frequency. Consequently, there would be no direct or long-term effects on floodplain values or lives and properties.

Table 4.7–1 shows the estimated area of each proposed corridor that could be in the 100-year floodplain (refer to Appendix C for additional details). The Western and Crossover Corridors would have the greatest potential impact on floodplains in the project area. For these two alternative corridor routes, total potential impact within the 100-year floodplain is estimated at about 1.97 acres (0.80 ha). The Central Corridor would have the least impact to the 100-year floodplain (an estimated 1.58 acres [0.64 ha]).

Table 4.7–1. Estimated Impacts to Floodplains by Alternative.

Segment	Western (acres)	Crossover (acres)	Central (acres)
North	1.34	1.34	1.34
North Central	0.54	0.54	0.15
South Central	0.00	0.00	0.00
East-West	-	0.00	-
South	0.09	0.09	0.09
TOTAL	**1.97**	**1.97**	**1.58**

"-" means corridor does not pass through this segment.

Impacts to floodplains would be avoided to the extent possible by siting access roads and pole laydown areas outside floodplains, and spanning floodplains where feasible. Impacts to floodplains resulting from the South Substation expansion would be unavoidable, however, because the South Substation was originally constructed in the 100-year floodplain, and the proposed project is designed to connect to the existing electrical grid at this location. In the case of Sopori Wash (see Figure 3.7–3), for any of the three corridors TEP would place one structure within the 100-year floodplain, though outside the normal flow line, as this wash is too wide to span across. The structure would be engineered to withstand a 100-year flood. In addition, for the Crossover Corridor an estimated two structures would be placed in the bottom of Peck Canyon, as described in Section 4.7.1.3.

TEP would be required to comply with Pima and Santa Cruz County floodplain protection standards. These standards require that all structures associated with the power line installation be flood-proofed or elevated at least 1 ft (0.3 m) above the base flood elevation. In the project area, this would apply to the South Substation expansion and corridor access roads that cross the floodplain. The support structures, though permanent structures, would not require any specific mitigation since they would not have an effect on flood elevations. Similarly, the pole laydown areas would not affect flood elevations because they would be temporary. Finally, obtaining a Floodplain Permit for this project would be contingent on concurrent acquisition of any *Clean Water Act* (CWA) Section 401 (state certification) and 402 (National Pollutant Discharge Elimination System) permits, if necessary.

Placement of roads within the floodplain can restrict transport of organic and inorganic materials, divert streamflow, and constrain natural channel migration. These factors can result in alteration or degradation of stream habitats, as well as physical damage to the landscape as a whole. Because the location and physical attributes of drainage channels are dynamic, appropriate placement of roads and other structures must account for movement of geomorphic (surface) features within the floodplain. Information regarding site-specific conditions on where proposed roads would approach floodplains would be used during the design and construction of these roads in order to ensure that the design best protects the integrity of channel and floodplain dynamics. Although flash floods could occur in narrow washes, they would not be expected to impact the transmission towers, as the towers would be located to span across such washes.

Surface Water. The following discussion describes potential surface water impacts and mitigation for each of the three proposed corridors. Surface waters include the tributaries identified in the previous section (Floodplains and Wetlands) that could be part of the 100-year floodplain.

4.7.1.1 *Western Corridor*

The Western Corridor would cross numerous dry washes, many very small, and approximately 15 large washes, both within and outside of the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, including one minor drainage on Bureau of Land Management (BLM) land. Potential impacts to surface waterbodies would be from increased erosion and subsequent siltation due to construction activities around these areas. Although the exact placement of the structures has not yet been identified, TEP would span the surface water features and avoid placing structures adjacent to surface water features where feasible, except as noted previously for Sopori Wash.

Access roads to the proposed project, both for construction and ongoing maintenance, would traverse numerous washes, including approximately 134 drainages and washes on the Coronado National Forest along the Western Corridor. Proposed access roads would be designed in accordance with Best Management Practices (BMPs) (and USFS guidance on national forest lands) to minimize impacts to washes (URS 2003a). Potential effects related to stream crossings include increased sedimentation, changes in stream morphology including substrate composition, and changes in the ability of the stream to support vegetation and wildlife. Because drainage along the corridor is intermittent and the road use would also be intermittent, roads would generally not need culverts or bridges where they cross streams. Therefore, stream crossings should not interfere with material transport (wood, fine organic matter, sediment) in streams. The road system could create a potential for pollutants (primarily from motorized vehicles) to reach surface waters, when water flow occurs at stream crossings in locations where road drainage flows directly into a stream. However, as the stream network is intermittent, road-stream crossings are limited, and expected vehicle use is infrequent, the potential for pollutants to enter surface waters as a result of the proposed project is negligible. All construction equipment would be refueled no closer than 500 ft (150 m) from a wash or drainage (URS 2003a).

Road effects on the surface and subsurface hydrology of a given area include potential diversion and concentration of flow. Road design including water bars, rolling dips, and hardened crossings would be developed in coordination with the land owners and managers (for example, USFS, as part of the Special Use Permit process).

TEP is in consultation with USFS regarding development of BMPs for minimizing impacts on geologic, soil, and water resources from the proposed project on national forest lands, in accordance with the USFS "Soil and Water Conservation Practices Handbook" (FSH 2509.22, R-3 Transmittal, USFS 1990). Specific BMPs would be identified after coordination with Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, to mitigate potential impacts for the entire length of the selected corridor. BMPs would include standard erosion control methods such as silt fencing and hay bales in areas where erosion into surface water drainages could occur.

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

4.7.1.2 *Central Corridor*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply for the Central Corridor. The Central Corridor would cross numerous dry washes, many very small, and approximately 14 large washes, both on and off the Coronado National Forest. On the Coronado National Forest, access roads to the proposed project, both for construction and ongoing maintenance would traverse numerous washes, including approximately 21 drainages and washes along the Central Corridor (URS 2003a).

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

4.7.1.3 *Crossover Corridor*

The potential impacts to surface water resources and mitigation discussed in Section 4.7.1.1 for the Western Corridor also generally apply for the Crossover Corridor. The Crossover Corridor would cross numerous dry washes, many very small, and approximately 14 large washes, both on and off the Coronado National Forest. Two proposed towers within the Peck Canyon segment would be located in the bottom of the wash due to the steep terrain of the area limiting potential structure base locations. The tower foundations and associated sediment deposition and streambed vegetation could disrupt channel hydraulics during flood debris flow events. This would force flow against the valley walls, potentially resulting in increased erosion. The probability of this occurring should be evaluated in more detail if the Crossover Corridor is selected for construction (URS 2003a). On the Coronado National Forest, access roads to the proposed project, both for construction and ongoing maintenance would traverse numerous washes, including approximately 86 drainages and washes along the Crossover Corridor (URS 2003a).

Application of BMPs for road and tower construction, revegetation for roads not needed for ongoing maintenance, and spot repairs of existing roads would mitigate the potential for impacting USFS water resource parameters (see Section 3.7) on the Coronado National Forest.

4.7.1.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. Current water resource patterns would continue, as described in Section 3.7.1.

4.7.2 Groundwater

4.7.2.1 *Western Corridor*

During construction of the project, water would be required primarily for dust control. Groundwater may be used, with the specific water sources to be determined upon precise siting of the right-of-way (ROW). It is estimated that approximately 1 acre-ft would be used during the course of construction process. This water would be obtained from various sources and aquifers within the project area. Although the exact sources are not known, removal of this minimal quantity of groundwater would not have a noticeable effect on groundwater supply in the region. For comparison, the total groundwater demand in the Santa Cruz Active Management Area in 2000 was 54,100 acre-ft.

During construction of the project, the storage and use of fuel, lubricants, and other fluids during the construction phase of the facilities and access roads could create a potential contamination hazard. Spills or leaks of hazardous fluids could contaminate groundwater and affect aquifer use. This impact would be minimized or avoided by restricting the location of refueling activities and by requiring immediate clean-up of spills and leaks of hazardous materials. In this manner any potentially contaminating materials would be removed before they could migrate downward to the groundwater. In addition, the generally large depth to groundwater in the project area further limits the potential for groundwater contamination from surface spills. In the event of a spill, TEP would notify the appropriate state (ADEQ) and local officials, and the affected landowner, while initiating emergency response actions.

Oil and diesel fuel would be stored in clearly marked tanks onsite that would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed by a contractor to an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with manufacturer’s recommendations. Paint containers would be tightly sealed to prevent leaks or spills. Excess paint would be disposed of consistent with the manufacturer’s recommendations and according to applicable governmental regulations.

4.7.2.2 *Central Corridor*

The groundwater issues described for the Western Corridor also apply to the Central Corridor.

4.7.2.3 *Crossover Corridor*

The groundwater issues described for the Western Corridor also apply to the Crossover Corridor.

4.7.2.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. TEP would generate no additional wastes and the potential for effects on local groundwater would be eliminated. Current trends in groundwater usage and subsidence would continue, as described in Section 3.7.2.

4.8 AIR QUALITY

This section includes discussion of the potential effects of the emissions of the proposed project on air quality, the conformity analysis required under the *Clean Air Act* (CAA), and the potential particulate matter contributions to the United States that could result from construction of Mexico's connecting portion of the transmission line to be built in Mexico. The methodology for determining impacts is presented, along with a description of the construction and operation impacts for each alternative.

4.8.1 Emissions

Methodology

The air quality impacts discussion focuses on the construction phase of the project as the primary activity with the potential to impact air quality. This evaluation includes potential air emissions that could occur during construction of each alternative from fugitive dust (dust which escapes from a construction site) and equipment exhaust. Potential air impacts are evaluated for both project construction in the U.S. and for impacts in the U.S. that could be caused by air emissions transported to the U.S. from construction of Mexico's connecting portion of the transmission line to be built in Mexico. The projected construction progression, local climate and soil conditions, and project area land use are considered in assessing the significance of air quality impacts associated with the proposed project. Mitigation measures to avoid potential nuisance dust conditions and minimize construction equipment impacts to nearby residents are also described.

4.8.1.1 *Western Corridor*

The potential for effects on air quality associated with the Western Corridor would occur primarily during the construction phase. Fugitive dust emissions would result from construction along the transmission line right-of-way (ROW) at the South and Gateway Substations and staging areas, and at other construction areas as described in Section 2.2.3, Transmission Line Construction. The major sources of dust emissions would be construction equipment traffic, land clearing, drilling, excavation, and earth moving. Tucson Electric Power Company (TEP) anticipates that some explosives blasting would be required depending on geological conditions. Dust emissions would vary substantially from day to day, depending on the level of activity, the specific operation, and the prevailing meteorological conditions. The use of construction equipment would also result in the emission of air pollutants associated with diesel combustion (NO_x [nitrogen oxides], CO [carbon monoxide], SO_x [sulfur oxides], PM_{10} [particulate matter with an aerodynamic diameter less than or equal to 10 microns] and reactive organic gases [ROG] from the fuel). All construction vehicle movements would be limited to the ROW or to pre-designated staging areas or public roads. Roads and active areas would have watering requirements appropriate for dust control in arid regions. An Activity Permit would be obtained from the Pima County Department of Environmental Quality for construction activities. The Arizona Administrative Code (AAC) contains dust control requirements for activities in Santa Cruz County, although no "dust control permit" would be required for activities in Santa Cruz County (Yockey 2001). Given the limited emissions of the project, it would not be subject to New Source Review (NSR) permitting under the CAA.

The Western Corridor crosses primarily undeveloped land. A limited number of residents in the vicinity of the ROW may be affected by a temporary adverse impact on their local air quality during construction. The average duration a construction site would be active adjacent to any one residence or business is 2 to 3 months. Construction is estimated to be completed in 10 months; however, due to potential restrictions on construction during fauna breeding and nesting seasons, construction could be spread over 12 to 18 months. No air quality impact associated with construction at any Class I Areas, or impacts to overall climate, would be expected from the proposed project. Construction generated dust would settle out of the air within a distance of several miles from the project, thus avoiding visibility impacts at the Saguaro National Monument East Class I area, 18 mi (29 km) north of TEP's South Substation in Sahuarita. Given that the construction would be temporary and the adjacent land is primarily undeveloped, no significant impacts are expected to occur from construction.

No significant air impacts are expected from ongoing operation and maintenance of the Western Corridor. An occasional maintenance vehicle would be required to perform maintenance activities. Where maintenance access roads are not required, restoration of the ROW to natural vegetation would mitigate any fugitive dust emissions. The potential would exist for trace amounts of ozone production resulting from corona effects, the electrical breakdown of air into charged particles around the conductors, as explained in Section 3.10.2, Corona Effects. During damp or rainy weather (the peak conditions for corona effects), the ozone produced from similar transmission lines is less than 1 part per billion (ppb) (DOE 2001a). Background ozone measurements under the direction of the Arizona Department of Environmental Quality (ADEQ) in similar rural areas show 8-hour average ozone levels in the range of 70 to 80 ppb, considerably higher than levels generated by corona effects (Yockey 2001). Thus, no significant effects to air quality would be associated with the operation along the Western Corridor. Corona would be mitigated by using proper line design and by incorporating line hardware shielding.

4.8.1.2 *Central Corridor*

The potential for impacts to air quality associated with the construction and operation of the Central Corridor would be very similar to those for the Western Corridor. An increased number of residents may be temporarily affected by fugitive dust during construction of the Central Corridor. Given the temporary nature of construction and the limited impacts during operation, no significant effects to air quality would be associated with the Central Corridor, and it would not be subject to NSR permitting under the CAA.

4.8.1.3 *Crossover Corridor*

The potential for impacts to air quality associated with the construction and operation of the Crossover Corridor would be very similar to those for the Western Corridor. Given the temporary nature of construction and the limited impacts during operation, no significant effects to air quality would be associated with the Crossover Corridor, and it would not be subject to NSR permitting under the CAA.

4.8.1.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this Environmental Impact Statement (EIS). Current air quality trends would be expected to continue, as described in Section 3.8, Air Quality.

4.8.2 CAA Conformity Requirements

Section 176(c) of the CAA requires Federal agencies to ensure that their actions conform to applicable implementation plans (in most cases, the State Implementation Plan [SIP]) for achieving and maintaining the National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The State of Arizona General Conformity regulations (R18-2-1438) contain procedures and criteria for determining whether a proposed Federal action would conform to the SIP required by the CAA. (Arizona's General Conformity regulations are identical to, and reference, 40 CFR Part 93, Subpart B.) The regulations apply to a proposed Federal action that would cause emissions of criteria air pollutants above certain levels for the emitted pollutants, in non-attainment or maintenance areas (areas redesignated as attainment within the last 10 years). DOE's guidance document, *CAA General Conformity Requirements and the NEPA Process*

(DOE 2000), outlines the specific steps for addressing CAA conformity requirements in *National. Environmental Policy Act* (NEPA) documents such as this EIS

For the proposed Sahuarita-Nogales Transmission Line project, the potential actions of Federal agencies included in this EIS (see Section 1.2.2) are as follows:

- U.S. Department of Energy (DOE) – the granting of a Presidential Permit
- U.S. Department of Agriculture Forest Service (USFS) – the granting of a special use permit
- Bureau of Land Management (BLM) – the approval of TEP's application to cross Federal lands managed by BLM

There are two phases to addressing CAA conformity requirements. In the first phase, the conformity *review* process, the Federal agency evaluates whether the conformity regulations would apply to an action (which, in turn, determines if the second phase of analysis is required). The second phase of analysis is the conformity *determination* process, in which the Federal agency demonstrates (often through extensive analyses) how an action would conform to the applicable implementation plan. For the proposed project, DOE, as the lead Federal agency, has conducted a conformity review for each analyzed alternative (the Western, Central, and Crossover Corridors), and has determined that a conformity determination would not be required for implementation of any of these alternatives. To the extent that the final alternative selected differs significantly from the assumptions utilized in the conformity review, the conformity review may need to be revisited before construction of the alternative.

There are two areas for which a conformity review is required, as shown in Figure 3.8–2: (1) the Nogales area, designated as being in moderate non-attainment of the NAAQS for PM_{10}, and (2) a CO maintenance area located near Tucson. The PM_{10} non-attainment area encompasses Township 23 South, Ranges 13 to 14 East, and Township 24 South, Ranges 13 to 14 East, and includes portions of the proposed transmission line, project access, and the Gateway Substation. The CO maintenance area includes Township 16 South, Ranges 12 to 16 East, and runs adjacent to the north of a segment of the proposed transmission line and the South Substation. As stated in Section 4.8.1, both PM_{10} (a component of fugitive dust) and CO would be emitted under each alternative. Thus, PM_{10} and CO are identified as the pollutants of concern for the conformity review.

For the conformity review of each alternative, the total emissions were estimated for each pollutant of concern within the non-attainment or maintenance area for that pollutant. Because the project emissions during operation would be limited to those from occasional maintenance vehicles or equipment, the maximum year of project emissions calculated for the conformity review are those that would occur during a full year of project construction. (Construction is estimated to be completed in 10 months; however, due to potential restrictions on construction during fauna breeding and nesting seasons, construction could be spread over 12 to 18 months). To be conservative in terms of estimating the maximum emissions that could possibly occur, a one-year period for project construction was assumed, with scheduled 6-day work-weeks and with no allowance for work-days lost to bad weather, time off, or holidays. The emissions included within the conformity review are as follows: (1) PM_{10} fugitive dust emission from construction and use of project access (including access road grading), staging areas, and tower and substation areas, (2) PM_{10} and CO vehicle emissions from construction access vehicles and heavy construction equipment, (3) PM_{10} and CO emissions from explosives blasting for tower and access construction, (4) emissions from the personal vehicles of construction workers traveling to and from the project staging sites, and (5) emissions from any increase in recreational use (for example, by off-highway vehicles) of the project area as a result of the proposed project.

In accordance with 40 CFR 93.153 (b), the total emissions estimates of each alternative were compared to the applicable threshold emissions rates for the pollutants of concern, as listed in Table 4.8–1. For both PM_{10} and CO, the applicable threshold emission rate is 100 tons per year (tpy) (91 metric tons, or tonnes, per year [mtpy]). If the total emissions estimates are equal to or greater than the threshold emission rates for any pollutant of concern, a conformity determination would be required.

In addition, according to 40 CFR 93.153 (i) and (j), the total emissions estimates of each alternative are compared to the non-attainment and maintenance area's total emissions (that is, the listing of air pollutant emissions in the U.S. Environmental Protection Agency [EPA]-approved SIP) for the pollutants of concern. If the total emissions estimates are equal to or greater than 10 percent of the emissions inventory for a pollutant of concern, the proposed project would be considered a "regionally significant action" and a conformity determination would be required.

For the Nogales PM_{10} non-attainment area, the SIP that ADEQ submitted to EPA in 1993 did not contain air pollutant emissions estimates, and thus EPA has not taken action to approve this portion of the SIP. Therefore, there is no PM_{10} emissions inventory available for the Nogales PM_{10} non-attainment area (ADEQ 2003a) that would allow a regionally significant level to be formally derived.

For the Tucson CO maintenance area, the EPA-approved SIP includes a Limited Maintenance Plan that does not establish an emissions inventory for CO. The Limited Maintenance Plan was developed with the support of the Pima Association of Governments, that estimated the mobile source emissions of CO (that is, from personal and commercial vehicles), constituting a majority of the CO emissions in the maintenance area. The estimated CO mobile source emissions for the maintenance area for 2003 are 325.1 tons per day, or 118,661 tpy (107,647 mtpy) (EPA 2000a). Therefore, 10 percent of 118,661 tpy (107,647 mtpy), that is, 11,866 tpy (10,765 mtpy), may be regarded as the emissions level above which the proposed project may be considered a regionally significant action. This regionally significant level for the Tucson maintenance area CO emissions is listed in Table 4.8–2.

Table 4.8–1. Regulatory Threshold Emission Rates for PM_{10} and CO.

Criteria Pollutant and Air Quality Classification	Threshold Emission Rates (tons per year)
PM_{10} Moderate Non-attainment Area	100
CO Maintenance Area	100

Source: 40 CFR 93.153[b].

Table 4.8–2. Regionally Significant Action Level of PM_{10} and CO.

Criteria Pollutant	Emission Rates (tons per year)
PM_{10}	(no EPA-approved SIP)
CO	11,866

EPA = U.S. Environmental Protection Agency; SIP = State Implementation Plan
Source: EPA 2000a, EPA 2003b

The following background assumptions were made for estimating the fugitive dust emissions, equipment and vehicle emissions, and explosives blasting emissions for the Western, Central, and Crossover Corridors. Where precise information is not known conservative assumptions (potential overestimates) are used.

- There would be an estimated 18.8 mi (30.3 km) of unpaved project access roads for the Western Corridor, and 11.6 mi (18.7 km) for the Central and Crossover Corridors, within the Nogales non-attainment area. Access roads would be 12 ft (3.6 m) wide.

- There would be 57 support structures in the Western Corridor within the Nogales PM_{10} non-attainment area, and 65 support structures in the Central and Crossover Corridors within the Nogales PM_{10} non-attainment area.

- Each structure site would require a 100 by 200 ft (30 by 60 m) assembly area, which in some cases would overlap with the tower construction areas described in the following bullet item.

- Ten percent of the structures would be lattice towers (requiring 80,000 ft^2 [7,400 m^2] per tower for construction), and the remaining 90 percent would be monopoles (requiring 31,415 ft^2 [2,920 m^2] per tower for construction). Given the overlap of these tower construction areas with some of the tower assembly areas (in the previous bullet item), the net tower construction areas are reduced by 25 percent each for use in the emissions calculations.

- There would be a total of two tensioning/pulling sites (each 150 by 250 ft [46 by 76 m]) under active construction or use at any one time within the Nogales non-attainment area for any of the three proposed corridors.

- Construction along the Western, or Central, or Crossover Corridors would last one full year and would proceed at a steady rate along the entire length of the transmission line that is selected. There would be two construction crews within the Nogales PM_{10} non-attainment area, and one construction crew within the Tucson CO maintenance area, that would be working a maximum of 6 days a week throughout a year, or 313 days per year. Down time from bad weather, holidays or time off is conservatively assumed to be zero. Thirteen percent of the segment of the Western Corridor within the Nogales PM_{10} non-attainment area would be under construction at any one time, and 17 percent of that segment of the Central and Crossover Corridors that lies within the Nogales PM_{10} non-attainment area would be under construction at any one time.

- Construction at the Gateway Substation would last for 7 months of 6 day work-weeks.

- Of the 18 acres (7.3 ha) of the TEP portion of the Gateway Substation,10 acres (4 ha) would be fenced for construction, and 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time during the 7 month construction period.

- An additional 3 acres (1.2 ha) at the staging area adjacent to the Gateway Substation would be engaged in construction activities for 3 months of 6 day work-weeks.

- Each construction crew would utilize the following equipment continuously for 8 hours each day: one planer or bulldozer, one scraper, one wheeled loader, one off-highway truck, one loader, one excavator, one concrete paver, one crane, and one water spray truck (see Figure 2.2–1 for representative photographs of the proposed construction equipment).

- All emissions estimates and assumptions, unless otherwise stated, are based on EPA's Compilation of Air Pollutant Emission Factors (AP-42, EPA 1995). To calculate the fugitive dust emissions rate, the daily emissions rate of 80 pounds of total suspended particulate matter (TSP) per acre of active construction per day (90 kg per ha per day) was multiplied by the percentage of PM_{10} in TSP, which varies with soil type (Wild 1993). The proposed project would cross a range of soil types, as shown in

Figure 3.6–5, from sandy loams (10 to 30 percent PM_{10}) to clay loams (30 to 50 percent PM_{10}). The highest possible percentage of PM_{10} was conservatively assumed to be the 50 percent maximum.

- TEP would employ dust control measures on unpaved roads and in work areas. A control efficiency of 50 percent was assumed for typical dust control measures, such as watering roads and work areas, in an arid climate. This conservative estimate is based on EPA dust control efficiency assumptions for similar climates, ranging from 54 to 75 percent dust control (EPA 2002).

- In addition to the construction crews, there would be two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction.

- The 80-acre (32-ha) construction lay down yard would be near the Arivaca Road and I-19 interchange, approximately 20 mi (32 km) outside of both the Nogales PM_{10} non-attainment area and the Tucson CO maintenance area.

The emissions estimates for the pollutants of concern, and the results of the comparisons of the emissions to the threshold emissions rates and the area's emissions inventory, are presented in the following sections.

4.8.2.1 *Western Corridor*

The length of the Western Corridor within the Nogales PM_{10} moderate non-attainment area would be approximately 8.3 mi (13.4 km) and would include an estimated 57 support structures. Also within the Nogales PM_{10} moderate non-attainment area would be the Gateway Substation. TEP owns 18 acres (7.3 ha) at the Gateway Substation of which a subset of 10 acres (4 ha) would be fenced off for construction; of these 10 fenced acres a maximum of only 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time. There would also be a 3-acre (1.2-ha) staging area adjacent to the Gateway Substation that would be used for 3 months. The South Substation and approximately 1 mi (1.6 km) of the project corridor common to all three alternatives are just inside the Tucson CO maintenance area.

Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line in the Western Corridor within the PM_{10} non-attainment area would be approximately 12 acres (5 ha). This area would include support structure construction and access roads. This would result in maximum PM_{10} emissions of approximately 37.1 tpy (33.6 mtpy). Maximum PM_{10} emissions from 5 acres (2 ha) within the 10-acre (4-ha) fenced area of the Gateway Substation under continuous construction for seven months are estimated to be approximately 9.2 tpy (8.3 mtpy). Maximum PM_{10} emissions from the Gateway staging area are estimated to be approximately 2.3 tpy (2.1 mtpy). The maximum PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 4.0 tpy (3.6 mtpy) within the Nogales PM_{10} non-attainment area.

TEP anticipates that some explosives blasting may be required during construction depending on geologic conditions. While CO is the pollutant produced in the greatest quantities from explosives detonation, some PM_{10} is also generated (EPA 1995). Explosives blasting would be limited to one or two blasts per day on average, as needed, in areas of tower or access construction. As explosives are most efficiently used by containing the blast energy in the ground to fracture the rock, the fugitive dust (and PM_{10}) generated at the ground surface from explosives blasting would be minimal. The charge would be limited to fracturing rock in a small area and discharge of material would be limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust. The typical depth of explosives charges that would be utilized by TEP would be approximately 3 ft (0.9 m) below ground level. The ground disturbance associated with explosives blasting operations would be captured in the fugitive dust calculations previously described for the PM_{10} non-attainment area.

Maximum PM_{10} emissions from two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction are estimated to be approximately 7.3 tpy (6.6 mtpy). Emissions from the personal vehicles of construction workers traveling to and from the project staging sites would be minimal given that access to the staging sites is primarily paved. The maximum number of construction workers would be approximately 50. Assuming workers would travel 0.5 mi (0.8 km) each way on unpaved roads to reach one of the three staging sites, there would be 17 vehicle miles (27 vehicle km) traveled each day at a particular staging site. Given an AP-42 estimate of 1.74 lbs PM_{10} per vehicle mile (0.79 kg per vehicle kilometer) traveled, worker vehicle PM_{10} emissions would be an estimated 2.3 tpy (2.1 mtpy) within the Nogales PM_{10} non-attainment area. Any increase in indirect emissions associated with increased recreational use of the project area would be minimal given the existing opportunities for recreational vehicle use in the project area (see Section 4.1.2).

Thus, the total PM_{10} emissions would be approximately 62 tpy (56 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

For the CO maintenance area, the direct emissions sources included in the calculations are from equipment and vehicle emissions and explosives blasting. Assuming that one construction crew is active all year within or adjacent to the CO maintenance area, and based on AP-42 construction vehicle emission factors and the equipment and usage factors given in the assumptions, the CO emissions would be an estimated 11.5 tpy (10.4 mtpy).

CO is the pollutant produced in the greatest quantities from explosives detonation. For ammonium nitrate and fuel oil, the explosives commonly used for construction work, approximately 67 pounds of CO would be emitted for each ton of rock blasted (EPA 1995). Assuming that TEP performs 25 blasts of 10 tons (9.1 metric tons) of rock each, in the area within or adjacent to the CO maintenance area, the resulting CO emissions would be an estimated 8.4 tpy (7.6 mtpy).

Emissions from construction workers' personal vehicles reporting to one of the three project staging sites could also contribute CO to the Tucson maintenance area depending on where the workers live. Assuming that the construction workers reporting to the South Substation staging area would drive 15 mi (24 km) each way in the Tucson CO maintenance area, and given EPA's factor of 0.046 lbs CO per mi (0.013 kg per km), maximum annual emissions of CO would be an estimated 4.3 tpy (3.9 mtpy) (EPA 2000b). Thus, the maximum year of emissions could result in an estimated 24.2 tpy (21.9 mtpy) of CO emissions immediately adjacent to or within the Tucson CO maintenance area. This emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy) that would trigger a conformity determination. This emissions rate would also be below the regionally significant source emissions threshold rate of 11,866 tpy. Therefore, a conformity determination for the proposed project within the Tucson CO maintenance area would not be required.

4.8.2.2 *Central and Crossover Corridors*

The Central and Crossover Corridors are identical within the Nogales PM_{10} non-attainment area, and are addressed by a single conformity review that follows for the PM_{10} non-attainment area. The Central and Crossover Corridors are the same as the Western Corridor with respect to the Tucson CO maintenance area; therefore, the assumptions, emissions estimates, and conclusion described in Section 4.8.2.1 that a conformity determination would not be required for the proposed project adjacent to the CO maintenance area also apply for the Central and Crossover Corridors.

The Central and Crossover Corridors within the Nogales PM_{10} moderate non-attainment area would be approximately 10.5 mi (16.9 km) long and would include 65 support structures. TEP owns 18 acres (7.3 ha) at the Gateway Substation of which a subset of 10 acres (4 ha) would be fenced off for construction, and, of these 10 fenced acres, a maximum of only 50 percent (that is, 5 acres [2 ha]) would be under construction at any one time. There would also be a 3-acre (1.2-ha) staging area adjacent to the Gateway Substation that would be used for 3 months.

Based on the previously stated assumptions, the construction area under active construction at any one time for the transmission line in the Central Crossover Corridor within the PM_{10} non-attainment area would be approximately 15 acres (6 ha). This area would include support structure construction and access roads. This would result in maximum emissions of approximately 47.6 tpy (43.2 mtpy). Maximum PM_{10} emissions from five acres under continuous construction for seven months within the 10-acre (4-ha) fenced area of the Gateway Substation are estimated to be approximately 9.2 tpy (8.3 mtpy). Maximum PM_{10} emissions from the Gateway staging area are estimated to be approximately 2.3 tpy (2.1 mtpy). The maximum PM_{10} emissions from construction vehicle and equipment engines are estimated to be approximately 4.0 tpy (3.6 mtpy) within the Nogales PM_{10} non-attainment area.

TEP anticipates that some explosives blasting may be required during construction depending on geologic conditions. While CO is the pollutant produced in the greatest quantities from explosives detonation, some PM_{10} is also generated (EPA 1995). Explosives blasting would be limited to one or two blasts per day on average, as needed, in areas of tower or access construction. As explosives are most efficiently used by containing the blast energy in the ground to fracture the rock, the fugitive dust (and PM_{10}) generated at the ground surface from explosives blasting would be minimal. The charge is limited to fracturing rocks in a localized area and discharge of material would be limited by proper charge design and use of blasting mats, which TEP would place over the excavation to further limit material and dust. The typical depth of explosives charges that would be utilized by TEP would be approximately 3 ft (0.9 m) below ground level. The ground disturbance associated with explosives blasting operations would be captured in the fugitive dust calculations previously described for the PM_{10} non-attainment area.

Maximum PM_{10} emissions from two 0.75-ton (0.68-metric ton) trucks that would each travel approximately 30 mi (48 km) per day on unpaved roads within the PM_{10} non-attainment area for coordination and completion of construction are estimated to be approximately 7.3 tpy (6.6 mtpy). Emissions from the personal vehicles of construction workers traveling to and from the project staging sites would be minimal given that access to the staging sites is primarily paved. The maximum number of construction workers would be approximately 50. Assuming workers would travel 0.5 mi (0.8 km) each way on unpaved roads to reach one of the three staging sites, there would be 17 vehicle miles (27 vehicle km) traveled each day at a particular staging site. Given an AP-42 estimate of 1.74 lbs PM_{10} per vehicle mile (0.79 kg per vehicle km) traveled, worker vehicle PM_{10} emissions would be an estimated 2.3 tpy 2.1 mtpy) within the Nogales PM_{10} non-attainment area. Any increase in indirect emissions associated with increased recreational use of the project area would be minimal given the existing opportunities for recreational vehicle use in the project area (see Section 4.1.2).

Thus, the total PM_{10} emissions would be approximately 73 tpy (66 mtpy) within the Nogales PM_{10} non-attainment area. This calculated maximum yearly PM_{10} emissions rate would be below the emissions threshold rate of 100 tpy (91 mtpy). Therefore, a conformity determination for the proposed project within the Nogales PM_{10} non-attainment area would not be required. Although conservative assumptions were used for estimating PM_{10} emissions in this conformity review, there is some uncertainty in the estimated annual emissions because final project-specific input data were not available at the time of this analysis. Therefore, upon selection of an alternative to be implemented and preparation of final construction plans, the assumptions used in this review would be re-examined, and, if necessary, project PM_{10} emissions in the Nogales PM_{10} non-attainment area would be recalculated to assure that emissions are below the 100 tpy (91 mtpy) threshold emission rate.

4.8.3 PM_{10} Contributions from Transmission Line Construction in Mexico

Emissions that could be generated in Mexico from the construction of Mexico's connecting portion of the transmission line were assumed to occur simultaneously with TEP's construction of the proposed project in the U.S., as a scenario to predict maximum annual emissions. Given the lack of available information on project design and construction in Mexico (as TEP would not construct this portion of the project), the conservative assumptions stated previously for project access, support structure type and span length, and construction progression and equipment in the U.S. were also applied for construction on the Mexico portion of the project. Project-generated emissions for Mexico could be transported to the U.S. by tropospheric dispersion. As shown in Figure 3.8–1, surface winds are predominately southeasterly, and blow from Mexico in the south to the U.S. in the north (including to the north, north-northeast, and north-northwest) approximately 25 percent of the time (NOAA 2003). Emissions from the project connecting to TEP's proposed border crossing into Nogales, Mexico, were considered for the first 10 mi (16 km) of Mexico's project south of the border, mirroring the approximate 10 mi (16 km) of TEP's proposed project within the Nogales, Arizona PM_{10} non-attainment area. As estimated for the approximate 10 mi (16 km) of TEP's proposed project within the Nogales, Arizona PM_{10} non-attainment area, approximately 15 acres (6 ha) in Mexico near the U.S. border may be under active construction at any one time and approximately 61 tpy (56 mtpy) of PM_{10} emissions may result. If 25 percent of these emissions were transported to the Nogales, Arizona, PM_{10} non-attainment area in the U.S., this would correspond to a contribution of approximately 15 tpy (14 mtpy) of PM_{10} emissions from Mexico.

4.9 NOISE

This section discusses the potential noise impacts of the construction and operation of the proposed Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project along each alternative corridor. The methodology for determining impacts is presented below, followed by a description of the impacts from each alternative.

Methodology

The noise impact analysis evaluates the potential noise levels generated during construction and operation of the proposed project, and identifies potential receptors along each alternative corridor. The analysis includes quantification of projected noise levels and assesses the potential for corona effects from transmission lines. Specific noise impacts would be mitigated by limiting the daily hours of construction of the proposed project.

As explained in Section 3.9, noise levels are measured as a composite decibel (dB) value. The adjusted decibels (dBA) represent the human hearing response to sound for a single sound event. Day-Night Average Sound Level (DNL) represents the average sound level over a complete 24-hour period, which is often used for the evaluation of community noise effects.

For construction of the proposed project, both an average noise level (DNL) and a single sound event noise level (dBA) have been evaluated. The single sound event analysis shows the peak noise levels near the right-of-way (ROW), while the DNL predicts average community noise levels near the ROW. For this analysis, the calculation of the DNL assumes that no construction would occur between the hours of 10 p.m. and 7 a.m. The noise levels are calculated for the nearest residences and businesses to the ROW. Noise levels would be reduced for receptors further removed from the ROW by approximately 6 dBA for each doubling of distance from the source. For example, a 75 dBA noise heard at 50 ft (15 m) from the source would be reduced to 69 dBA at 100 ft (30 m) away from the source (Canter 1977).

The potential for construction noise to impact wildlife is addressed in the Biological Assessments prepared for the proposed project, included as Appendices D, E, and F of this Environmental Impact Statement (EIS) (HEG 2003a, 2003b, 2003c). The species that may be affected are described in this section and in Section 4.3, Biological Resources.

In determining the significance of the calculated DNL, results for each alternative are compared to established standards. In 1974, the U.S. Environmental Protection Agency (EPA) identified noise levels that could be used to protect public health and welfare, including prevention of hearing damage, sleep disturbance, and communication disruption. Outdoor DNL values of 55 dBA were identified as desirable to protect against activity interference and hearing loss in residential areas and at educational facilities.

The determination as to whether the impact of a single sound event (or series of single events) is significant is a qualitative assessment of the increase in noise level above background as experienced by receptors near the source. A subjective response to changes in sound levels based upon personal judgements of sound presented within a short timespan indicate that a change of ±5 dBA may be quite noticeable, although changes that take place over a long period of time of this magnitude or greater may be “barely perceptible.” Changes in sound levels of ±10 dBA within a short timespan may be perceived by humans as “dramatic” and changes in sound levels of ±20 dBA within a short timespan may be perceived as “striking.” In qualitative terms, these types of changes in sound level could be considered significant (DOE 2001a).

The construction schedule of each alternative would likely involve several areas under active construction concurrently. As construction of the project progresses, the areas impacted by noise would follow the active construction areas. Construction for the proposed project would be completed in a period of 12 to 18 months.

4.9.1 Western Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Western Corridor. Construction activities would generate noise produced by heavy construction equipment and trucks used along the access roads and ROW. Explosives blasting may be used as needed, based on local geologic conditions, and thus could contribute to noise impacts. Construction noise levels would be variable and intermittent, as equipment is operated on an as-needed basis. Construction activities normally would be limited to daytime hours, and thus would not impact existing background noise levels at night. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction.

Table 4.9–1. Peak Attenuated Noise Levels (dBA) Expected from Construction Equipment[a].

Source	Peak Noise Level	Distance from Source						
		50 ft	100 ft	200 ft	400 ft	1,000 ft	1,700 ft	2,500 ft
Heavy Trucks	95	84-89	78-83	72-77	66-71	58-63	54-59	50-55
Dump trucks	108	88	82	76	70	62	58	54
Concrete mixer	108	85	79	73	67	59	55	51
Jackhammer	108	88	82	76	70	62	58	54
Scraper	93	80-89	74-82	68-77	60-71	54-63	50-59	46-55
Bulldozer	107	87-102	81-96	75-90	69-84	61-76	57-72	53-68
Generator	96	76	70	64	58	50	46	42
Crane	104	75-88	69-82	63-76	55-70	49-62	45-48	41-54
Loader	104	73-86	67-80	61-74	55-68	47-60	43-56	39-52
Grader	108	88-91	82-85	76-79	70-73	62-65	58-61	54-57
Pile driver	105	95	89	83	77	69	65	61
Forklift	100	95	89	83	77	69	65	61

[a] Attenuation with distance is dependent on the frequency of the sound and thus varies as shown for the following sources of varying frequencies.
Source: Golden et al. 1980.

The combined effect of several equipment types operating simultaneously is not represented by the sum of the individual noise levels, but rather is calculated based on the logarithmic scale of decibels (see explanation in Section 3.9). Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

Table 4.9–2. Example of Maximum Combined Peak Noise Level from Bulldozer, Jackhammer, and Scraper.

	Distance from Source				
	50 ft	**100 ft**	**200 ft**	**1,000 ft**	**2,500 ft**
Combined Peak Noise Level	103 dBA	97 dBA	91 dBA	77 dBA	69 dBA

For tower sites where workers or equipment are to be inserted by helicopter or sky crane, the approach, landing, and takeoff of a helicopter would be an additional noise source. Noise from medium-lift helicopters typical of those that would be used is in the range of 90 to 100 dBA at 100 ft (31 m). Helicopters are most likely to be used within the Coronado National Forest, where fewer access roads currently exist.

Explosives blasting may be required at tower locations founded on bedrock in steep terrain, in order to level the base prior to rock bolting the tower. The projected peak noise levels associated with explosives blasting would be in the range of the construction equipment listed in Table 4.9–1 (Golden et al. 1980). As blasting is accomplished most efficiently by directing the blasting energy into the ground, the noise associated with blasting would be mitigated by the noise absorbing effects of the ground.

The potential construction noise impacts of the Western Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW, as described in Land Use, Section 3.1. The existing background noise in residential and commercial areas is typically 45 dBA or higher. Table 4.9–2 shows that peak construction noise at a distance of approximately 1,000 ft (305 m) from the ROW would be an estimated 77 dBA. The residences nearest to the ROW (an estimated 1,000 ft [305 m] away), as described in Section 3.1, would experience construction noise levels that may be perceived as striking or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized and intermittent. The average total duration that any construction area may be active is 2 to 3 months. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation within the Coronado National Forest, as described in Section 3.1.2.

Impacts to jaguars may result from noise disturbance associated with construction activities, especially during morning or late evening hours. However, these impacts would be widely distributed because of the linear nature of the project (HEG 2003a).

Impacts to cactus ferruginous pygmy-owls may result from noise disturbance associated with construction activities. According to the Harris Environmental Group (2003a), “short term noise disturbance and human activity associated with construction activity may temporarily discourage cactus ferruginous pygmy-owl use of habitat within and immediately adjacent to the proposed right-of-way.”

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW.

In evaluating the potential for hearing damage (both Temporary Threshold Shift and Noise-Induced Permanent Threshold Shift), the noise level and duration of exposure are considered. For example, Noise-induced Permanent Threshold Shift would be produced by unprotected exposures of 8 hours per day for several years to noise above 105 dBA. Similarly, Temporary Threshold Shift would be based on exposure to a steady noise level of 80 to 130 dBA, increasing with duration of exposure (Canter 1977). The intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage.

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles.

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona-generated audible noise from transmission lines is generally characterized as a crackling or hissing noise. During dry weather conditions, audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW. Modern transmission lines are designed, constructed, and maintained so that during dry conditions they will operate below the corona-inception voltage, meaning that the line will generate a minimum of corona-related noise. Sound level measurements taken during fair weather at existing TEP 345-kV transmission lines indicate only a 2 to 3 dB difference between background noise levels and levels beneath the transmission lines (Meyer 2001b). In foul weather conditions corona discharges can be produced by water droplets and fog. Given the arid climate in the project area and the distance of receptors from the ROW, the impact of corona-generated audible noise is not expected to be significant.

Transformers at the existing South Substation in Sahuarita and the new Gateway Substation in Nogales would generate minimal noise during operation. There are no residences within 0.5 mi (0.8 km) of either substation and the substation noise would not be discernible from background noise at any residences. Measurements at an existing TEP substation similar to those proposed indicate sound levels to be typically 40 to 55 dBA, within the existing background range (Meyer 2001b). Occasional maintenance activities on the transmission lines and substations would be required. Noise impacts from these activities would be intermittent and are not expected to be significant.

Based upon the noise impacts analyses of the Western Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and Federal Occupational Safety and Health Administration (OSHA) procedures for hearing protection.

4.9.2 Central Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Central Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent. As there is increased development along the I-19 corridor compared to the Western Corridor, as described in Section 3.1, Land Use, a few more residences may experience temporary construction noise impacts.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

The potential construction noise impacts of the Central Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (at a distance of approximately 500 ft [150 m]), as described in Section 3.1, would experience construction noise levels that may be perceived as "striking" or very loud. Peak noise levels experienced by Tubac residents would be comparable to a street sweeper at a distance of 30 ft (9 m). These peak noise levels would be localized, temporary, and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the limited segment of the Central Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor in Section 4.9.1, the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Central Corridor, the primary effect of noise generated would probably be one of annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.3 Crossover Corridor

Construction Impacts. The acoustical environment would be impacted during construction of the Crossover Corridor similarly to the Western Corridor as described in Section 4.9.1. While relatively high peak noise levels in the range of 80 to 103 dBA would occur on the active construction sites, these noise levels would be temporary and intermittent.

Table 4.9–1 presents the peak noise levels (dBA) expected for a single sound event from various equipment during construction. Table 4.9–2 presents the results of a sample calculation assuming a scenario of a bulldozer, jackhammer, and scraper operating simultaneously, which is highly unlikely.

The potential construction noise impacts of the Crossover Corridor would primarily affect the residences and commercial areas in the immediate vicinity of the ROW. The residences nearest to the ROW (the same as described for the Western Corridor) would experience construction noise levels that may be perceived as "striking" or very loud, comparable to a lawn mower or a leaf blower. These peak noise levels would be localized, temporary and intermittent. In addition to residences and businesses, intermittent peak noise levels would be experienced by nearby hikers and participants in other recreation along the Crossover Corridor in the Coronado National Forest, as described in Section 3.1.2.

A second measure of construction noise is the 24-hour average noise level, represented by the DNL to gauge average community noise effects. The DNL would decrease to near the background noise level of 48 dBA for receptors beyond 325 ft (99 m) from the ROW. As described for the Western Corridor in Section 4.9.1, the intermittent peak construction noise levels would not create the steady noise level conditions for an extended duration that could lead to Temporary Threshold Shift or Noise-induced Permanent Threshold Shift hearing damage (Canter 1977).

Operational Impacts. Upon completion of construction, the potential for noise impacts associated with the project would be from three major sources: (1) corona from the transmission lines (a crackling or hissing noise); (2) operation of the transformers at the substations; and (3) maintenance work and vehicles. As with the Western Corridor the potential corona effects and substation operational noise would be comparable to background noise levels for receptors, and thus not significant. Noise impacts from maintenance activities would be intermittent and not expected to be significant.

Based upon the noise impacts analyses of the Crossover Corridor, the primary effect of noise generated would probably be annoyance to the residents nearest to the ROW during the construction period. Construction workers would be located closer to the noise sources, would experience longer exposure durations than the public, and would follow standard industry and OSHA procedures for hearing protection.

4.9.4 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this EIS. Potential noise impacts associated with the construction and operation of the Sahuarita-Nogales Transmission Line Project would not occur. The local noise conditions would continue according to current patterns, as described in Section 3.9.

4.10 HUMAN HEALTH AND ENVIRONMENT

This section discusses the potential human health and environment effects of the proposed project. The methodology for determining effects is presented, followed by a description of the effects for each alternative. Potential impacts on human hearing are addressed in Section 4.9, Noise Impacts.

Methodology

The electric and magnetic field (EMF) effects of the transmission lines were calculated for a range of distances from the transmission line. In general, the farther removed a person is from the transmission line, the lower the EMF strength. A number of different scenarios were tested in the calculations. Because the magnetic field varies with the current carried on the transmission line, magnetic field strength was calculated for both the normal anticipated current load of 250 million volt-amperes (MVA) per circuit, and the maximum anticipated current load of 500 MVA per circuit. Calculations were also performed for a number of different transmission line configurations (vertical optimized phasing orientation or vertical non-optimized phasing orientation) that can affect the EMF strength. In the optimized phasing orientation, the phases of the two circuits are offset to minimize the EMF strength. As described in Section 3.10, the focus of EMF health studies and the focus of the following impacts analysis is on magnetic fields, although electric fields are included for completeness.

Since Tucson Electric Power Company's (TEP) policy is to minimize EMF exposure levels to the extent practicable, TEP would use the vertical optimized phasing orientation for the double-circuit line. Results from the non-optimized phasing orientation are included for comparison purposes only. The calculations evaluate EMF strength at a range of distances from the centerline of the transmission line, both within and outside the approximate 125-ft (38-m) right-of-way (ROW). The magnetic field is expressed in units of milligauss (mG); the electric field is expressed in units of kilovolt per meter (kV/m).

The potential for corona effects and effects on safety is also evaluated. The nearest potential receptors to the transmission line based on the proposed corridors are listed for each alternative, including residences, schools, and commercial establishments.

4.10.1 Electric and Magnetic Fields

4.10.1.1 *Western Corridor*

Electric and Magnetic Field Effects. The Western Corridor would consist primarily of single steel pole double-circuit structures strung with 345-kV conductors. The spacing of the structures would be in the range of 600 to 1,000 ft (183 to 305 m) apart. The minimum ground clearance of the conductors would be 32 ft (9.8 m).

Table 4.10–1 lists the EMF strength under normal anticipated load conditions for the 345-kV double-circuit transmission line. Table 4.10–2 lists this same information for maximum anticipated load conditions. EMF strength is given for both the optimized phasing configuration that would be used by TEP, and for the non-optimized phasing configuration for comparison purposes. Figures 4.10–1 and 4.10–2 graphically illustrate the EMF strengths, respectively, for the optimized phasing configuration of the transmission line (Meyer 2001a). The distances given represent the distance of a receptor from the centerline of the transmission line. At a given distance, the electric and magnetic field strength would be nearly identical on both sides of the transmission line.

Table 4.10–1. EMF Strength for Normal Operating Conditions (250 MVA Current, 345-kV Double Circuit).

	Optimized Phase Configuration		Non-optimized Phase Configuration (for comparison purposes only)	
Distance from Centerline (feet)	**Magnetic Field Strength (mG)**	**Electric Field[a] Strength (kV/m)**	**Magnetic Field Strength (mG)**	**Electric Field[a] Strength (kV/m)**
1500	0.002	0.001	0.102	0.004
1250	0.004	0.001	0.146	0.006
1000	0.007	0.002	0.228	0.009
750	0.017	0.003	0.405	0.015
500	0.056	0.007	0.904	0.034
450	0.076	0.009	1.112	0.041
400	0.108	0.012	1.401	0.051
350	0.159	0.016	1.817	0.065
300	0.248	0.021	2.448	0.084
250	0.418	0.030	3.467	0.113
200	0.777	0.042	5.257	0.153
175	1.114	0.048	6.698	0.175
150	1.667	0.050	8.785	0.192
125	2.627	0.032	11.934	0.183
100	4.403	0.054	16.897	0.084
90	5.520	0.129	19.667	0.054
80	6.999	0.252	23.055	0.214
70[a]	8.973	0.448	27.198	0.497
60	11.612	0.753	32.223	0.946
50	15.108	1.203	38.171	1.630
45	17.228	1.486	41.440	2.078
40	19.598	1.799	44.821	2.601
35	22.190	2.122	48.196	3.186
30	24.936	2.418	51.400	3.812
25	27.713	2.638	54.233	4.438
20	30.351	2.729	56.508	5.014
15	32.653	2.659	58.117	5.492
10	34.433	2.450	59.081	5.838
5	35.552	2.206	59.544	6.042
0	35.934	2.093	59.673	6.108

[a] Beyond edge of 125 ft ROW.
Source: Meyer 2001a.

Table 4.10–2. EMF Strength for Maximum Operating Conditions (500 MVA Current, 345-kV Double Circuit).

Distance from Centerline (feet)	Optimized Phase Configuration		Non-optimized Phase Configuration (for comparison purposes only)	
	Magnetic Field Strength (mG)	Electric Field [a] Strength (kV/m)	Magnetic Field Strength (mG)	Electric Field[a] Strength (kV/m)
1500	0.004	0.001	0.203	0.004
1250	0.007	0.001	0.293	0.006
1000	0.014	0.002	0.457	0.009
750	0.034	0.003	0.810	0.015
500	0.112	0.007	1.807	0.034
450	0.153	0.009	2.224	0.041
400	0.216	0.012	2.801	0.051
350	0.318	0.016	3.364	0.065
300	0.497	0.021	4.897	0.084
250	0.835	0.030	6.934	0.113
200	1.553	0.042	10.514	0.153
175	2.227	0.048	13.396	0.175
150	3.334	0.050	17.570	0.192
125	5.254	0.032	23.868	0.183
100	8.807	0.054	33.795	0.084
90	11.040	0.129	39.334	0.054
80	13.998	0.252	46.109	0.214
70[b]	17.945	0.448	54.395	0.497
60	23.223	0.753	64.446	0.946
50	30.217	1.203	76.343	1.630
45	34.455	1.486	82.881	2.078
40	39.196	1.799	89.643	2.601
35	44.381	2.122	96.393	3.186
30	49.871	2.418	102.800	3.812
25	55.425	2.638	108.466	4.438
20	60.702	2.729	113.017	5.014
15	65.306	2.659	116.234	5.492
10	68.866	2.450	118.163	5.838
5	71.105	2.206	119.088	6.042
0	71.867	2.093	119.346	6.108

[a] Electric field strength is not affected by the current load. Thus, electric field strength values given for normal and maximum operating conditions are the same.
[b] Beyond edge of 125 ft ROW.
Source: Meyer 2001a.

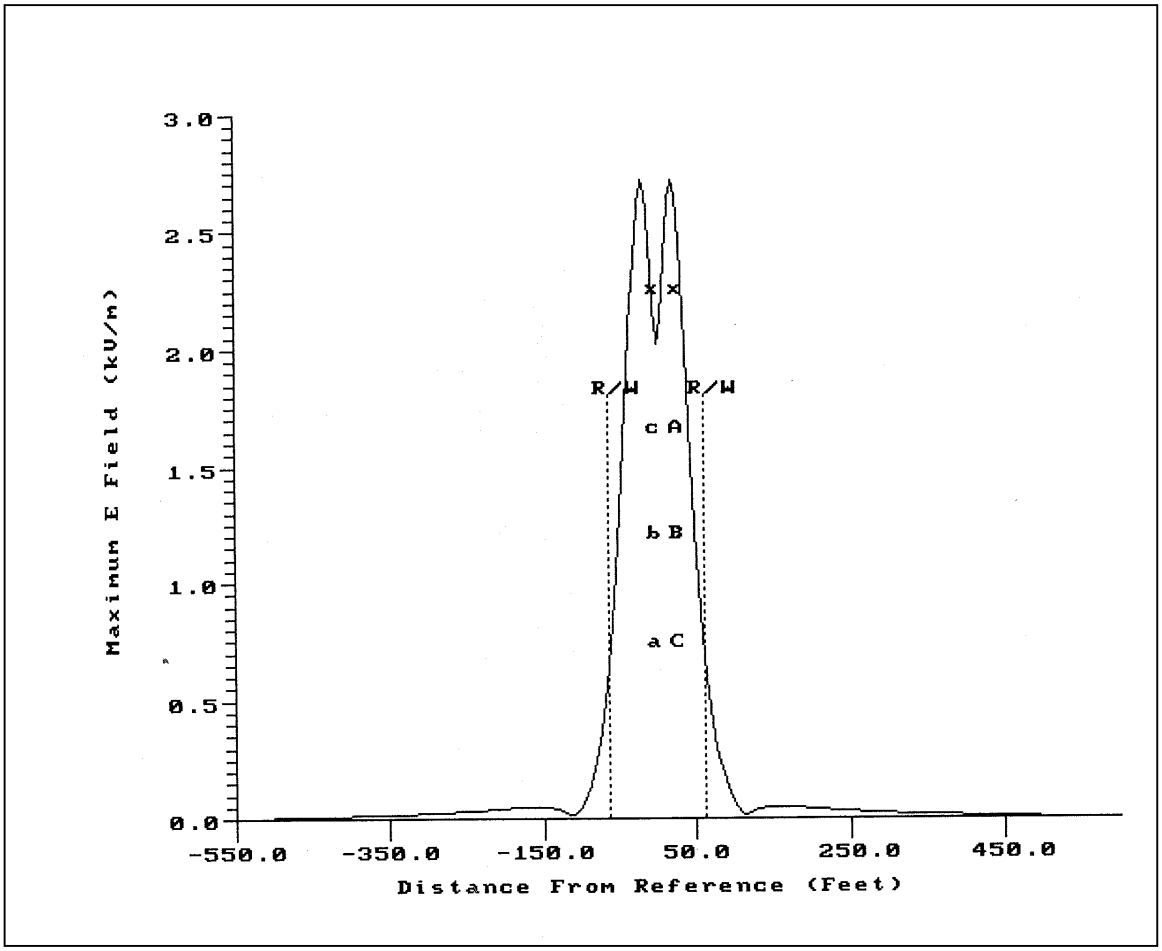


Figure 4.10–1. Electric Field Strength for Normal Operating Conditions, Optimized Phasing.

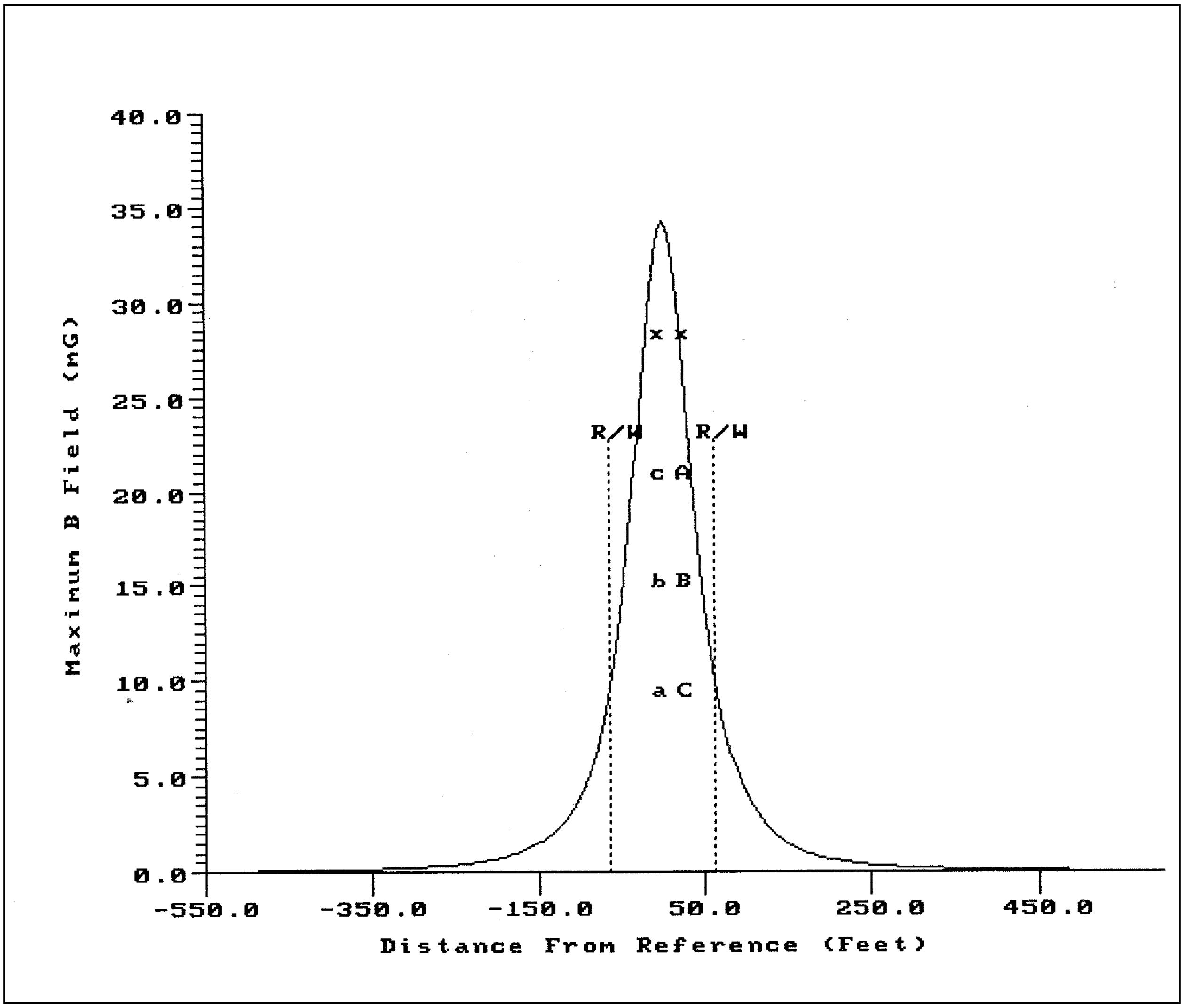


Figure 4.10–2. Magnetic Field Strength for Normal Operating Conditions, Optimized Phasing.

Beyond the edge of a 125-ft (38-m) ROW, the magnetic field strength of the optimized phasing configuration under normal operating conditions would be 8.9 mG. This would diminish to 4.4 mG at a distance of 100 ft (30 m) from the centerline, 0.78 mG at a distance of 200 ft (61 m) from the centerline, and 0.25 mG at a distance of 300 ft (91 m) from the centerline. For comparison purposes only, the non-optimized phasing configuration would result in a magnetic field of 27 mG at the edge of a 125-ft (38-m) ROW, three times the magnetic field from the optimized phasing configuration. Temporary exposure to magnetic fields on this level of magnitude are similar to being 1 ft (0.3 m) away from common household appliances such as a mixer or hair dryer (Waveguide 2003).

The electric field strength at the edge of a 125-ft (38-m) ROW under normal operating conditions for the optimized phasing configuration would be 0.45 kV/m. This would diminish to 0.054 kV/m at a distance of 100 ft (30 m) from the centerline, 0.042 kV/m at a distance of 200 ft (61 m) from the centerline, and 0.021 kV/m at a distance of 300 ft (91 m) from the centerline.

Tables 4.10–1 and 4.10–2 demonstrate the EMF strength reductions that would be achieved by TEP's use of the optimized phasing configuration, compared to the non-optimized phasing configuration. Two shield wires, which provide necessary shielding for lightning protection, would be placed near the top of each pole to shield the 12 345-kV phase subconductors. Each circuit of a double-circuit transmission line consists of three phases; each phase consists of two subconductors. Phasing between the two circuits would be configured in a way that would minimize EMF strength.

Magnetic field levels would be elevated in the vicinity of the proposed ROW on Bureau of Land Management (BLM) land and in other areas where TEP's proposed project would be adjacent to existing transmission lines, west of Sahuarita and Green Valley as shown in Figure 3.11–1. As an example of maximum combined EMF from existing transmission lines and the proposed project, TEP has modeled EMF levels from the proposed project on BLM land, where the proposed project runs adjacent to the south of 345-kV and 138-kV transmission lines. At the southern edge of the ROW of TEP's proposed transmission line (340 ft [104 m] south of the existing 345-kV transmission line), the magnetic field would be 12.1 mG and the electric field would be 0.83 kV/m. At a distance of 200 ft (61 m) south of the proposed centerline, the magnetic field would be 0.9 mG and the electric field would be 0.045 kV/m. This would diminish to a magnetic field of 0.44 mG and an electric field of 0.024 kV/m at a distance of 300 ft (91 m) from the centerline (TEP 2003).

It is the policy of TEP that no residences would be within the ROW. The nearest residences to the proposed Western Corridor ROW are a group of about five houses at a distance of approximately 1,000 ft (305 m) from the ROW centerline, south of Sahuarita Road, west of the Town of Sahuarita. Sahuarita High School and Middle School are approximately 4,000 ft (1,200 m) south of the ROW centerline.

In the segment from Gateway Substation to the U.S.-Mexico border, there are warehouses and apartments approximately 1,000 ft (305 m), from the corridor centerline. Mary Welty Elementary School is located more than 1 mi (1.6 km) to the east of the ROW near the U.S.-Mexico border.

Long-term EMF exposure at these nearest residences, schools, and commercial establishments would be well below 0.8 mG, an average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). The EMF strengths conform to those normally found in comparable lines.

Safety. As described in Section 3.10.1, the electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, towers, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception and neurobehavioral responses. The following describes the potential for effects on safety, and design mitigation measures that would be incorporated.

Induced Currents. The 345-kV transmission lines would have a minimum ground clearance of 32 ft (9.8 m) to reduce the potential for induced current shocks. In addition, permanent structures in the ROW, such as fences, gates, and metal buildings would be grounded.

Steady-State Current Shocks. Features reducing the level of potential for induced current in objects near the transmission line also reduce the level of a possible induced current shock. The proposed lines would be constructed in accordance with industry and TEP standards to minimize hazardous shocks from direct or indirect human contact with an overhead, energized line. These lines are not expected to pose any such hazards to humans.

Spark Discharge Shocks. In accordance with TEP's transmission line standards, the magnitude of the electric field would be low enough that spark discharge shocks would occur rarely, if at all. The potential for nuisance shocks would be minimized through standard grounding procedures. Carrying or handling conducting objects, such as irrigation pipe, under transmission lines can result in spark discharges that are a nuisance. The primary hazard with irrigation pipes or any other long objects, however, is electrical flashover from the conductors if the section of pipe is inadvertently tipped up near the conductors. The transmission lines would be constructed with adequate ground clearance to minimize these effects.

Field Perception and Neurobehavioral Responses. Perception of the field associated with the transmission lines would not be felt beyond the edge of the ROW. Persons working under the ROW might feel the field. Studies of short-term exposure to electric fields have shown that fields may be perceived (for example, felt as movement of arm hair) by some people at levels of about 2 to 10 kV/m, but studies of controlled, short-term exposures to even higher levels in laboratory studies have shown no adverse effects on normal physiology, mood, or ability to perform tasks (DOE 2001a). The International Commission on Non-Ionizing Radiation Protection Guidelines recommend that short-term exposures be limited to 4.2 kV/m for the general public. The exposures associated with the proposed action are below this recommended limit, reaching a maximum of less than 2.8 kV/m within the ROW (ICNIRP 2003).

The single pole steel structures that would be used are non-climbable. The ground clearance of the conductors would be a minimum of 32 ft (9.8 m), adequate clearance for safety considerations as related to most recreational activities.

The Amended Certificate of Environmental Compatibility issued to TEP on October 29, 2001, by the ACC (ACC 2001) includes a provision that all transmission structures must be at least 100 ft (30 m) away from the edge of the existing 50 ft (15 m) El Paso Natural Gas Company (EPNG) pipeline ROW. TEP would comply with this provision.

Smoke is a conductor of electrical current. When a fire is in the vicinity of a 345-kV transmission line, firefighters would monitor smoke near the transmission line for possible fire starts outside fire perimeter. Firefighters would remain at a distance that would not leave them vulnerable to the electric current or shock.

Power Line Hazards are identified in the Forest Service Fireline Handbook (NWCG Handbook 3, PMS 410-1, NFES 0065). If possible, the power company should deactivate lines in the fire area that may endanger firefighters. All personnel should be cautioned against directing water streams or aerial retardant into high-tension lines. They should also be made aware that the smoke may become charged and conduct the electrical current. Deactivated transmission and distribution lines may continue to pose a hazard due to induction. TEP and any involved firefighting personnel would follow the mitigation and safety requirements on pages 53 and 54 of the Fireline Handbook, and additional mitigation and safety requirements in Forest Service Handbook (FSH) 6709.11 (Health and Safety Code Handbook) on pages 30-29 and 30-30.

4.10.1.2 *Central Corridor*

The Central Corridor would involve the construction of 345-kV double-circuit transmission lines. The EMF strengths calculated for the Western Corridor would also apply for the Central Corridor. However, the list of nearest receptors to the transmission lines would be different for the Central Corridor.

Table 4.10–1 lists the EMF strength under normal anticipated load conditions for the 345-kV double-circuit transmission lines. Table 4.10–2 lists this same information for maximum anticipated load conditions. Figures 4.10–1 and 4.10–2 graphically illustrate the electric and magnetic field strengths, respectively, for the optimized phasing configuration of the transmission lines. The distances given represent the distance of a receptor from the centerline of the transmission lines. At a given distance, the EMF strength would be nearly identical on both sides of the transmission line ROW.

The nearest receptors to the proposed Central Corridor ROW include all of those listed for the Western Corridor, with the following additions. In the Tubac area there are multiple residences between 1,200 and 1,800 ft (370 to 550 m) from the centerline of the ROW. The nearest residences to the Central Corridor are three houses approximately 500 ft (150 m) from the centerline, north of Aliso Springs Road in Tubac. The Sopori School is located approximately 1 mi (1.6 km) east of the ROW in the town of Amado. The Cascabel School is approximately 2.2 miles (3.5 km) to the east of the ROW.

Long-term EMF exposure at these nearest residences, schools, and commercial establishments would be well below 0.8 mG, an average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). The EMF strengths conform to those normally found in comparable lines.

The potential for effects on safety and design mitigation measures for the Central Corridor are the same as those listed for the Western Corridor.

4.10.1.3 *Crossover Corridor*

The Crossover Corridor would involve the construction of 345-kV double circuit transmission lines. The EMF strengths calculated for the Western Corridor would also apply for the Crossover Corridor. The nearest potential receptors and the maximum long-term EMF exposure from the transmission lines would be the same as for the Western Corridor.

The potential for effects on safety and design mitigation measures for the Crossover Corridor are the same as those listed for the Western Corridor.

4.10.1.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no EMF exposure associated with the project. EMF exposure from existing transmission lines and household appliances would be expected to continue according to current trends.

4.10.2 Corona Effects

4.10.2.1 *Western Corridor*

Corona is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. As described in Section 3.10.2, corona is of concern for potential radio and television interference, audible noise, and photochemical reactions.

Audible Noise. Noise levels generated by the transmission lines would be greatest during damp or rainy weather. For the proposed lines, low-corona design established through industry research and experience would minimize the potential for corona-related audible noise. The proposed lines would not add substantially to existing background noise levels in the area. Research by the Electric Power Research Institute (EPRI) (EPRI 1982) has validated this by showing the fair-weather audible noise from modern transmission lines to be generally indistinguishable from background noise at the edge of a 100 ft (30 m) ROW. During rainy or damp weather, an increase in corona-generated audible noise would be balanced by an increase in weather-generated noise. For a complete assessment of the noise from the Proposed Action and alternatives, refer to the analysis of noise in Section 4.9.

Radio and Television Interference. Transmission line-related radio-frequency interference is one of the indirect effects of line operation produced by the physical interactions of transmission line electric fields. The level of such interference usually depends on the magnitude of the electric fields involved. The line would be constructed according to industry standards, which minimize the potential for surface irregularities (such as nicks and scrapes on the conductor surface), sharp edges on suspension hardware and other irregularities around the conductor surface that would increase corona effects. However, if such corona interference were to be generated, no interference-related complaints would be expected given the distance of residents from the transmission lines. Federal Communications Commission regulations require each project owner to ensure mitigation of any such interference to the satisfaction of the affected individual.

Visible Light. The corona levels associated with the proposed transmission lines would be similar to those of existing transmission lines. The visible corona on the conductors would be observable only under the darkest conditions with the aid of binoculars. There would be no effects on the operation of observatories in the project vicinity (Fred Lawrence Whipple and Kitt Peak Observatories) from the proposed project (Criswell 2002).

Photochemical Reactions. The maximum incremental ozone levels at ground level produced by corona activity on the proposed transmission lines would be similar to that produced by the existing lines in the area. During damp or rainy weather the ozone produced would be less than 1 ppb. This level is insignificant when compared to natural levels and their fluctuations (DOE 2001a).

Corona would be mitigated by using proper line design and by incorporating line hardware shielding. The design of electrical hardware and equipment considers the potential for corona effects.

4.10.2.2 *Central Corridor*

The corona effects generated under the Central Corridor would be the same as those described for the Western Corridor.

4.10.2.3 *Crossover Corridor*

The corona effects generated under the Crossover Corridor would be the same as those described for the Western Corridor.

4.10.2.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no corona effects associated with the project.

4.11 INFRASTRUCTURE

This section discusses the impacts of the project to the local infrastructure including the current utilities and facilities in the area of the proposed project. This section also discusses waste management issues. Roads are discussed in Section 4.12, Transportation.

4.11.1 Utilities and Facilities

4.11.1.1 Western Corridor

Construction of the proposed project in the Western Corridor would result in the following changes to the existing infrastructure:

- Tucson Electric Power Company's (TEP) existing South Substation would be expanded to accommodate the 345-kV line to the new Gateway Substation. The addition of the second 345-kV circuit would require an 100-ft (30-m) expansion to the existing fenceline.

- The new Gateway Substation would be constructed within a developed industrial park north of Mariposa Road (SR 189), an estimated 0.5 mi (0.8 km) east of the Coronado National Forest boundary (Northeast 4, Section 12, Township 24 South, Range 13 East). The TEP portion of the site is an estimated 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has already performed pre-construction activities for preparation of the site.

- A new 345-kV transmission line would be constructed for a length of an estimated 65.7 mi (106 km). The maximum height of the structures for the 345-kV transmission line would be 140 ft (42.7 m). The length of the new 345-kV transmission line would be an estimated 29.5 mi (47.5 km) on the Coronado National Forest, and an estimated 1.25 mi (2.01 km) on Federal lands managed by the Bureau of Land Management (BLM).

No additional impacts to existing infrastructure would be expected from implementation of the Western Corridor. The proposed transmission line is no greater a terrorist target than any other extra high voltage transmission line in the United States. The worst case terrorist scenario would be that several transmission line poles are felled and that it takes a few days to a couple of weeks to replace them and restring the conductors. The interconnected transmission system is designed with redundancy to accommodate such a situation (TEP 2003).

4.11.1.2 Central Corridor

The only difference to the changes to infrastructure described above for the Western Corridor compared to the Central Corridor is the length of the new transmission line. The new 345-kV transmission line would be constructed for a length of an estimated 57.1 mi (91.9 km). The length of the new 345-kV transmission line would be an estimated 15.1 mi (24.3 km) on the Coronado National Forest.

No additional impacts to existing infrastructure would be expected from implementation of the Central Corridor, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.3 Crossover Corridor

The only difference to the changes to infrastructure described above for the Western Corridor compared to the Crossover Corridor is the length of the new transmission line. The new 345-kV transmission line would be constructed for a length of an estimated 65.2 mi (105 km). The length of the new 345-kV transmission line would be an estimated 29.3 mi (47.2 km) on the Coronado National Forest.

No additional impacts to existing infrastructure would be expected from implementation of the Crossover Corridor, and the potential impacts from terrorism would be as described for the Western Corridor.

4.11.1.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this Environmental Impact Statement (EIS). There would be no changes to the existing infrastructure in the project area.

4.11.2 Waste Management

4.11.2.1 *Western Corridor*

During construction of the project, the storage and use of fuel, lubricants, and other fluids during the construction phase of the facilities and access roads could create a potential contamination hazard. Spills or leaks of hazardous fluids could contaminate groundwater and affect aquifer use. This impact would be minimized or avoided by restricting the location of refueling activities and by requiring immediate cleanup of spills and leaks of hazardous materials. TEP would implement a Spill Prevention Control and Countermeasures Plan (SPCC) to prevent, control, and minimize impacts from a spill of fuels or other hazardous substances during construction of the transmission line. The following measures would be incorporated into the plan: preventative measures, spill response, and reporting procedures (TEP 2003).

Oil and diesel fuel would be stored in clearly marked tanks onsite that would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed of by a contractor to an approved disposal site. Lubricating oils, acids for equipment cleaning, and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures onsite, and disposed of at a licensed treatment and/or disposal facility in accordance with local or state regulations and in compliance with the manufacturer’s recommendations. Paint containers would be tightly sealed to prevent leaks or spills. Excess paint would not be discharged to the stormwater system but disposed of consistent with manufacturer’s recommendations and according to applicable governmental regulations.

Septic wastes generated during construction would be provided for by the use of temporary portable sanitary facilities. Vegetative debris collected during right-of-way (ROW) and structure site clearing would be scattered adjacent to the ROW to create habitat or reduce surface erosion where it would not be considered a potential fire danger.

Operational wastes generated at substations would include minor quantities of municipal solid waste. This waste would usually be paper and plastic wrapping materials from new equipment. No hazardous waste would be generated from substation operation. The amount of wastes generated from construction and operation would be too small to affect the life expectancy of the many municipal solid waste facilities currently operated in the project area, as listed in Section 3.11.2.

4.11.2.2 *Central Corridor*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the Central Corridor.

4.11.2.3 *Crossover Corridor*

The waste management issues and the SPCC Plan described above for the Western Corridor also apply to the Crossover Corridor.

4.11.2.4 *No Action Alternative*

Under the No Action Alternative, TEP would not build the proposed transmission line and the associated facilities as proposed in this EIS. TEP would generate no additional wastes and the potential for spills of hazardous materials or wastes from this project to affect local soils or groundwater would be eliminated. Waste management facilities in the area, as described in Section 3.11.2, Waste Management, would continue current operations.

4.12 TRANSPORTATION

This section discusses the potential impacts to transportation in the vicinity of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project. The discussion includes a description of the methodology of analysis and the impacts for each alternative. Because road use, construction, and closure can impact various resource areas, including biological, cultural, visual, geological, and recreational resources, the potential impacts to these resource areas are addressed in their respective impacts sections.

Methodology

The transportation impact analysis includes the potential effects generated by the construction and operation of the proposed project on transportation in the project area. The analysis is based on review of existing transportation in the project area and project access requirements during construction and operation. The analysis of the Coronado National Forest is supplemented by the Roads Analysis (RA) completed for the proposed project, based on data obtained from the U.S. Department of Agriculture Forest Service (USFS), agency and public input; interpreted from recent aerial imagery; and documented during extensive field reviews (URS 2003a). An RA must be completed for any road construction and reconstruction on national forest land, which would be required for all three proposed corridors. The conclusions of the RA are referenced within this Draft Environmental Impact Statement (EIS), both in the transportation impacts section, and in other applicable resource impacts sections. Construction activities represent the principal means by which an impact on transportation (for example, building of new access roads, closing of existing wildcat roads, or traffic disruption) could occur. Impacts to transportation are determined relative to the context of the affected environment described in Section 3.12.

To determine if an action may cause a significant impact, both the context of the proposed project and the intensity of the impact are considered. The context of the proposed project is the locally affected area between Sahuarita and the U.S.-Mexico border, and the significance depends on the effects in the local area. The intensity of the impact is primarily considered in terms of any unique characteristics of the area (for example, a proposed USFS inventoried roadless area [IRA] or special management area), and the degree to which the proposed project may adversely affect such unique characteristics. Impacts would be significant if the proposed project would change the transportation system permanently, or would have extensive short-term effects during construction.

4.12.1 Western Corridor

The proposed project would be constructed over a period of approximately 12 to 18 months. The construction would require an average construction workforce of 30 individuals, with peak workforce levels reaching 50 individuals for short periods of time. Most workers would come from within Pima and Santa Cruz Counties and would commute on Interstate 19 (I-19) to the three primary points of access: (1) Pima Mine Road in Sahuarita for the South Substation, (2) Arivaca Road exit in Amado for the central access point, and (3) Mariposa Road exit for the southern mobilization yard at the Gateway Substation in Nogales. The average daily traffic numbers for the year 2000 on I-19 at the segment north of Mariposa Road (milepost 2.95) are 18,744 vehicles, at the Arivaca Road exit (milepost 30.95) are 17,919 vehicles, and at the Pima Mine Road exit (milepost 49.62) are 25,271 vehicles (ADOT 2000). The project workforce would add up to 50 vehicles to I-19. Given the temporary and geographically disperse nature of the construction, no significant impact to the existing traffic patterns would be expected and no traffic disruptions on I-19 would occur. Short-term traffic delays may be encountered during construction when the proposed transmission line crosses major roads (such as Arivaca Road). No traffic delays are expected on I-19.

Access to the Western Corridor outside of the Coronado National Forest would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists. Siting of access roads would be coordinated with the affected property owners and land managers to establish the most appropriate access to the structure sites. TEP would use helicopters for stringing conductors, but would not likely use helicopters to bring in poles along the Western Corridor (TEP 2003). On the land managed by the Bureau of Land Management (BLM) west of Sahuarita, an existing access road to TEP's 345-kV Westwing-South transmission line would be utilized by turning off Mission Road, with new 12 ft (3.7 m)-wide access road segments and spur roads to each structure to reduce the area of new disturbance, totaling an estimated 0.9 mi (1.4 km) (an estimated 1.3 acres [0.5 ha] from new access roads and spur roads) in accordance with the Plan of Development (POD) which is being completed concurrently with the EIS. The POD also addresses the revegetation of roads identified to be "retired" following construction, and the gating of roads to prevent off-highway vehicle use. TEP would comply with BLM road closing requirements (TEP 2003).

Within the Tumacacori Ecosystem Management Area (EMA) of the Coronado National Forest, an existing network of Level 2 and wildcat roads would provide access to portions of the Western Corridor, as shown in Figure 3.12–1. Minor spot repairs (such as repairing erosion damage, breaking rocks, removing brush, or reducing a hump) would be required for existing roads including wildcat roads as indicated by the yellow markers on the map. An estimated 95 locations within the Western Corridor would require repair or improvement. Ruby Road and existing wildcat roads would provide some project access as the Western Corridor continues east and joins the El Paso Natural Gas Company (EPNG) pipeline right-of-way (ROW). The new roads that would need to be constructed by TEP for the proposed project are indicated as TEP Proposed Roads in Figure 3.12–1. For the Western Corridor, an estimated 20 mi (32 km) of temporary new roads would be built by TEP for project construction. No roads would be constructed by TEP within an IRA. All proposed roads to structure sites would be amended to the Forest Plan as administratively closed special use roads, and roads to access these maintenance roads would be Level 2 roads. Further, USFS classified roads currently at Level 2 would be reconstructed to Level 3 during construction of the proposed project, but allowed afterwards to revert back to their original level. Proposed roads would be approximately 12 ft (3.7 m) wide. No proposed roads in the Western Corridor would have a slope of over 30 percent (URS 2003a).

TEP utilized the following criteria in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project (for more detail, see URS 2003a):

- Use existing roads wherever possible.
- Avoid identified biologically and culturally sensitive areas.
- Avoid sediment transport.
- Minimize erosion potential.
- Avoid areas with water features.
- Avoid prominent topographic features.
- Avoid sensitive viewsheds.
- Facilitate road closure.
- Avoid impacting ranching permittees.
- Comply with maximum road slopes.
- Use the most direct route.

- Facilitate roadway obliteration and restoration.
- Comply with roadway geometry standards such as a minimum turning radius.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards, as described in Section 2.2. For the Western Corridor, the total new area temporarily disturbed by construction would be an estimated 197 acres (79.7 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber-optic splicing sites. For the Western Corridor, the permanent area disturbed would be an estimated 29.3 acres (11.9 ha). The roads that would remain open for use by TEP (administratively controlled special use roads) following construction would be administratively closed (see Section 4.1, Land Use) (URS 2003a).

Table 4.12–1. Temporary and Permanent Area Disturbed on the Coronado National Forest by the Proposed Project.

	Western Corridor (acres)	Central Corridor (acres)	Crossover Corridor (acres)
New temporary area of disturbance during construction	197	105	238
New permanent area of disturbance	29.3	23.1	36.4

Source: URS 2003a.

As described in Section 3.12, the Forest Plan gives direction to "Limit density of existing and new road construction to one mile of road or less per square mile" (0.62 km of road per km^2); USFS has indicated that current road density is estimated to be near this level (USFS 2001). Construction and operation of the proposed project would not affect the road density management plan directives, as TEP is currently working with USFS to identify existing roads for removal, restoration, and permanent closure, such that 1.0 mi (1.6 km) of existing road would be closed for every 1.0 mi (1.6 km) of proposed road to be used in the operation or long-term maintenance of the proposed project. USFS has established principles for identifying high-priority road closure areas including roads within or near specially designated areas (see Figure 3.1–1), roads that cross riparian areas, and wildcat roads. The roads to be closed by TEP would be preliminarily identified by USFS prior to a Record of Decision (ROD), and final determination and documentation of the roads to be closed would be based on field operations with USFS during construction (URS 2003a).

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers (BLM or USFS) would have boulders, natural impediments, or trenches across the travelway for long-term closure. On the Coronado National Forest, portions of the roadbed would be ripped, obliterated, and reseeded/revegetated in consultation with USFS, especially in the initial visible portion of the roadway to effectively obscure signs of the roadway. To the extent that remnants of closed roadways remain, these could be used by illegal immigrants although they would not provide a single continuous pathway from the U.S.-Mexico border. Revegetation would be limited to species found in the particular biome. These long-term road closure methods would also be applied to roads identified for closure by USFS in the ROD in accordance with road density requirements. Transmission line tensioning and pulling sites, fiber-optic sites, and laydown yard areas would be restored within 6 months of the project becoming fully operational (URS 2003a).

4.12.2 Central Corridor

The Central Corridor would require the same average and peak workforce and approximately the same period of time to construct as the Western Corridor. Also, the primary points of access for mobilization and reporting sites along the Central Corridor would be similar to those for the Western Corridor. Impacts to current traffic patterns from commuting workers would be as described for the Western Corridor.

Access to the Central Corridor would be on existing utility maintenance roads (for example, access to the EPNG pipeline ROW) which would require extensive upgrades, ranch access roads and trails, and new access ways where no access currently exists, as described for the Western Corridor. TEP would use helicopters for stringing conductors, but would not likely use helicopters to bring in poles along the Central Corridor (TEP 2003).

Within the Tumacacori EMA of the Coronado National Forest, an existing network of Level 2 and wildcat roads would provide access to portions of the Central Corridor, as shown in Figure 3.12–1. An estimated 15 locations within the Central Corridor would require repair or improvement. For the Central Corridor, an estimated 13.8 mi (22.2 km) of temporary new roads would be built by TEP for project construction. No roads would be constructed by TEP within an IRA. All proposed roads to structure sites would be amended to the Forest Plan as described for the Western Corridor. An estimated 1 percent of the total mileage of the proposed roads in the Central Corridor would have a slope of over 30 percent (URS 2003a). The criteria utilized by TEP in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project are as described above for the Western Corridor.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber optic splicing sites, and laydown construction yards, as described in Section 2.2. For the Central Corridor, the total new area temporarily disturbed by construction would be an estimated 105 acres (42.5 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber optic splicing sites. For the Central Corridor, the permanent area disturbed would be an estimated 23.1 acres (9.3 ha). The roads that would remain open for TEP use following construction would be administratively closed, and would be matched within an equal mileage of road closure to avoid affecting road density on national forest land, as described for the Western Corridor (URS 2003a).

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers would be closed as described for the Western Corridor. These long-term road closure methods would also be applied to roads identified for closure by USFS in the ROD in accordance with road density requirements. Transmission line tensioning and pulling sites, fiber-optic sites, and laydown yard areas would be restored within 6 months of the project becoming fully operational (URS 2003a).

4.12.3 Crossover Corridor

The Crossover Corridor would require the same average and peak workforce and approximately the same period of time to construct as the Western Corridor. Also, the primary points of access for mobilization and reporting sites along the Crossover Corridor would be similar to those for the Western Corridor. Impacts to current traffic patterns from commuting workers would be as described for the Western Corridor.

Access to the currently anticipated alignment of the ROW within the Crossover Corridor would be on existing utility maintenance roads, ranch access roads and trails, and new access ways where no access currently exists, as described for the Western Corridor.

Within the Tumacacori EMA of the Coronado National Forest, an existing network of Level 2 and wildcat roads would provide access to portions of the Crossover Corridor, as shown in Figure 3.12–1. Within Peck Canyon on the segment unique to the Crossover Corridor, existing access is limited to wildcat roads. Helicopter access would be used to bring in 20 to 25 structures in this segment as described in Section 2.2.3. Minor spot repairs would be required for existing roads, including wildcat roads, as indicated by the yellow markers on the map. An estimated 98 locations within the Crossover Corridor would require repair or improvement. For the Crossover Corridor, an estimated 20.7 mi (33.3 km) of temporary new roads would be built by TEP for project construction. Within the IRA, no new roads would be built by TEP, and existing wildcat roads would be used as feasible in their existing condition, but would not be improved. All proposed roads to structure sites would be amended to the Forest Plan as described for the Western Corridor. An estimated 2 percent of the total mileage of the proposed roads in the Crossover Corridor would have a slope of over 30 percent (URS 2003a). The criteria utilized by TEP in the siting of proposed roads and other areas required for the construction, maintenance, and long-term operation of the proposed project are as described above for the Western Corridor.

Table 4.12–1 shows the total new area of land (currently undisturbed) on the Coronado National Forest that would be disturbed during construction activities. In addition to the new proposed roads, this acreage includes support structure sites, transmission wire tensioning and pulling sites, fiber-optic splicing sites, and laydown construction yards, as described in Section 2.2. For the Crossover Corridor, the total new area temporarily disturbed by construction would be an estimated 238 acres (96.3 ha). Table 4.12–1 also indicates the permanent area to be disturbed by the proposed project, which would consist primarily of the footprint of the support structures and roads to fiber-optic splicing sites. For the Crossover Corridor, the permanent area disturbed would be an estimated 36.4 acres (14.7 ha). The roads that would remain open for TEP use following construction would be administratively closed, and would be matched with an equal mileage of road closure to avoid affecting road density on national forest land, as described for the Western Corridor (URS 2003a).

Roads which would not be required for ongoing project maintenance and that are required to be closed by land owners or managers would be closed as described for the Western Corridor. These long-term road closure methods would also be applied to roads identified for closure by USFS in the ROD in accordance with road density requirements. Transmission line tensioning and pulling sites, fiber-optic sites, and laydown yard areas would be restored within 6 months of the project becoming fully operational (URS 2003a).

4.12.4 No Action Alternative

Under the No Action Alternative, TEP would not build the proposed transmission line and associated facilities as proposed in this EIS. There would be no transportation impacts associated with the No Action Alternative. Current traffic patterns and growth of wildcat roads on the Coronado National Forest would be expected to continue.

4.13 ENVIRONMENTAL JUSTICE

In Section 3.13, the U.S. Department of Energy (DOE) identified the minority and low-income populations in the project area pursuant to Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629, 16 February 1994). This section discusses the potential for environmental justice impacts to those populations.

Methodology

Environmental justice impacts can result if the proposed activities cause disproportionately high and adverse human health or environmental effects to minority or low-income populations. DOE assesses three factors to the extent practicable to identify disproportionately high and adverse environmental effects:

- Whether there would be an impact on the natural or physical environment that significantly and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment.

- Whether environmental effects would be significant and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group.

- Whether such environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

4.13.1 Western, Central, and Crossover Corridors

As shown in Section 3.13.1, five of the census block groups intersected by the Central Corridor, and six of the census block groups intersected by the Western and Crossover Corridors, exceed the meaningfully greater minority population percentage. Also, one of the ten census block groups intersected by the proposed corridors (where the corridors are common) exceeds the low-income population threshold. As shown in Figures 3.13–1 and 3.13–2, the census block groups that *would be* intersected by the proposed corridors are of a similar composition to those that *would not be* intersected by the proposed corridors (that is, the corridors do not pass through concentrated pockets of low-income or minority populations). Nonetheless, the following describes the potential environmental impacts of the proposed project in terms of any special circumstances or mechanisms through which low-income or minority populations may experience disproportionately high and adverse human health or environmental effects.

The main environmental impacts to minority and low-income residents within the proposed project area would be in the form of changes to the visual setting from the presence of the transmission line and supporting towers, and impacts to recreational resources. The area evaluated for potential effects on visual and recreational resources is the entire area (and viewshed) of the valleys and mountains from Tucson to Nogales, Arizona. Although a few residential areas in Sahuarita, Nogales, Amado, and Tubac would experience a change in visual setting, great parts of the corridors would run through uninhabited areas or would not be visible from residential or recreational areas. Some residences near Sahuarita and Nogales would experience a change in foreground (within 0.5 mi [0.8 km]) visual setting under any of the alternatives, while some residences near Amado and Tubac would experience a change in foreground visual setting for the Central Corridor only. The residences located further away from the proposed transmission line would likely experience less visual impact as the degree of discernible detail decreases with distance.

DOE has not attempted to quantify the visual impacts because of their subjective nature, and because they are likely to differ from one person to another as they each would view the proposed transmission line from their own vantage point.

The Coronado National Forest and trails and unpaved roads outside of the national forest lands provide recreational opportunities. The transmission line may impact recreational resources in the area of the corridor by disturbing the visual setting over the long term. Construction of the transmission line may cause temporary impacts to recreational resources, such as road closures. However, these impacts would be of short duration in any one location, and recreational resources are used by both the general population and low-income and minority residents.

Neither DOE nor its cooperating agencies are aware of any special circumstance that would disproportionately impact minority or low-income populations, such as unique exposure pathways or practices among the minority or low-income populations, or food gathering practices specific to low-income or minority populations.

The proposed project is within the traditional territories of several Native American tribes. DOE initiated formal government-to-government consultation in a letter sent to tribal governments of the 12 Native American communities/tribes/nations that are likely to have traditional concerns in the area. Seven of the 12 tribes contacted have indicated to DOE representatives that they have concerns about the proposed project, but to date have not named specific locations of any traditional cultural properties (TCPs) or sacred sites.

Long-term electric and magnetic field (EMF) exposure from the proposed transmission line to the nearest residences, schools, and commercial establishment would be well below 0.8 milliGauss (mG) per day, which is equivalent to the average daily exposure to maximum magnetic fields from some common household appliances (see Table 3.10–1 for a list of EMF levels of some common household appliances). Therefore, the surrounding population would not be impacted by EMF exposure, and no mechanism has been identified for minority or low-income populations to be disproportionately affected.

The population in the regional airshed of southern Arizona would not be impacted by the temporary increase in air pollutant emissions during construction, and no mechanisms have been identified for minority or low-income population to be disproportionately affected during construction or operation of the project.

The potential noise impacts of the construction and operation of the proposed corridor alternatives would create annoyance primarily to the residents nearest to the right-of-way (ROW) during the construction period. The noise levels would be temporary and intermittent, and no construction would occur between the hours of 10 p.m. and 7 a.m. Therefore, the surrounding population would not be impacted by the noise generated from the proposed project, and no mechanism has been identified for minority or low-income populations to be disproportionately affected.

On the basis of the foregoing discussion, DOE concludes that no disproportionately high and adverse impacts, for the resource areas discussed above, would be expected for minority or low-income populations.

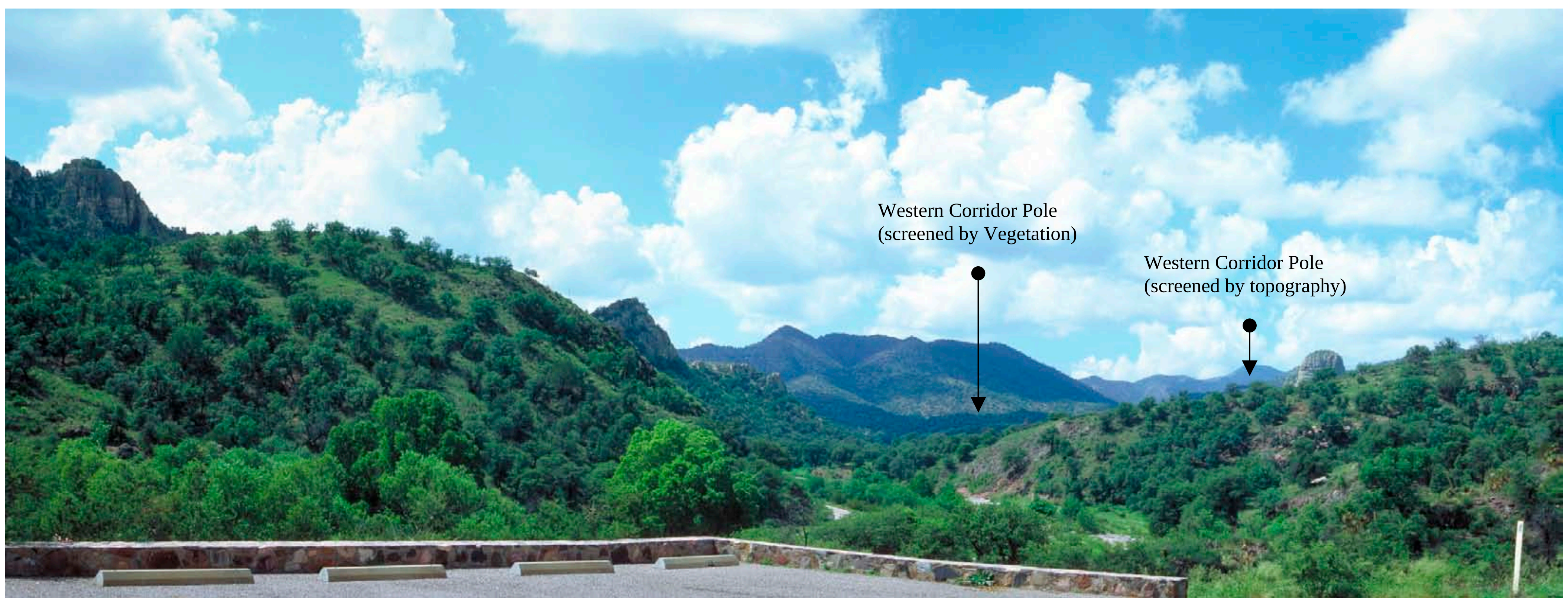
For all other resource areas (that is, land use, socioeconomics, biology, geology and soils, water resources, infrastructure, and transportation), DOE concludes that, because the proposed corridor alternatives would be purposely sited away from residential areas and in sparsely populated areas in order to avoid impact on large numbers of residences, no potential for disproportionately high and adverse impacts among minority or low-income populations would be expected.

The potential for cumulative impacts to minority or low-income populations from the proposed project in combination with other past, present, and reasonably foreseeable future actions is addressed in Chapter 5, Cumulative Impacts.

4.13.2 No Action Alternative

Under the No Action Alternative, Tucson Electric Power Company (TEP) would not build the proposed transmission line and the associated facilities as proposed in the Environmental Impact Statement (EIS). No environmental justice impacts would be experienced under this alternative.

Existing Conditions: View from Upper Thumb Picnic Area looking down Peña Blanca Canyon towards Castle Rock.

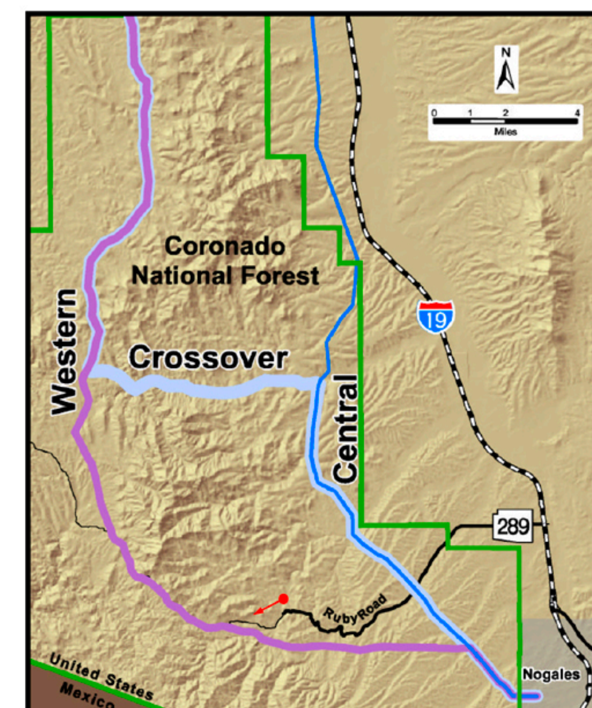


Visual Simulation: Depicting self-weathering monopoles.

Visual Simulation 1: Western Corridor from Upper Thumb Picnic Area at Peña Blanca Lake Recreation Area.

An example, partially-blocked view of the Western Corridor from a Concern Level 1 travelway.

Direction: Southwest
Distance to Nearest Pole: 1.2 mi

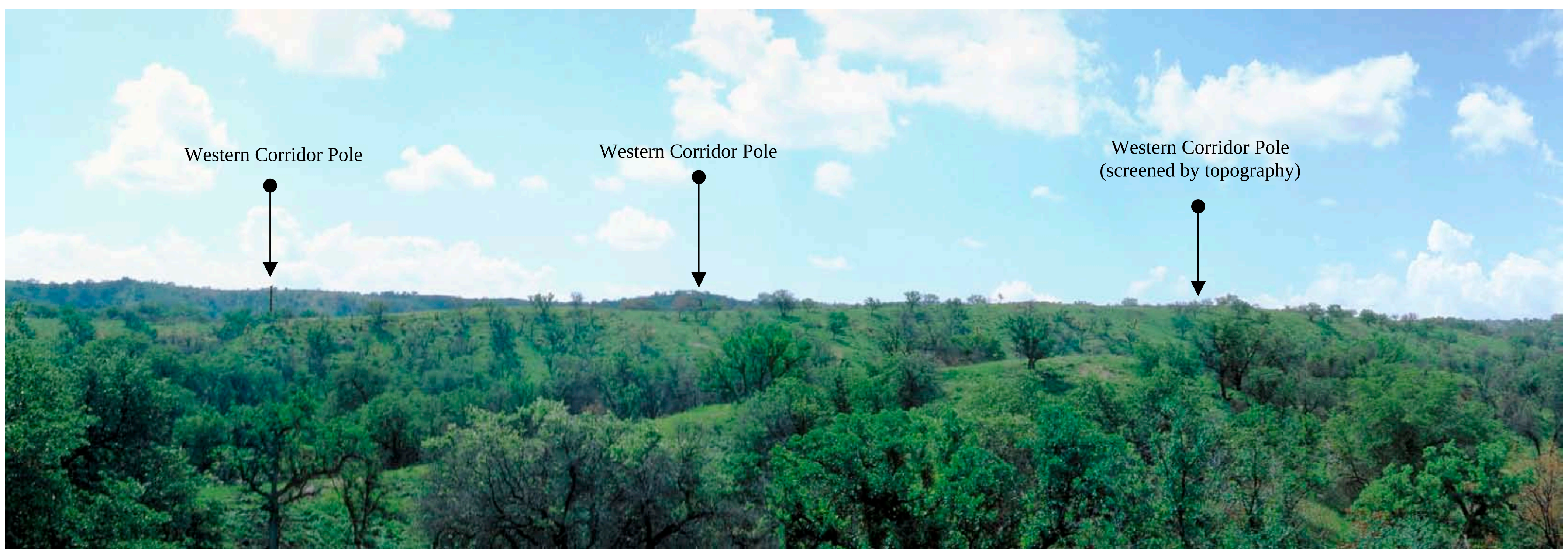


Existing Conditions: View from Ruby Road west of the Calabasas Group Area.

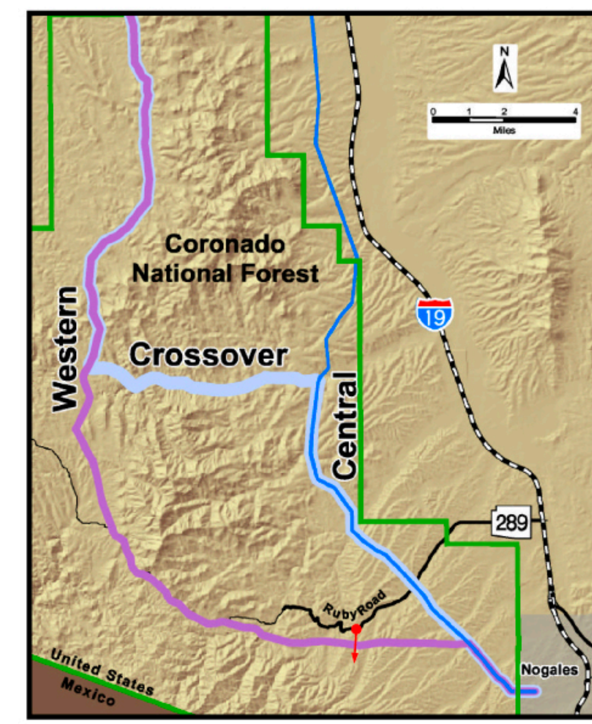
Visual Simulation 2: Western Corridor from Ruby Road west of the Calabasas Group Area.

An example, partially-blocked view of the Western Corridor from a Concern Level 1 travelway.

Direction: South
Distance to Nearest Pole: 0.4 mi



Visual Simulation: Depicting self-weathering monopoles.



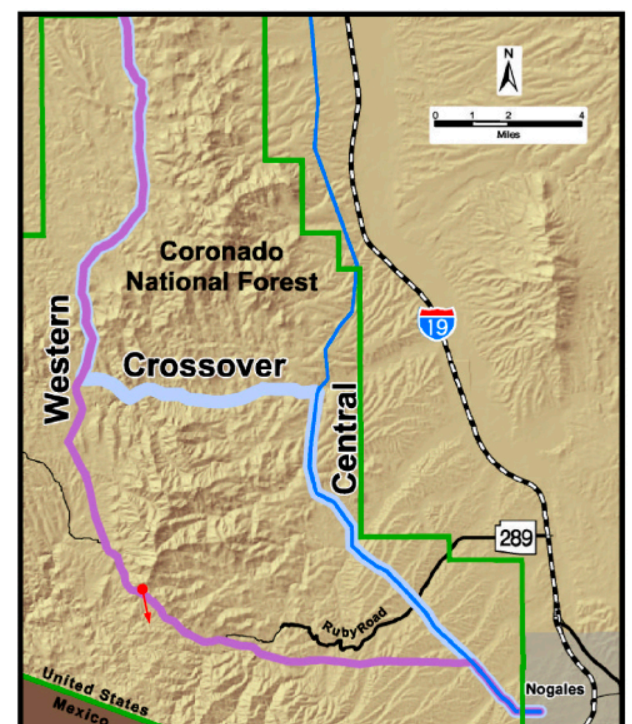
Existing Conditions: View looking southwest along Ruby Road, north of the Pajarita Wilderness.

Visual Simulation: Depicting self-weathering monopoles.

Visual Simulation 3:
Western Corridor along Ruby Road north of Pajarita Wilderness.

An example, wide-open view of the Western Corridor from a Concern Level 1 travelway.

Direction: Southeast
Distance to Nearest Pole: .01 mi



Existing Conditions: View from Ruby Road toward Castle Rock.

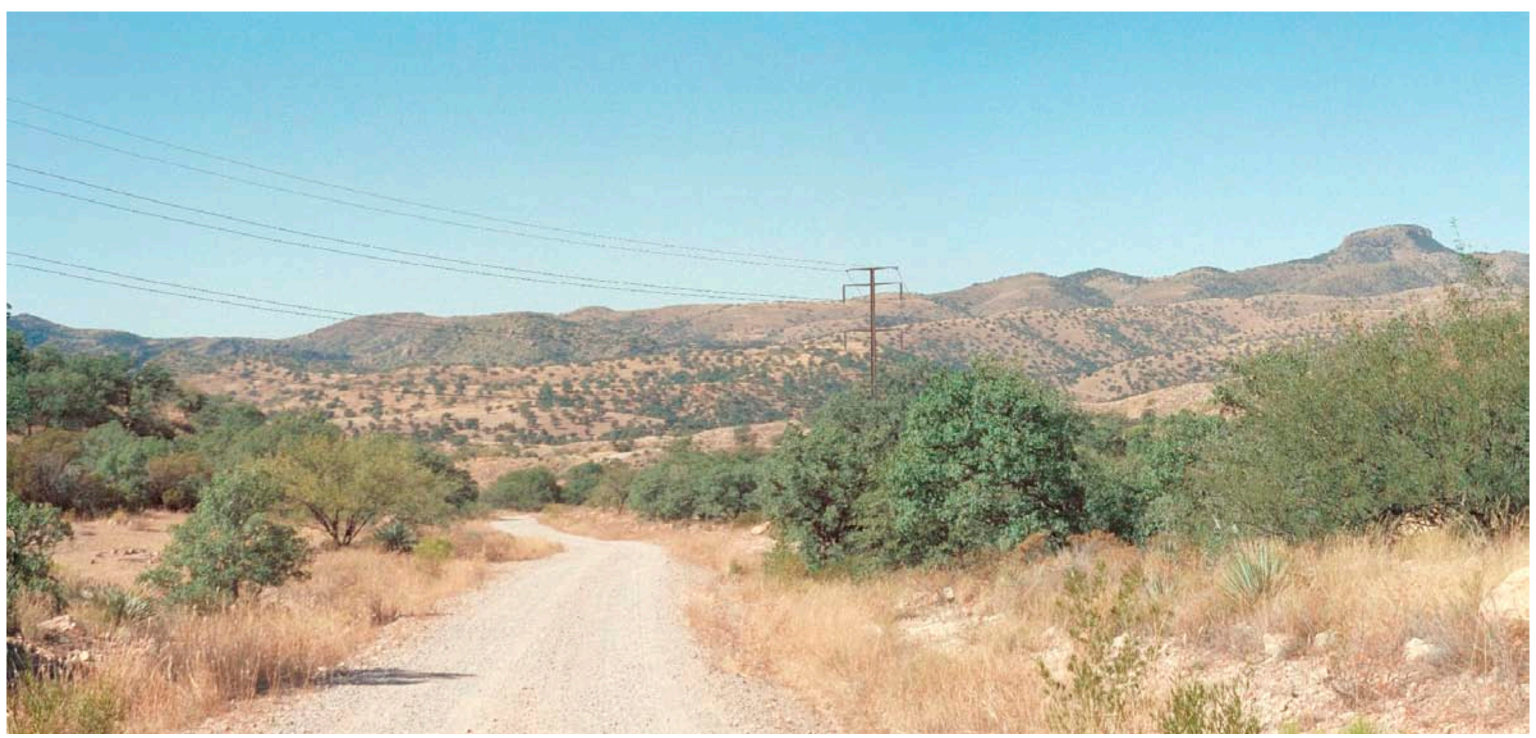
Visual Simulation: Depicting self-weathering monopoles.

Visual Simulation 4:
Western Corridor and Castle Rock from Ruby Road.

An example, partially-blocked view of the Western Corridor from a Concern Level 1 travelway.

Direction: Southeast
Distance to Nearest Pole: 0.4 mi

Existing Conditions: Western Corridor crossing Site of Ruby Road looking Westbound.



Visual Simulation: Depicting Self-weathering Monopoles.

Visual Simulation 5: Western Corridor Crossing Ruby Road.

An example, wide-open view of the Western Corridor from a Concern Level 1 travelway.

Direction: West
Distance to Nearest Pole: 0.06 mi

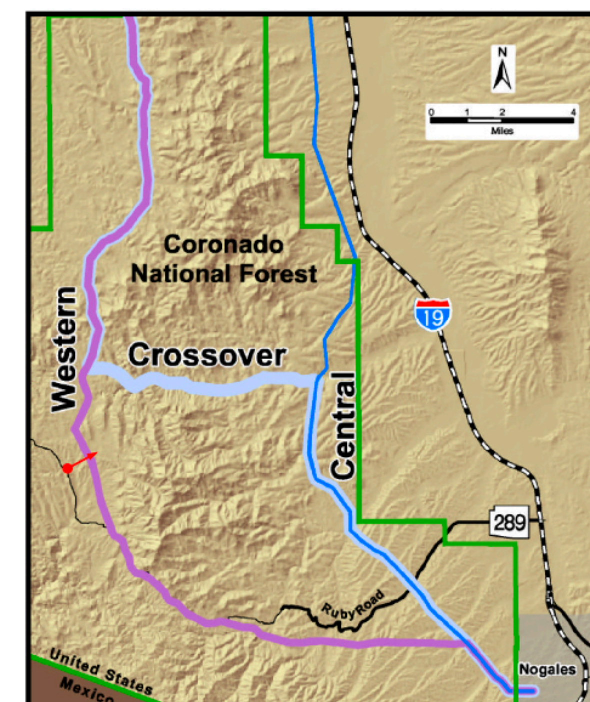
Existing Conditions: View from Ruby Road looking northeast along the west side of the Tumacacori Mountains.

Visual Simulation 6: Western Corridor from Ruby Road west of the Tumacacori Mountains.

An example, wide-open view of the Western Corridor from a Concern Level 1 travelway.

Direction: Northeast
Distance to Nearest Pole: 0.8 mi

Visual Simulation: Depicting self-weathering monopoles.



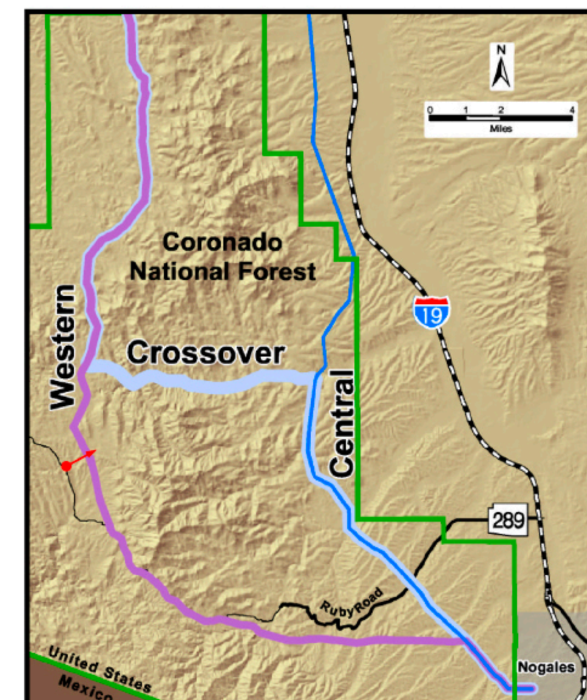
Existing Conditions: View from Ruby Road looking northeast along the west side of the Tumacacori Mountains.

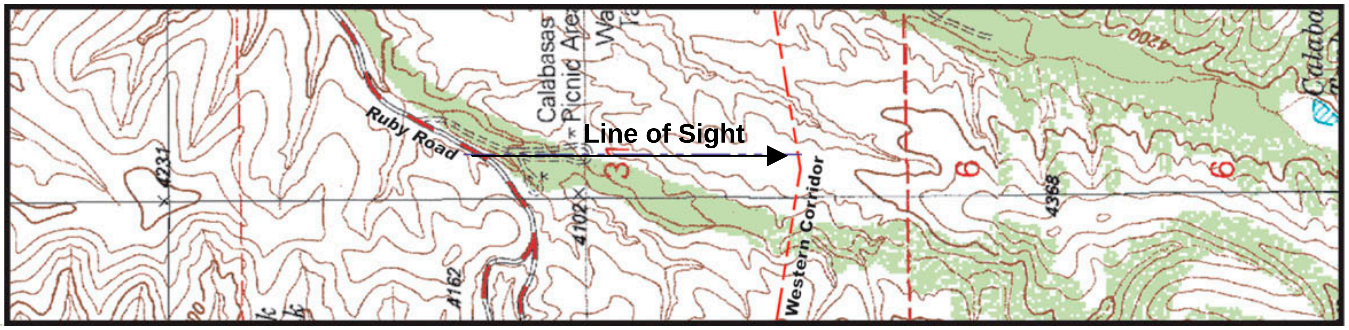
Visual Simulation 7: Western Corridor from Ruby Road west of the Tumacacori Mountains.

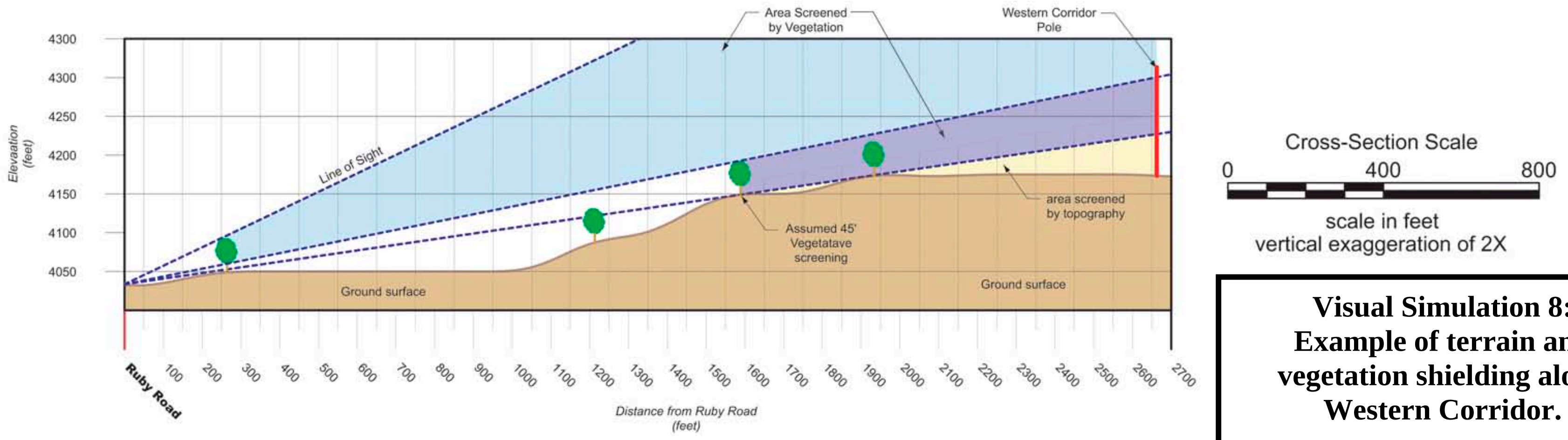
An example, wide-open view of the Western Corridor from a Concern Level 1 travelway.

Direction: Northeast
Distance to Nearest Pole: 0.8 mi

Visual Simulation: Depicting dulled galvanized lattice towers with access roads required for this type of structure.







Visual Simulation 8:
Example of terrain and vegetation shielding along Western Corridor.

This topographic map and graph show that the Western Corridor would be mostly screened from view by topography and vegetation for viewers on Ruby Road looking towards the Calabasas Group Area.

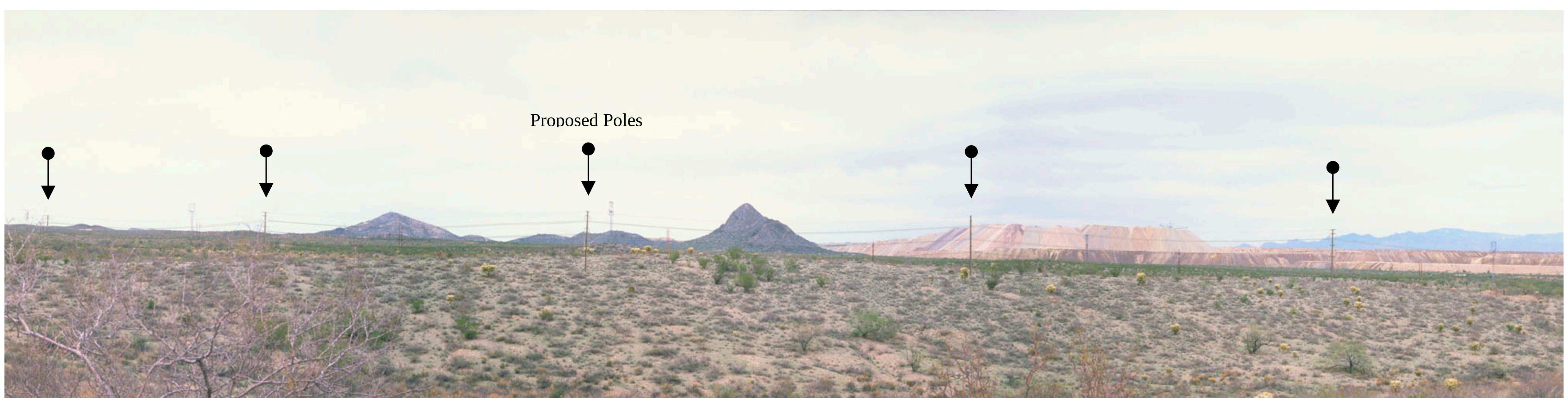
Direction: South
Distance to Nearest Pole: 3.6 mi

Visual Simulation 9: All Three Corridors on BLM Land.

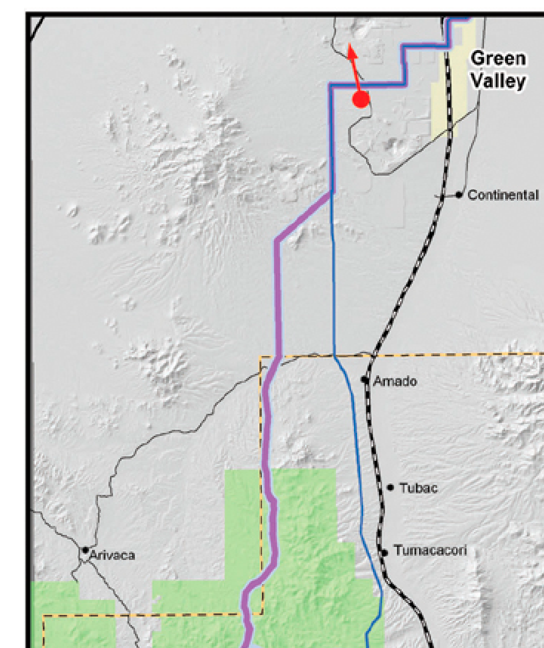
An example, wide-open view of a common segment of the Western, Central, and Crossover Corridors, adjacent to existing transmission lines near Mission Road.

Direction: Northwest
Distance to Nearest Pole: 0.4 mi

Existing Conditions: View of existing transmission lines on BLM land.



Visual Simulation: Depicting self-weathering monopoles.



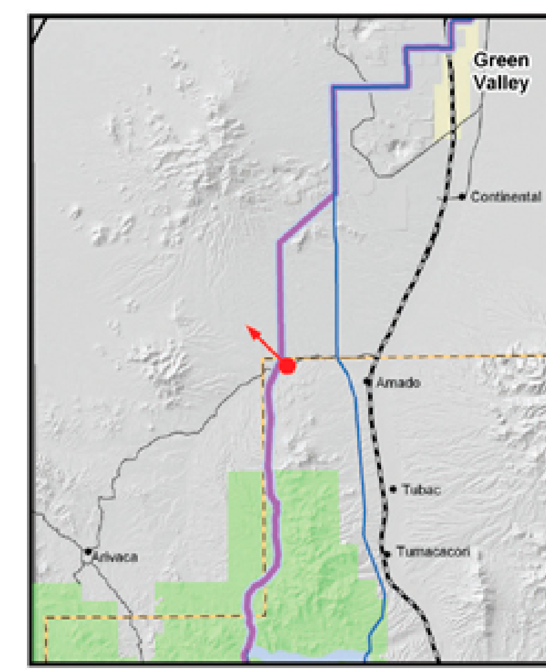
Existing Conditions: Western and Crossover Corridor crossing site of Arivaca Road.

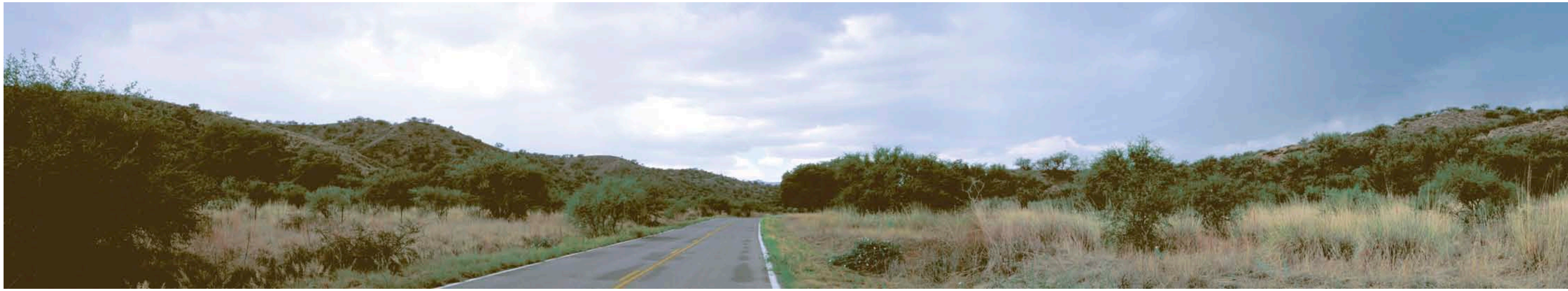
Visual Simulation 10: Western and Crossover Corridor Crossing Arivaca Road.

An example, wide-open view of the Western Corridor crossing Arivaca, north of the Coronado National Forest.

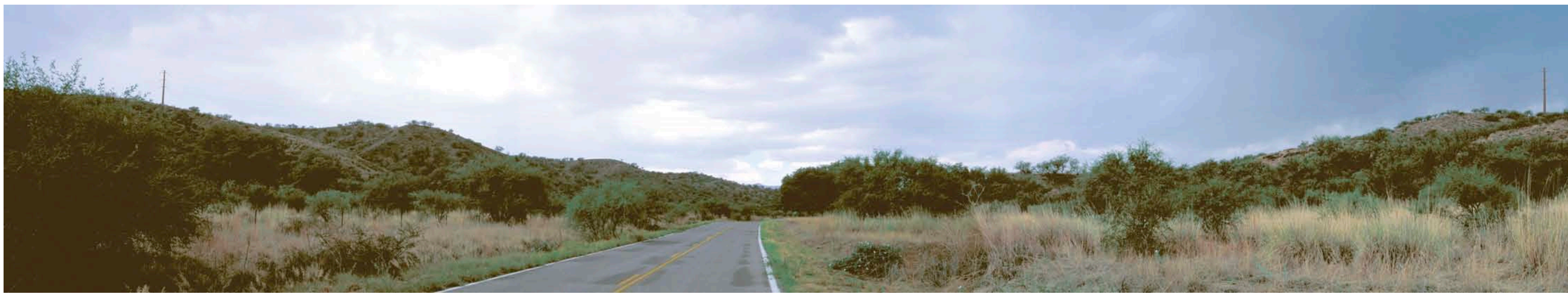
Direction: Northwest
Distance to Nearest Pole: 0.1 mi

Visual Simulation: Depicting self-weathering monopoles.





Existing Conditions: Central Corridor crossing of Ruby Road looking westbound.

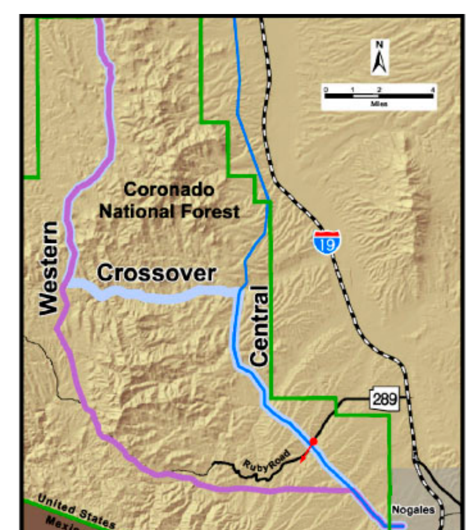


Visual Simulation: Depicting self-weathering monopoles.

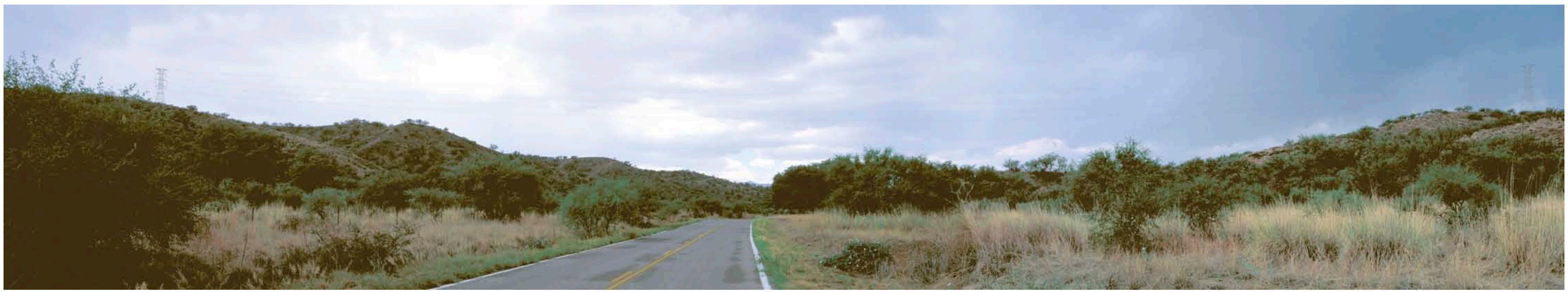
Visual Simulation 11: Central Corridor Crossing of Ruby Road.

Wide-open view of the Central Corridor from a Concern Level 1 travelway.

Direction: Southwest
Distance to Nearest Pole: 0.2 mi



Existing Conditions: Central Corridor crossing of Ruby Road looking westbound.

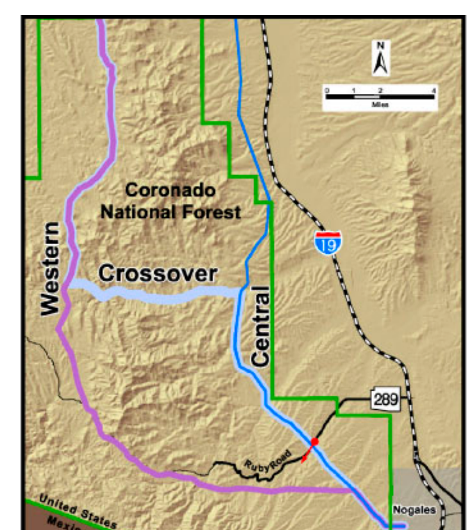


Visual Simulation: Depicting dulled galvanized lattice towers.

Visual Simulation 12:
Central Corridor Crossing of Ruby Road.

Wide-open view of the Central Corridor from a Concern Level 1 travelway.

Direction: Southwest
Distance to Nearest Pole: 0.2 mi

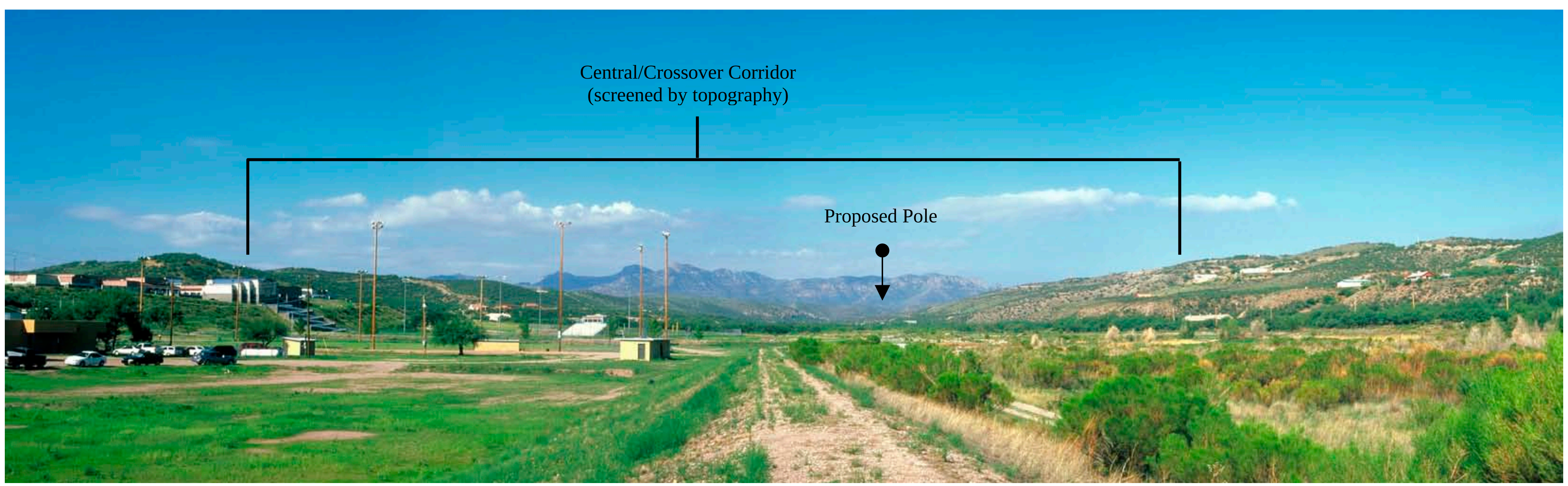


Existing Conditions: Peck Canyon west of I-19 north of San Cayetano Elementary School.

Visual Simulation 13:
Central or Crossover Corridor from Peck Canyon at I-19.

An example, partially blocked view of the Central Corridor from a Concern Level 1 travelway.

Direction: Southwest
Distance to Nearest Pole: 3.6 mi



Visual Simulation: Depicting self-weathering monopoles.

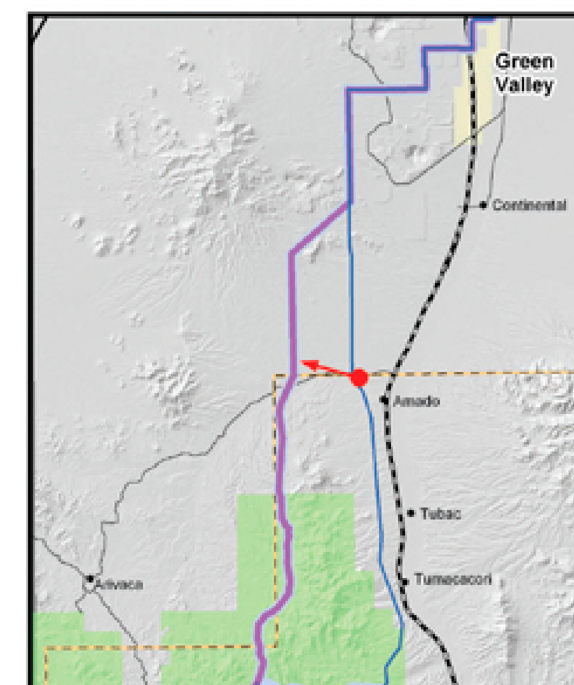
Existing Conditions: Central Corridor crossing site of Arivaca Road.

Visual Simulation 14:
Central Corridor Crossing
Arivaca Road.

An example, wide-open view of the Central Corridor crossing Arivaca Road, north of the Coronado National Forest.

Direction: Northwest
Distance to Nearest Pole: 0.1 mi

Visual Simulation: Depicting self-weathering monopoles.



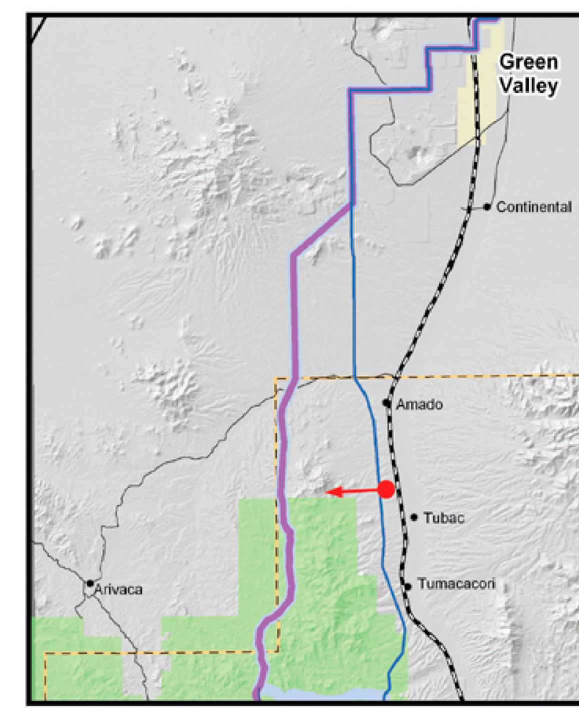
Existing Conditions: Northwest of Tubac, looking west.

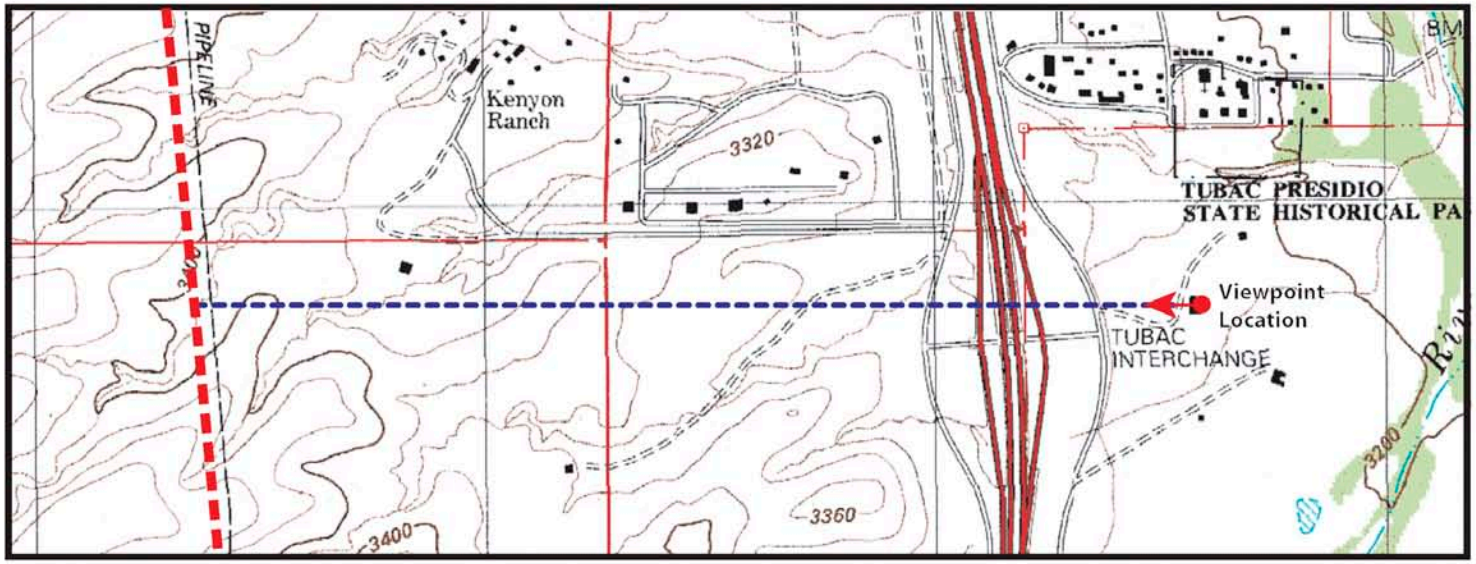
Visual Simulation 15: Central Corridor Northwest of Tubac.

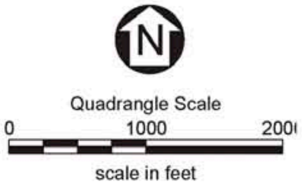
An example, wide-open view of the Central Corridor from the Burro Inn, with a partial backdrop of mountains.

Direction: West
Distance to Nearest Pole: 0.1 mi

Visual Simulation: Depicting self-weathering monopoles.



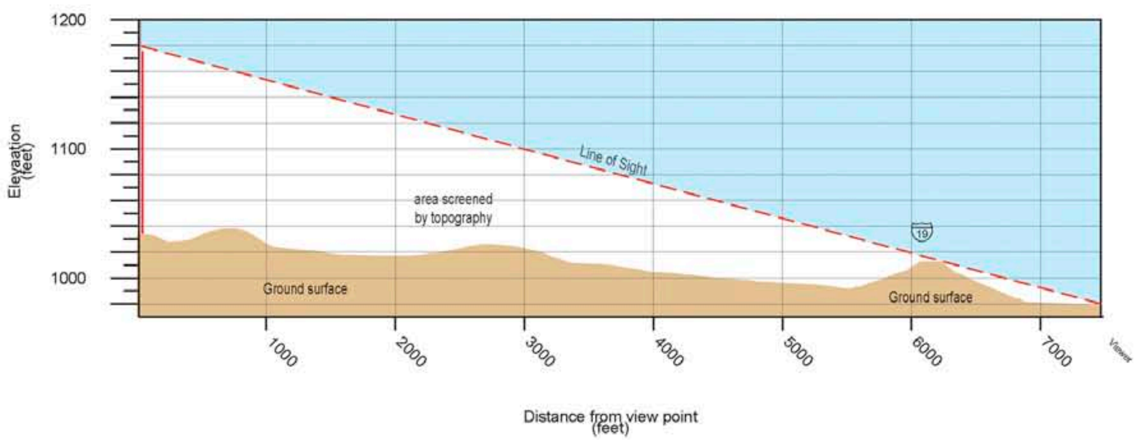


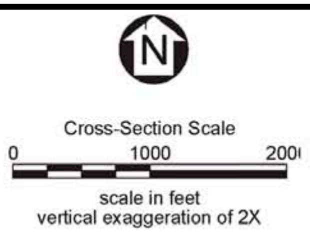


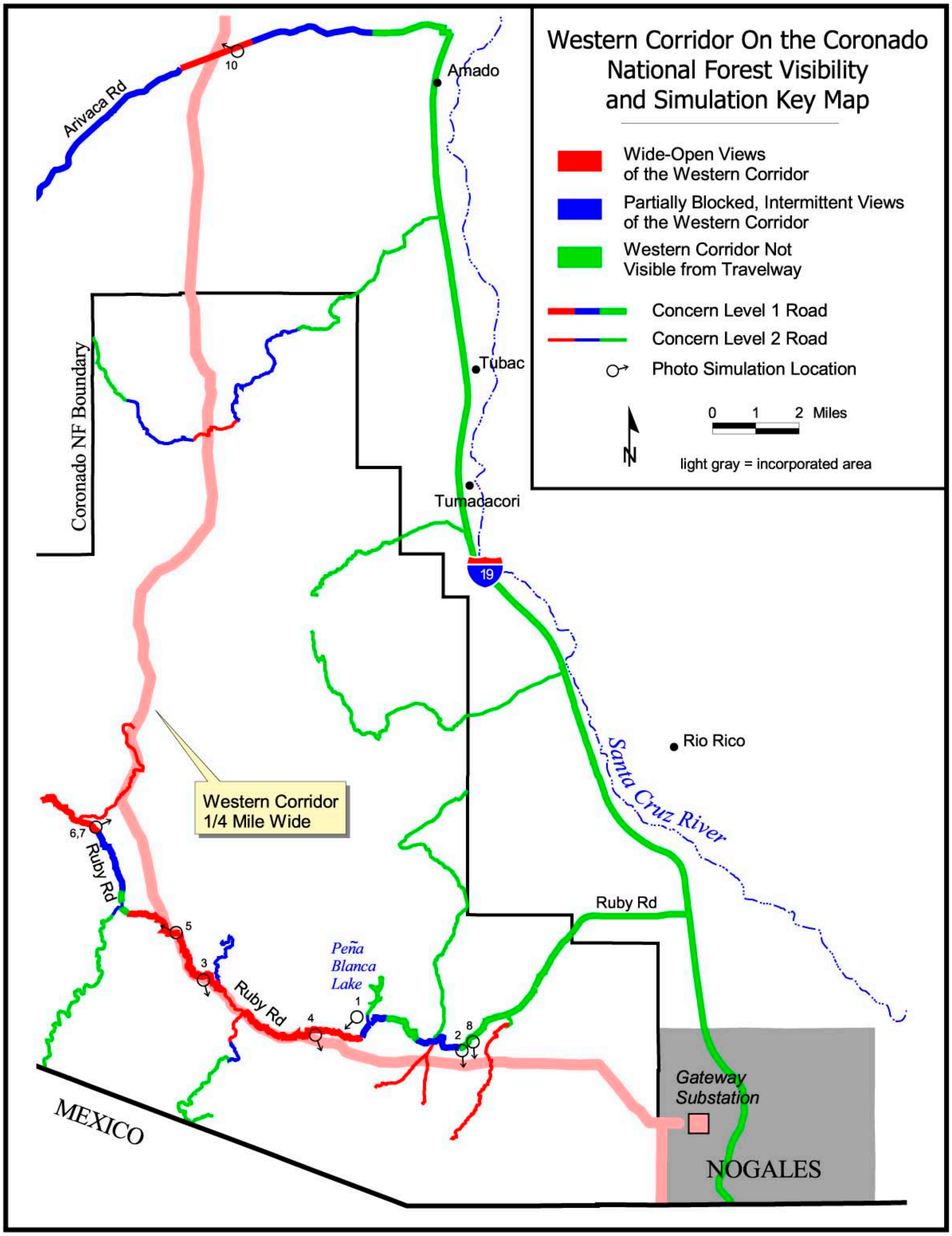
Visual Simulation 16: Example of partial terrain shielding along Central Corridor.

This topographic map and graph show that the Central Corridor would be mostly screened from view by topography from the Barrio de Tubac subdivision east of I-19.

Direction: West
Distance to Nearest Pole: 1.4 mi

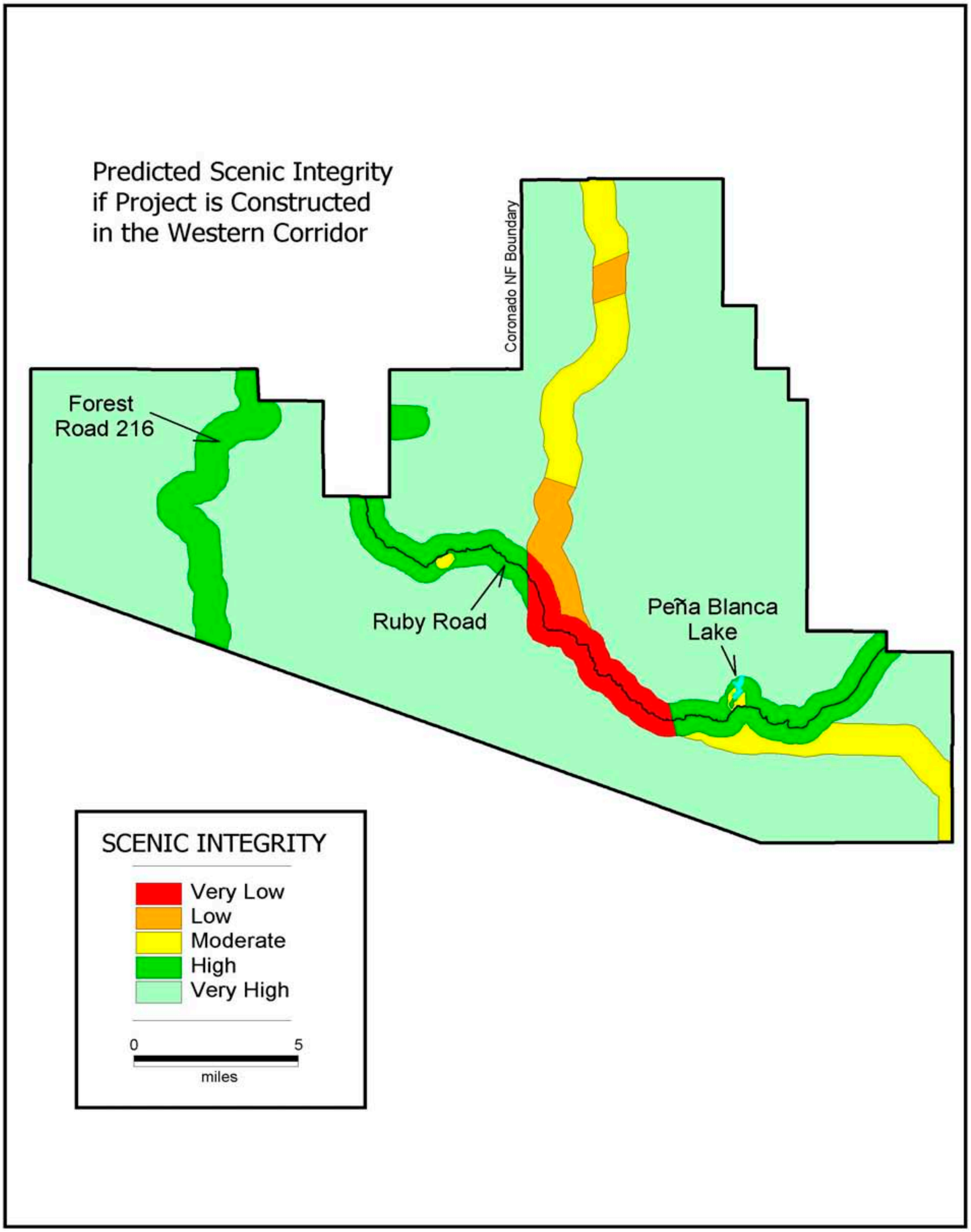






Note: This figure assumes monopoles with minimal access roads. Access roads required for lattice towers would likely result in different maps.

Figure 4.2–1. Western Corridor on the Coronado National Forest Visibility and Simulation Key Map.



Note: This figure assumes monopoles with minimal access roads. Access roads required for lattice towers would likely result in different maps.

Figure 4.2–2. Predicted Scenic Integrity of the Western Corridor.

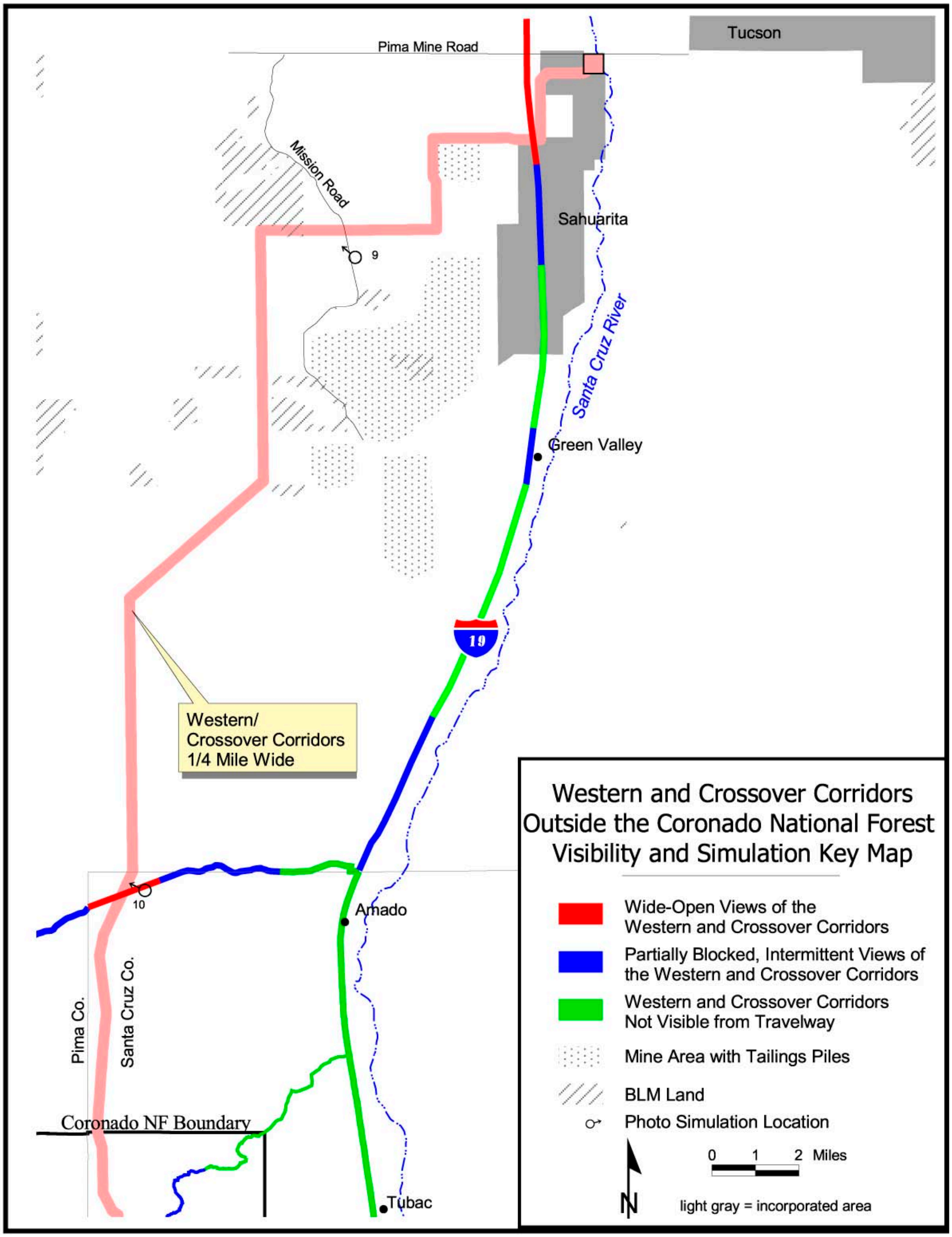


Figure 4.2–3. Western and Crossover Corridors Outside the Coronado National Forest Visibility and Simulation Key Map.

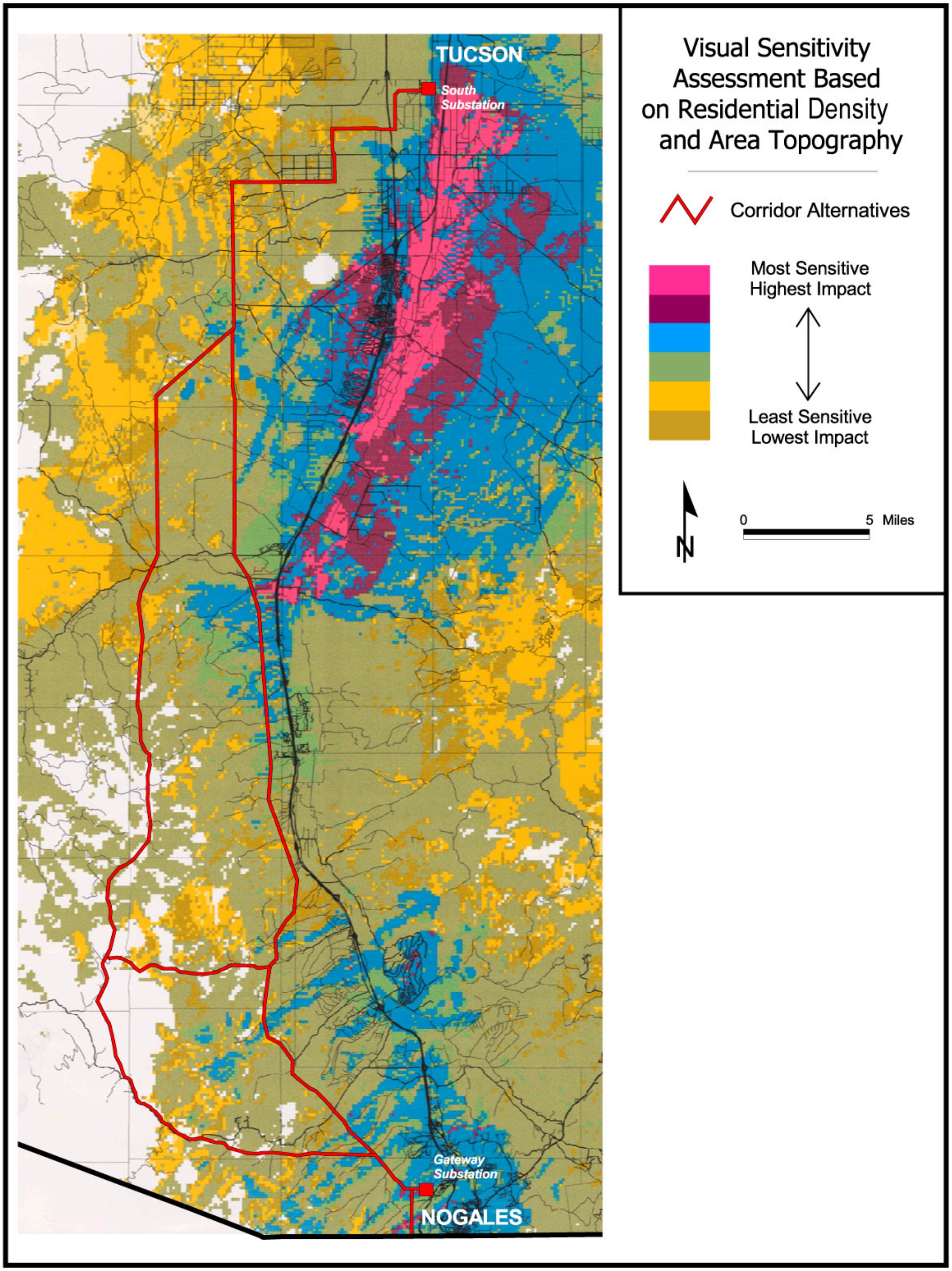
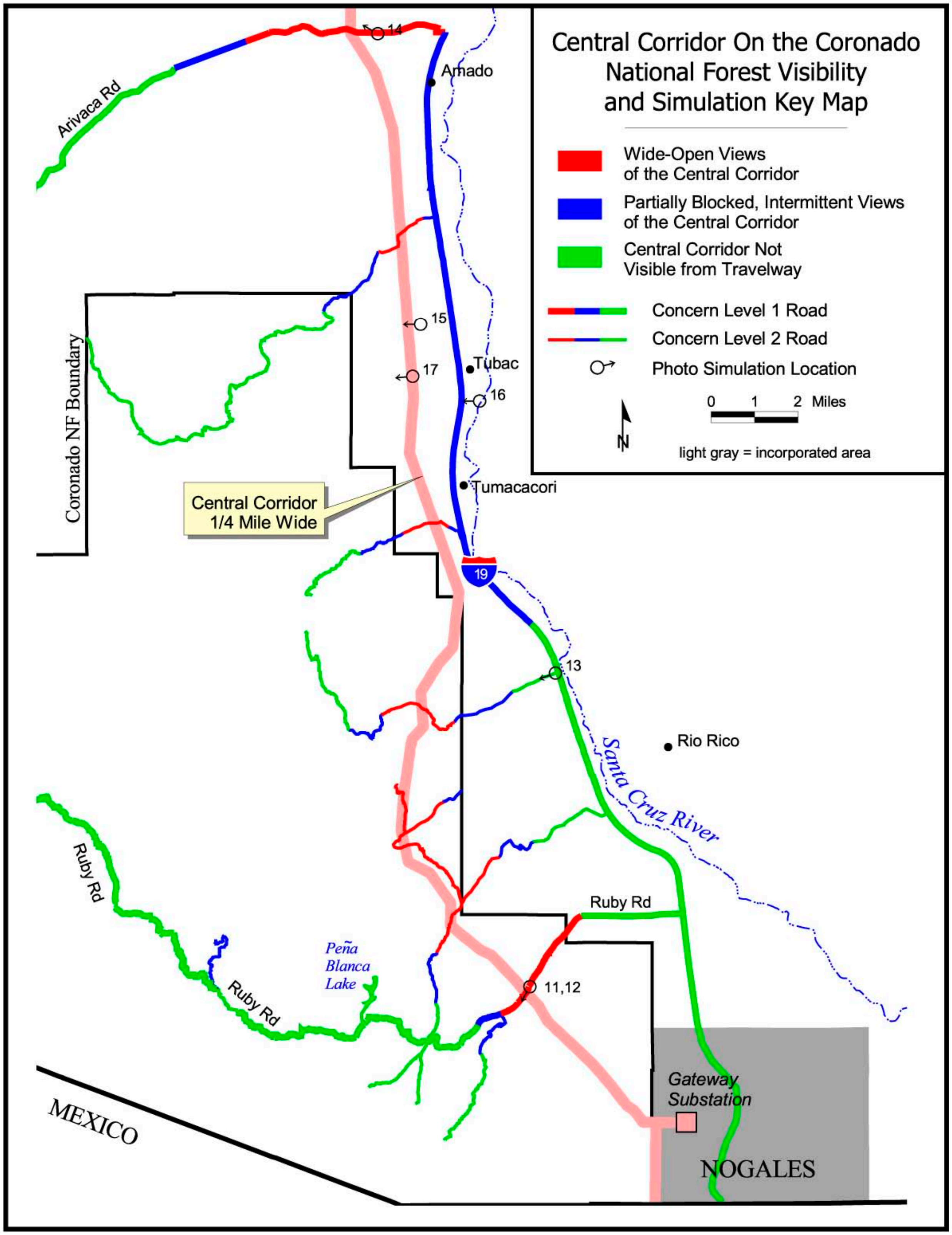
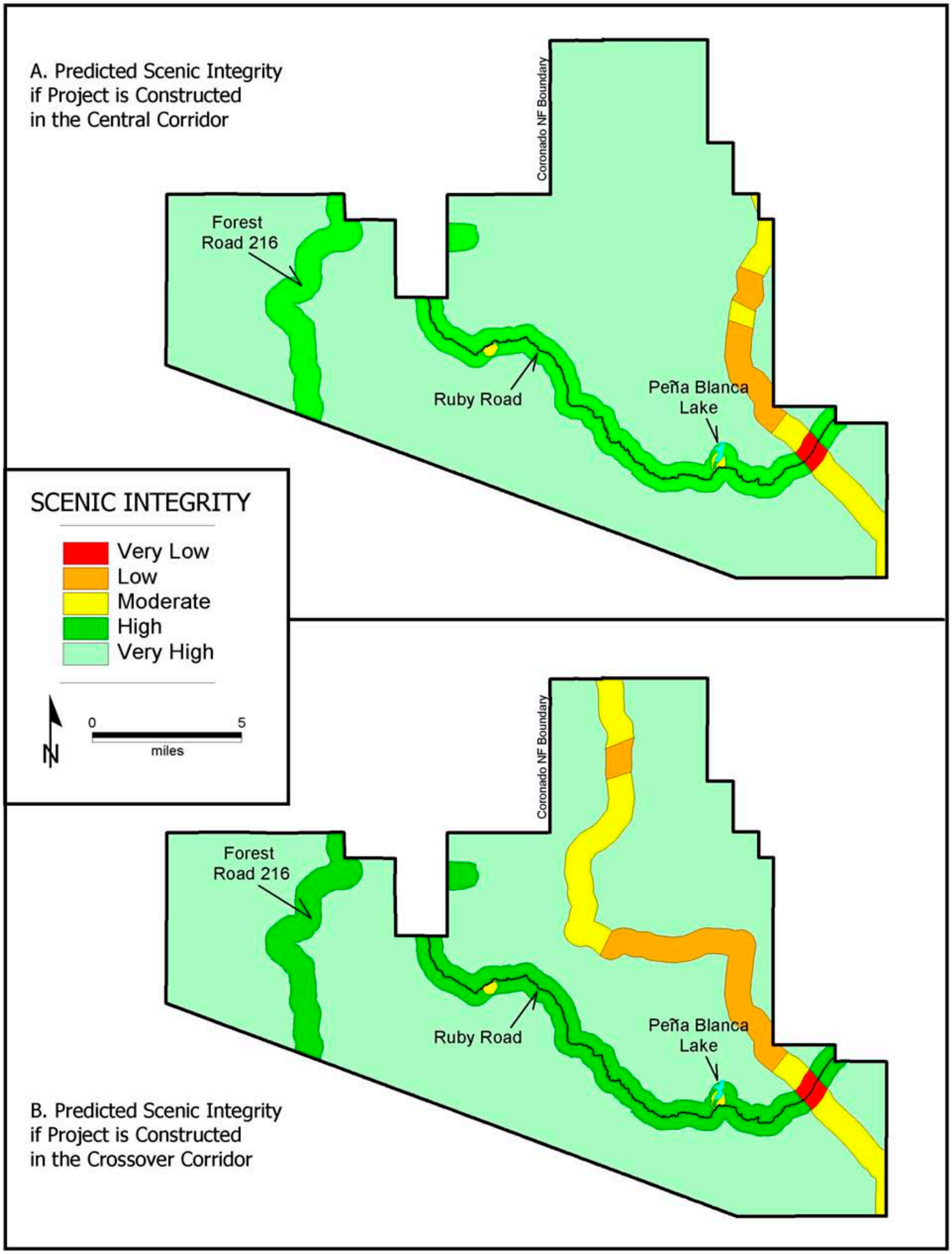


Figure 4.2–4. Visual Sensitivity Map.



Note: This figure assumes monopoles with minimal access roads. Access roads required for lattice towers would likely result in different maps.

Figure 4.2–5. Central Corridor on the Coronado National Forest Visibility and Simulation Key Map.



Note: This figure assumes monopoles with minimal access roads. Access roads required for lattice towers would likely result in different maps.

Figure 4.2–6. Predicted Scenic Integrity of the Central and Crossover Corridors.

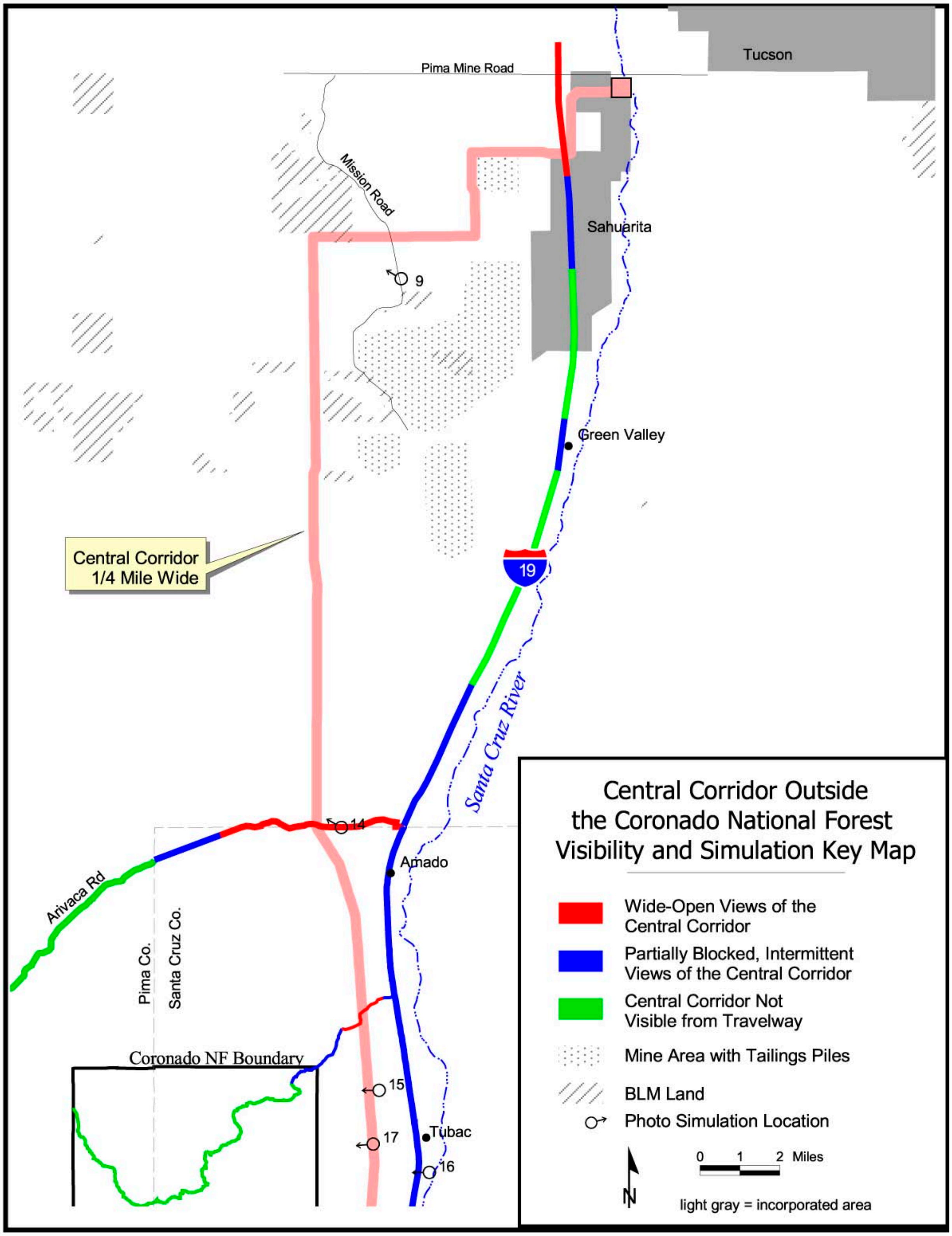
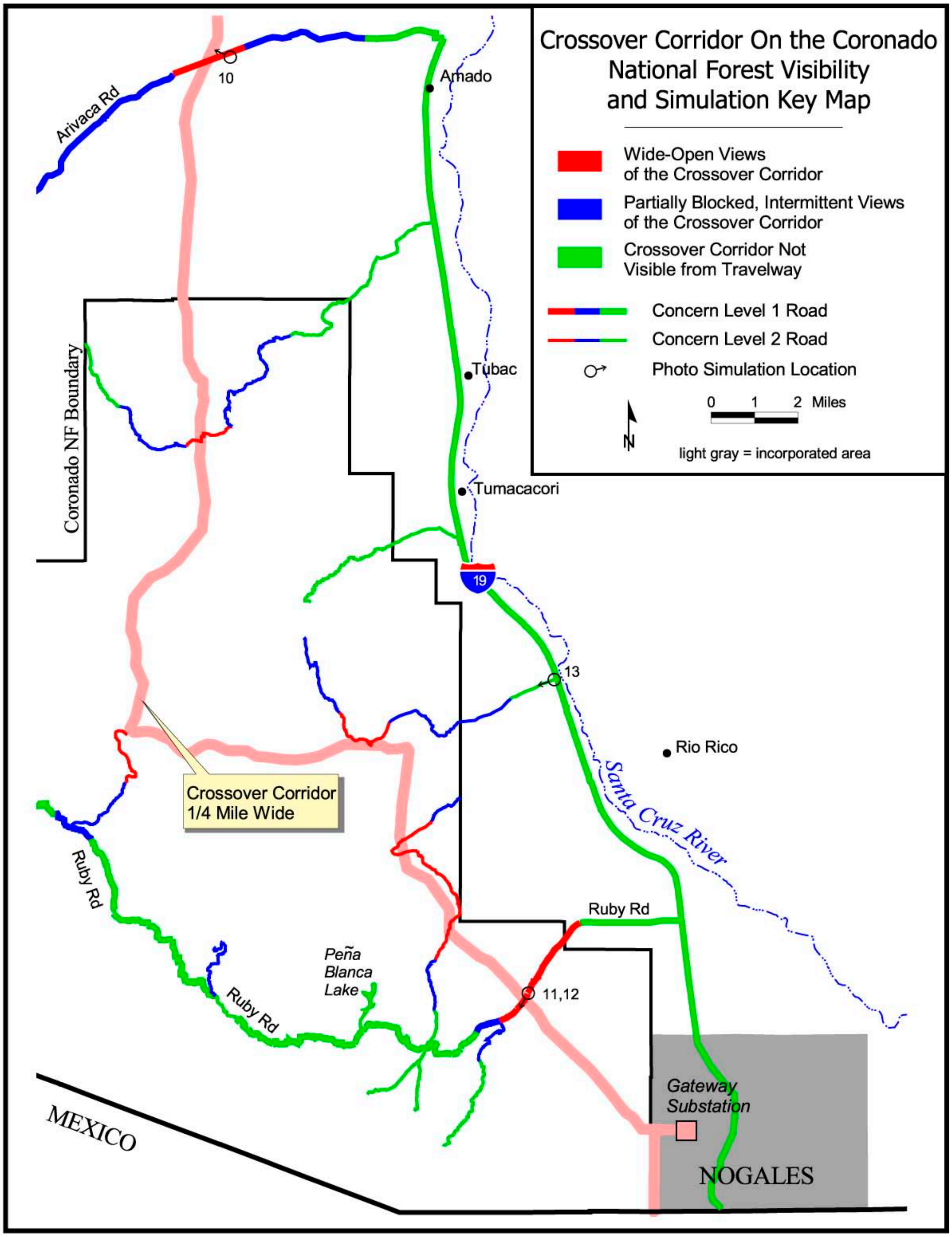


Figure 4.2–7. Central Corridor Outside the Coronado National Forest Visibility and Simulation Key Map.



Note: This figure assumes monopoles with minimal access roads. Access roads required for lattice towers would likely result in different maps.

Figure 4.2–8. Crossover Corridor on the Coronado National Forest Visibility and Simulation Key Map.

The most significant environmental effects may result not from the direct effects of a particular action, but from the combination of the minor effects of multiple individual actions over time (CEQ 1997b). The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of the *National Environmental Policy Act* (NEPA) define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain that "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

5.1 METHODOLOGY

The cumulative impacts analysis presented in this document is based on the potential effects of the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project when added to impacts from other actions in the region. The discussion in this chapter centers on the cumulative effects of past, present, and reasonably foreseeable future actions. The potential effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project. The region of influence (ROI) varies for each resource area, primarily depending on the distance a potential effect can travel. For water and soil, the ROI is the watersheds described in Section 3.7, Water Resources; for biological resources, the ROI is the Sky Island Region as described in Section 3.3, Biological Resources; for land use, recreation, cultural, and visual, the ROI is the entire area (and viewshed) of the valleys and mountains between Tucson and Nogales, Arizona; for socioeconomics, the ROI is Pima and Santa Cruz Counties. For air quality, the ROI is the regional airshed in southern Arizona; the analysis contained in this chapter includes actions that could be reasonably anticipated to occur and have cumulative effects within the ROI. The potential for wind transport of air pollutants generated by reasonably foreseeable actions from Mexico into the ROI (in the U.S.) is included in the air quality cumulative impacts analysis. Following the discussion of potential cumulative impacts for each resource area for the entire ROI, potential cumulative impacts specific to the Coronado National Forest are discussed.

5.2 REASONABLY FORESEEABLE ACTION IDENTIFICATION

The following actions have been evaluated as reasonably foreseeable and are included in the analysis of cumulative impacts with the TEP Sahuarita-Nogales Transmission Line Project.

Other Transmission Line Projects. Public Service Company of New Mexico (PNM) has applied to the U.S. Department of Energy (DOE) for a Presidential Permit to construct an electric transmission line across the U.S.-Mexico border in Nogales, overlapping portions of the proposed TEP project as shown in Figure 2.1–4. PNM's overall proposed project consists of two new high voltage transmission lines originating at the Palo Verde Substation, approximately 125 mi (201 km) northwest of Tucson, and connecting through a number of alternative routes to a single proposed route through Nogales, Arizona, to the Santa Ana Substation in Sonora, Mexico. Specifically, PNM's proposed alternative corridor, termed the Pipeline Corridor, parallels TEP's proposed corridors for a total of approximately 44 mi (71 km) as they follow or cross the existing El Paso Natural Gas Company (EPNG) pipeline right-of-way (ROW). Like the TEP corridors, the PNM corridor contains a segment within the Coronado National Forest (approximately 15 mi [185 km]) and would require construction and ongoing maintenance access.

If TEP's proposed project goes forward, Citizens Communication Company (Citizens) would likely construct a new 115-kV transmission line from the proposed Gateway Substation (where TEP has begun preliminary construction activities) to Citizens' existing Valencia Substation in Nogales. The details of an approximately 3-mi (5-km) proposed 115-kV line connecting TEP's proposed Gateway Substation to Citizens' Valencia Substation are given in an application to the Arizona Power Plant and Transmission Line Siting Committee (TEP 2001). Citizens' proposed routes run east from the proposed Gateway Substation and do not overlap with any proposed TEP corridors.

Industrial Development. The U.S.-Mexico border is a developing center of commerce. Currently, more than $1 billion of Mexican produce crosses the U.S.-Mexico border at Nogales bound for the United States and Canada each year, and approximately 1,300 trucks from Mexico enter Nogales everyday from November through May. The U.S. 1998 *Transportation Equity Act for the 21st Century* allocates funding for the development and improvement of high priority corridors, including the CANAMEX corridor leading north from the U.S.-Mexico border along Interstate 19 (I-19). In Federal Fiscal Year 2003, it is estimated that the CANAMEX states will receive on average an estimated $277 million per year per state. On the high end, it is anticipated that Arizona will receive $462 million per year for the development and improvement of high priority corridors (CANAMEX 2001). The State of Arizona has pledged additional funding. The development and improvement of this high priority corridor would involve roadway improvements that could lead to an increase in industrial parks, manufacturing facilities, and truck traffic, especially in Nogales, Arizona.

Trade Corridor/Roadway Development. In January 2000, the City of Nogales, Arizona initiated an engineering and cost Feasibility Study (City of Nogales 2000) for trade corridors in its vicinity. Figure 5.2–1 shows the proposed roadways (trade corridors) and proposed intersections with existing roadways (proposed interchanges). The two proposed roadways are:

- North-South Interconnector – A 7.3-mi (12-km) partially access-controlled expressway or super-arterial roadway connecting State Highway 189, in the vicinity of the U.S.-Mexico border, to I-19 at Ruby Road (including an upgrade of Ruby Road). This project was depicted in the feasibility study as a four-lane highway with a median in a 150-ft (46-m) ROW.

- East-West Interconnector – A 3.5-mi (5.6 km), five-lane arterial roadway connecting the proposed North-South Interconnector with State Route 82 in the vicinity of Business 19.

The Unified Nogales/Santa Cruz County Transportation 2000 Plan (known as Transportation 2000 Plan) (UN/SCC 2000) indicates that corridor studies for these projects are planned for 2001 through 2005, and that construction of these projects is planned for 2006 through 2010. The Transportation 2000 Plan lists these projects as not funded, and no more recent information is available (City of Nogales 2003).

As shown in Figure 5.2–1, the planning alignment for the North-South Interconnector includes an estimated 3.5 mi (5.6 km) approximately 800 ft (244 m) inside of (west of) the Coronado National Forest boundary. The East-West Interconnector planning alignment begins at the North-South Interconnector within the Coronado National Forest, and exits the forest 800 ft (244 m) to the east. The development of these trade corridors could lead to business development in the Nogales area including industrial parks, manufacturing facilities, and increased truck traffic.

Additional Activities in the Project Area. Other activities include livestock grazing, immigrant alien incursions, and possible activities under special use permits granted by the Nogales Ranger District of the Coronado National Forest. In addition to the reasonably foreseeable actions that are distinct potential projects, there are more generally defined possible actions in the project area which may contribute to cumulative impacts. Such actions may include an increase in residential development in the project vicinity, increased operations of the U.S. Border Patrol given current heightened security concerns, ongoing activity of undocumented immigrants near the U.S.-Mexico border, and local initiatives to protect biological resources.

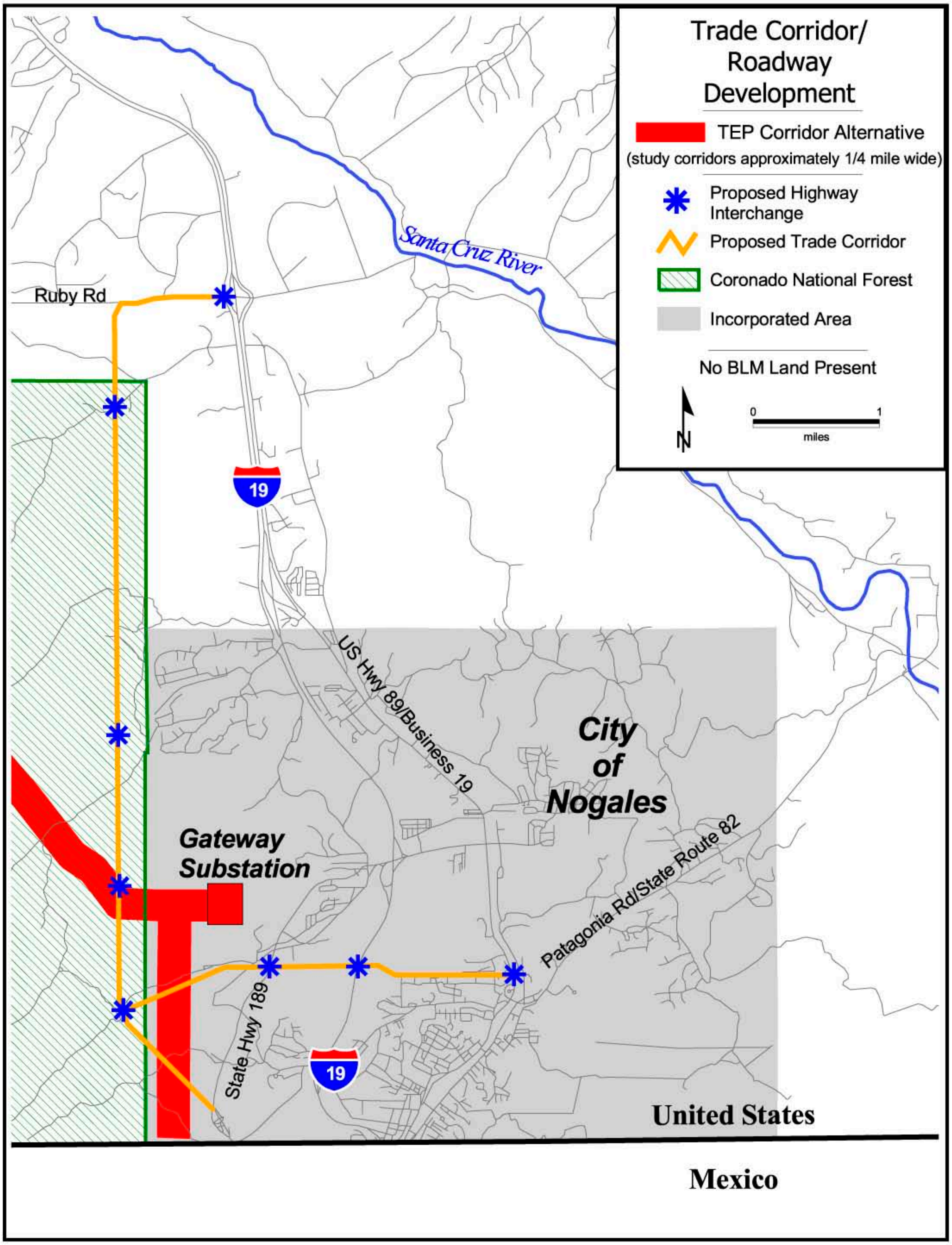


Figure 5.2–1. Trade Corridor/Roadway Development.

For example, in December 2001 Pima County incorporated the Sonoran Desert Conservation Plan into its comprehensive land use plan, although it has not yet been implemented. The Sonoran Desert Conservation Plan contains six areas of focus: Protection of Critical Habitat; Biological Corridors; Mountain Parks; Riparian Restoration; Historic and Cultural Preservation; and Ranch Land Conservation (Sonoran 2003). In the future, the county plans to apply for a multi-species Habitat Conservation Plan permit under the *Endangered Species Act* (ESA) to allow less specific protections for 55 federally listed species in exchange for habitat protection in the conservation reserve system under the Sonoran Desert Conservation Plan.

DOE has written to the U.S. Border Patrol about the proposed project (see Chapter 10); the U.S. Border Patrol has not brought any specific concerns to DOE's attention. The additional activities identified above have contributed to the creation of wildcat (unofficial) roads within the Coronado National Forest. Illegal immigrants continue to create footpaths and start unsupervised campfires at night.

Section 3.5, Socioeconomics, of this Draft Environmental Impact Statement (EIS) documents the growing population of the ROI. This could result in a trend toward increased residential development of Pima and Santa Cruz Counties.

To the extent that the potential environmental impacts of each of these possible activities can be identified, they are included in the cumulative impact analysis that follows.

5.3 CUMULATIVE IMPACTS ANALYSIS

The potential cumulative effects are evaluated both for the period of project construction (anticipated to be 12 to 18 months), and for the post-construction (operation) period of the project. Following the discussion of potential cumulative impacts for each resource area for the entire ROI, potential cumulative impacts specific to the Coronado National Forest are discussed.

The primary cumulative impacts from the combination of TEP's proposed project and other past, present, and reasonably foreseeable actions could affect land use (including recreation), visual resources, biological resources, cultural resources, socioeconomic resources, geology and soils, water resources, air quality, noise, human health and environment, and transportation. As detailed in Chapter 4, the proposed project's impacts to air, noise, water, and socioeconomic resources are minimal, and primarily associated with project construction, thus minimizing the potential for cumulative effects.

Land Use and Recreation. Land use may have adverse cumulative effects as a result of past, present, and reasonably foreseeable projects. The planning alignments of both the North-South Interconnector and the East-West Interconnector would cross TEP's proposed corridor near the Gateway Substation, and the PNM proposed project would potentially overlap with TEP's proposed project depending on the alternatives implemented as previously described. Potential industrial development associated with the CANAMEX corridor and residential development would introduce land use changes. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be development of land that is currently undisturbed or used for other activities such as ranching and recreation. The activities of the U.S. Border Patrol and illegal immigrants may further contribute to disturbance of land that is currently in a relatively natural state. When implemented, the Sonoran Desert Conservation Plan may help in defining a balance of land uses and in protecting them.

In general, national forest lands have historically been less impacted by construction and development than other land given USFS land management requirements. The cumulative impact of TEP construction outside of national forest lands would be part of a larger trend towards development, while construction of the TEP project on national forest lands would be in areas less cumulatively impacted by other development (except for other permitted uses).

If multiple projects are under construction simultaneously, an increased amount of land would be used temporarily for construction lay down yards and staging areas. For example, construction of the proposed TEP, PNM, and roadway corridor projects, combined with potential residential construction would temporarily require land use changes in the ROI.

To the extent that changes in land use occur, areas that are currently used for recreation may no longer be available for recreation, or may provide a different recreation experience due to a more developed setting. While a majority of the area crossed by the proposed trade corridors is not currently utilized for recreation, the North-South Interconnector would be an upgrade of Ruby Road for an estimated 0.5 mi (0.8 km) near I-19, impacting recreational driving (due to a change in scenery) on Ruby Road. The proposed transportation corridors' primary purpose is to enhance freight movement in the area, and they are not specifically designed to (or expected to) attract recreational users.

Recreational activities within the Coronado National Forest are expected to increase due to increased area populations (see Section 3.5, Socioeconomics) and the need to find climatic relief or relief from urban stress. Increased access from multiple projects, especially transmission line projects that require ongoing maintenance access, could accelerate the increase in recreational use of national forest lands. The cumulative impact of increased recreational use of national forest lands could be a change in aspects of the recreational experience such as remoteness, and a possible need for more facilities for visitor management.

Visual Resources. Directly related to the potential for the cumulative impact of development of natural land uses from past, present, and reasonably foreseeable future projects, the viewshed of the valleys and mountains between Tucson and Nogales, Arizona would continue to be altered from its natural state. If the PNM project was built in the Pipeline Corridor and the TEP project was built in the Central Corridor, these projects would be adjacent to each other for approximately 44 mi (71 km). In this case, the visual impact would be concentrated and would be less than if both projects were in view but in different locations. The definition and protection of land uses through the Sonoran Desert Conservation Plan, when implemented, could contribute to keeping cumulative visual impacts of development within designated areas. The introduction of construction equipment and staging areas from multiple projects under construction simultaneously would result in temporary increased visual impacts to the ROI. (Also, refer to the discussion of cumulative impacts specific to the Coronado National Forest at the end of this chapter.)

Biological Resources. Natural habitats and special status species could be impacted by many of the past, present, and reasonably foreseeable future actions. As a result of TEP's proposed project combined with other transmission line projects, industrial, roadway, and residential growth, a cumulative development of land that currently provides natural habitat could occur. The activities of the U.S. Border Patrol and illegal immigrants, along with increased recreational use described previously under Land Use, would further contribute to disturbance of land that currently provides natural habitat. The Sonoran Desert Conservation Plan, when implemented, would help in defining and protecting a balance of land uses.

Construction of an electric transmission line could have adverse effects on special status species. PNM's Pipeline Corridor is similar to TEP's Central Corridor and would have similar potential impacts as described in Section 4.3, Biological Resources. The cumulative impact of disturbance of native habitat, as described in Land Use, could impact at least twice the area from the TEP project alone. This could result in pressures for animals to find new food sources and habitats, and a potential change in the species composition of the area.

Cumulative impacts on biological resources could result in localized modification and fragmentation of habitat. These impacts could result in a decline of biodiversity in the Sky Island Region. Since the majority of the Sky Island habitats are under Federal management (for example, national forest land), all future actions with potential for significant impact would be subject to analysis under NEPA.

Potential impacts to special interest species would occur under all of TEP's action alternatives (see Appendices D, E, and F). All potential impacts as a result of any of the action alternatives and any future actions involving a Federal decision (for example, PNM's proposed project) would be subject to consultation requirements under Section 7 of the ESA. Thus, these actions would be subject to requirements and mitigation outlined by the U.S. Fish and Wildlife Service (USFWS). Therefore, impacts to threatened or endangered species would not accumulate without USFWS review. Likewise, all future actions on land administered by the U.S. Department of Agriculture Forest Service (USFS) (for example, roadway development or PNM's proposed project) would require Management Indicator Species analysis, and would not accumulate without USFS review (see Section 4.3.5, Management Indicator Species).

New disturbances from all past, present, and reasonably foreseeable future projects would provide a potential point of entry for invasive species onto the landscape, which could lead to adverse modification of the surrounding ecosystems. Colonization of an invasive species within the ROI would be a significant impact. The potential for introduction of invasive species would be greatest during construction of one or more projects, and would continue to exist during any project maintenance required. Increased access roads from multiple actions could result in increased disturbance of existing vegetation.

Cultural Resources. Directly related to the cumulative impact of natural land development caused by past, present, and reasonably foreseeable future projects, increased disturbance from multiple actions could result in cumulative adverse impacts to currently unknown cultural resource sites. In addition to project-related disturbance, the increased accessibility created by new roads built for the project can cause cumulative impacts in the form of increased public visitation, recreational impacts, and vandalism. If multiple actions occur, special care would need to be taken to address these cumulative impacts with appropriate mitigation or evaluation measures. Construction of TEP's proposed project along the EPNG pipeline ROW and PNM's project along the Pipeline Corridor would minimize the potential for discovery of unknown cultural sites as much of this area was previously disturbed for construction of the gas pipeline. Increased access roads from multiple actions could result in increased human disturbance to cultural resources.

In addition, Tribal representatives listed in Table 3.4–1 have expressed through ongoing Tribal consultations for TEP's proposed project that they value the project area's natural landscape. The cumulative impact on the area landscape from multiple projects would be greater than from the TEP project alone, and would likely evoke a similar concern.

Socioeconomics. Future economic development in the region could bring economic benefits to Pima and Santa Cruz Counties. Improvements in the CANAMEX corridor, including planned roadways, have the potential to significantly impact the economy of the border region near Nogales, leading to the creation of more jobs and revenue for the region. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be to generate more revenue and employment in both counties during and following their construction. However, any cumulative growth effect could also have the potential to impact (and stress) community resources such as schools, police, and fire protection, but is too speculative for cumulative impact analysis.

Geology and Soils. Directly related to the potential for the cumulative impact of development of natural land uses from past, present, and reasonably foreseeable future projects, cumulative adverse impacts to soil resources could result from an increased area of disturbance for construction of multiple projects.

These cumulative impacts would be similar to the potential impacts described in Section 4.6.2, Soils, but over a larger area of disturbance. These impacts include an increased potential for erosion and soil compaction from large equipment, and from decreased vegetation cover resulting from clearing of proposed roads and ROWs where necessary. Construction of TEP's proposed project along the EPNG pipeline ROW and PNM's project along the Pipeline Corridor would minimize the new area of soil disturbance.

Water Resources. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be an increase of water use in the ROI. This potential short-term impact would be greatest if multiple projects were constructed simultaneously, as water would be used for dust control and other purposes. In the long term, operation of transmission lines requires little if any water, so would not contribute to a cumulative long-term increase in water demand from potential residential and industrial growth.

Air Quality. The cumulative impact of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be an increase in airborne dust and vehicle emissions within the ROI. This potential impact would be greatest if multiple projects were constructed simultaneously due to the potential for airborne dust generation. An additional source of air pollutants in the U.S. could be wind transport of airborne dust or pollutants from Mexican transmission line or roadway construction activities in or near Nogales, Mexico. Construction vehicle emissions (as described in Section 4.8) would be greatest if multiple projects were constructed simultaneously, but would tend to dissipate within a few days rather than accumulate in the air over time. In the long term, operation of transmission lines generates very little air emissions, so it would not contribute to a cumulative increase in air emissions that could result from an increase in truck traffic associated with the CANAMEX corridor.

Noise. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be an increase in noise levels during periods when construction projects occur simultaneously. Cumulative noise impacts would be short term and limited to daylight hours. No long-term cumulative noise impacts would occur.

Human Health and Environment. The cumulative impacts to human health and safety could be an increase in background electric and magnetic field (EMF) exposure to residents in the immediate vicinity of overlapping transmission line projects (for example, by TEP and PNM). Section 4.10 gives example EMF exposures of two 345-kV transmission lines operating adjacent to one another (on BLM land, in this case). The EMF levels in this example at a distance where residences would potentially be located are well below 0.8 milligauss (mG), the average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 1999). While extensive research has been conducted to determine if exposure to electric or magnetic fields may cause or promote adverse health effects, the National Institute of Environmental Health Sciences (NIEHS) concluded that "The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak" and that "The probability that EMF exposure is truly a health hazard is currently small" (NIEHS 1999). Based on an assessment such as this, no long-term cumulative human health impacts are expected to occur. However, the subject remains controversial (see Appendix B).

Multiple simultaneous construction projects could result in a temporary increase in traffic congestion and traffic accidents and a decrease in worker safety. No longterm cumulative traffic impacts would occur.

Transportation. The cumulative result of TEP's proposed project combined with other transmission line projects, and industrial, roadway, and residential growth could be a cumulative development of more roadways for project access and private and commercial use. The activities of the U.S. Border Patrol and illegal immigrants may further contribute to the development of new roadways and paths. This change in land use has implications for a number of resources areas as previously described. In addition, multiple simultaneous construction projects could result in a temporary increase in traffic congestion.

Both the PNM and TEP proposed projects include corridors with a segment on the Coronado National Forest, and would require construction and ongoing maintenance access on national forest lands. Construction of TEP's proposed project along the EPNG pipeline ROW and PNM's project along the Pipeline Corridor would minimize the need for new project access. Cumulative traffic impacts would be short term and limited to daylight hours. No long-term cumulative traffic impacts would occur.

Environmental Justice. TEP's proposed project would not result in any disproportionately high and adverse impacts for the minority or low-income population, as described in Section 4.13. No means were identified for minority or low-income populations to be disproportionately affected and TEP's proposed project would not contribute cumulatively to any environmental justice impacts.

Cumulative Impacts Specific to the Coronado National Forest. In addition to the potential cumulative impacts described above for each resource area, which include impacts on national forest lands, the following discusses issues specific to the Coronado National Forest. The cumulative impacts from increased road access into any TEP corridor on the Coronado National Forest, combined with other past, present, and reasonably foreseeable projects, have the potential to adversely affect biological resources, visual resources, cultural resources, land use, and soil.

Cumulative adverse impacts to cultural resources could result from increased disturbance for construction of multiple projects that could disturb currently unknown cultural resource sites. Tribal consultations indicate that disturbance to the natural landscape would also be considered an adverse impact to cultural resources. If multiple actions occur, special care would need to be taken to address these cumulative impacts with appropriate mitigation or evaluation measures.

Cumulative adverse impacts to soil resources could also result from an increased area of disturbance for construction of multiple projects. These cumulative impacts would be similar to the potential impacts described in Section 4.6.2, Soils, but over a larger area of disturbance. These impacts include an increased potential for erosion and soil compaction from large equipment, and from decreased vegetation cover resulting from clearing of proposed roads and the ROW where necessary.

Recreational activities within the Tumacacori EMA are expected to increase due to increased area populations (see Section 3.5, Socioeconomics) and the need to find climatic relief or relief from urban stress. Increased access from multiple projects, especially transmission line projects that require ongoing maintenance access, could accelerate the increase in recreational use of national forest lands. This could adversely impact natural and cultural resources as described above. The cumulative impact of increasing development on national forest lands could be a change in the Recreation Opportunity Spectrum (ROS) settings. By causing a change in access, naturalness, and other ROS setting indicators, the range of possible ROS settings available for recreation could be narrowed. While most of the area crossed by the proposed trade corridors is not currently utilized for recreation, the North-South Interconnector would be an upgrade to Ruby Road for an estimated 0.5 mi (0.8 km) near I-19, further impacting the scenery for recreational driving on Ruby Road. Beyond Ruby Road, the proposed transportation corridors' primary purpose is to enhance freight movement in the area, and are not specifically designed to (or expected to) attract recreational users who would place a high value on scenery.

The specific potential cumulative impacts from the proposed trade corridors development on and adjacent to the Coronado National Forest and TEP's proposed project would be to land use, visual, biological, and cultural resources, as described above. The planning alignments of both the North-South Interconnector and the East-West Interconnector would cross TEP's proposed corridor near the Gateway Substation (outside of national forest land), would have a dominant visual impact and would impact overall Scenic Integrity in this area.

The cumulative impact of TEP's proposed project and other past, present, and reasonably foreseeable future actions could be a loss over time of land that gives the overall visual impression of bieing relatively undisturbed by human activities (that is a natural landscape). This change in landscape character (see Section 3.2, Visual Resources) could especially occur in rapidly growing southeastern Arizona. Public lands, such as the Coronado National Forest, are some of the few remaining natural landscapes, and these natural landscapes on national forest lands have increasing impacts from development as time goes on. For example, in the neighboring Santa Rita Mountains southeast of Tucson, the Whipple Observatory complex, Melendrez Pass communication site, and proposed Very Energetic Radiation Imaging Telescope Array System Project impact otherwise natural lands. Other potential contributors to these cumulative impacts on national forest lands include roadways, housing, commercial development, livestock grazing, recreation activities, undocumented immigrant activities associated with the U.S.-Mexico border, mining projects, and other possible activities under special use permits. Further evaluation of potential cumulative visual impacts is currently underway by DOE in consultation with USFS. The results of this evaluation will be included in the Final EIS.

CHAPTER 6
UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The construction and operation of the proposed action or any of the alternatives would result in some unavoidable adverse environmental impacts. The following is a description of these impacts grouped by topic.

Noise. During construction, daytime noise would increase in residential areas located near the transmission line right-of-way (ROW) and in areas near the ROW used for recreation. Since this impact is associated with the construction phase it would be short-term and temporary.

Waste Management. Construction of the project would result in the generation of small quantities of solid and hazardous wastes that could decrease the life of existing landfills and increase shipments to *Resource Conservation and Recovery Act* (RCRA)-permitted treatment and disposal facilities. Operation of the project would result in the generation of small quantities of municipal solid waste, such as paper and plastic wrapping materials from new equipment.

Erosion. Construction of the transmission line could potentially impact a small amount of prime farmland soils. This would include compaction of these soils and damaging the soil structure during excavation. The burying of soil and loss of soil productivity cannot be avoided in the action alternatives.

With construction of access roads it would be impossible to avoid increased water use and water yield from the aquifer. The point of delivery of that water can be chosen to mitigate the problems of localized increased yield. In addition, increases in soil erosion could occur as a result of construction of all proposed facilities. During the construction phase localized erosion could increase above natural levels and soil would be deposited downslope. This process continues after construction, with decreasing intensity until a stable condition is reached and drainages have adjusted to new hydrologic gradients. Best Management Practices (BMPs) would minimize erosion impacts during construction, and revegetation of construction roads would mitigate long-term impacts.

Water Resources. Potential increase in flood heights in the Santa Cruz River due to expansion of the South Substation within the 100-year floodplain would be unavoidable.

Air Quality. Vehicle and fugitive dust emissions would occur primarily during project construction. For all alternatives vehicle emissions cannot be avoided from continued motor vehicle access to project maintenance roads.

Biological Resources. Law enforcement and search-and-rescue needs would increase relative to increases in access to the area and potential increased human use of the area. Increased access to the area has the potential to disturb biological resources. Tucson Electric Power Company (TEP) would maintain locked gates to new roads required for project maintenance to limit public access. Construction and operation of the proposed project would cause temporary and permanent loss and disturbance to existing native and nonnative plant communities and loss of habitat for terrestrial animal populations.

Cultural Resources. Cultural resources present in the affected areas could be adversely impacted by construction of the proposed project. Increased access to the proposed project area has the potential to disturb cultural resources. TEP would maintain locked gates to new roads required for project maintenance to limit public access.

Recreation and Visual. Since portions of each alternative would be visible to some local residents, visitors on and off the Coronado National Forest, and people traveling on portions of Interstate 19 (I-19) and other area roads, the proposed project would have an adverse long-term impact on the viewshed. This would alter the recreational setting in the vicinity of the proposed project.

CHAPTER 7
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section describes the irreversible and irretrievable commitments of resources associated with implementation of the proposed action or any of the alternatives. A commitment of resources is irreversible when primary or secondary impacts limit the future options for a resource. It applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. It applies to the loss of production, harvest, or use of natural resources (USFS 1992).

Both irreversible and irretrievable commitments of resources would occur under the action alternatives. An irreversible commitment of land and visual resources would occur within and outside of the Coronado National Forest where relatively undisturbed land would be disturbed by the proposed project. All three corridors within the Coronado National Forest pass through areas rated by the U.S. Department of Agriculture Forest Service (USFS) in the USFS Scenery Management System (SMS) as Scenic Classes 1 through 4. Scenic Classes 1-2 have high public value. The proposed project would introduce human alterations to the natural landscape in areas with currently high or very high Scenic Integrity (areas where the landscape is intact, or appears to be intact, with only minute deviations). The visual resources are irretrievable during the duration of the project because the visual quality would be lost. If the project were removed the area would eventually revert back to its original visual state and the habitat would revert to its original form and function. The U.S. Department of Energy (DOE) does not expect this to occur. Each corridor would be visible from a number of recreation areas. These special use areas represent recreational opportunities where visitors likely have high concern for the landscape.

Placing of the poles and construction of the substations would have irretrievable and irreplaceable impacts on soils, vegetation, hydrology, and cultural resources. Irreversible commitments of resources would include removal of small areas of farmland from potential use for agriculture. Some clearing of cropland may be required during construction of the proposed transmission line, but only the land directly beneath the foundations of the new towers would be irreversibly committed. The loss of soil and productivity would be irreversible where permanent structures are constructed.

The direct loss of vegetation due to clearing and construction is irretrievable but it could be reduced by application of conservation measures. Specific impacts to vegetation would be identified and mitigated upon precise siting of the right-of-way (ROW) within the chosen corridor.

Long-term consequences of changing the hydrology of the watershed and trampling are irreversible and irretrievable although minimal.

Cultural resources are nonrenewable, and disturbance of a site is an irretrievable impact to that resource. Preservation of archaeological sites is possible through cultural resource site avoidance. Data recovery of historic properties eligible for the National Register of Historic Places may be a necessary mitigation measure; however, data recovery is an irreversible use of an historical property, effectively eliminating options for future preservation or study.

Construction of the transmission line structures and substations would require the irretrievable commitment of standard building materials and fuel for construction equipment. Approximately 1 acre-ft of water would be utilized during construction. The resources irretrievably committed for operation of this project would be relatively minor quantities of fuel for maintenance vehicles, operating supplies, and miscellaneous chemicals. Theoretically, construction of facilities (roads, electrical towers) is a reversible commitment of land and water. In practice it is an irretrievable commitment of land use, as the transmission line and its support structures would not be removed.

CHAPTER 8
SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

This section discusses the proposed project's short-term use of man's environment and the maintenance and enhancement of long-term productivity. The impacts and utilization of resources associated with the proposed project are given in Chapter 4.

Although the alternatives do not require a major amount of land to be taken out of production, losses of terrestrial plants and animals and habitats from natural productivity to accommodate the new facilities and temporary disturbances during construction are possible. Land clearing and construction activities resulting in personnel and equipment moving about an area would disperse wildlife and temporarily eliminate habitats. Short-term disturbances of previously undisturbed biological habitats from the construction of the transmission line and other structures could cause long-term reductions in the biological productivity of an area. These long-term effects tend to be more pronounced in arid areas such as the proposed project area where biological communities recover very slowly from disturbances (see Section 4.3, Biological Resources). Effects of long-term occupancy by the transmission line include negative effects of encounters between humans and wildlife, such as mortality from recreation or maintenance vehicles. Changes in types and patterns of recreation use can be positive or negative, depending on the personal values of the interested and affected public.

The proposed project's impacts on previously undisturbed land both within the Coronado National Forest and outside of national forest lands would affect long-term cultural and visual resources. A large portion of each alternative crosses undeveloped land, impacting long-term preservation of unaltered landscapes. While none of the three alternative rights-of-way (ROWs) traverse the Pajarita Wilderness (see Figure 3.1–1), portions of each alternative would be visible from many locations on and off national forest lands. The potential for disturbing cultural resources in previously undisturbed lands would be mitigated by intensive cultural resource surveys along the proposed ROW.

CHAPTER 9
APPLICABLE ENVIRONMENTAL LAWS, REGULATIONS, PERMITS, AND DOE ORDERS

New permits and approvals would be needed before the proposed project could be constructed. Permits regulate many aspects of facility construction and operations, including the quality of construction, fugitive dust control requirements, treatment and storage of hazardous waste, and discharges of effluents to the environment. These permits would be obtained as required from appropriate Federal, state, and local agencies. Table 9–1 contains a summary of the primary approvals that would be required to implement the proposed action or the alternatives.

The major Federal laws, regulations, Executive Orders (EOs), and other compliance actions that potentially apply to the proposed project, depending on the alternative, are identified in Table 9–2. There are a number of Federal environmental statutes that address environmental protection, compliance or consultation. In addition, certain environmental requirements have been delegated to state authorities for enforcement and implementation. It is Tucson Electric Power Company's (TEP) policy to conduct its operations in an environmentally safe manner and in compliance with all applicable statutes, regulations, and standards. Although this chapter does not address pending legislation or future regulations, TEP recognizes that the regulatory environment is in transition, and subject to many changes, and that the construction and operation of the proposed project must be conducted in compliance with all applicable regulations and standards.

Table 9–1. List of Potentially Required Permits/Approvals.

Agency	Permit/Approval
ACC	Certificate of Environmental Compatibility
EPA	Aquifer Protection Permit
ADEQ	Hazardous Waste Permit
	Stormwater Permits
Arizona Department of State Lands	Condemnation by TEP
BLM	Right-of-way Grant and fiber optic line permit
ADA	Native Plant Permit
ADOT	Encroachment Permit
	Crossing Permit
	Boring Permit
	Class C Permit
DOE	Presidential Permit
Pima County Department of Environmental Quality	Activity Permit
Pima and Santa Cruz Counties	Zoning Approval
	Industrial Use Permit
	Excavation/Grading Permit
	Septic Permit
	Permit for Temporary Construction Facilities
	Permit for Temporary Power
	Building Permits
	Permit to Build in Roadway
USFWS	ESA Concurrence or Biological Opinion
SHPO	NHPA Concurrence (and Advisory Council if necessary with clearance stipulations)
USACE	*Clean Water Act* Permits, Section 401 and 404
USFS	Cultural Resources Inventory Permit
	Special Use Permit (transmission line and fiber optic line permit)
	Cultural Resource Inventory Clearance Approval
USIBWC	Review and concur on construction plans upon issuance of ROD by the lead agency

ACC = Arizona Corporation Commission; ADA = Arizona Department of Agriculture; ADEQ = Arizona Department of Environmental Quality; ADOT = Arizona Department of Transportation; BLM = Bureau of Land Management; DOE = U.S. Department of Energy; EPA = U.S. Environmental Protection Agency; ESA = *Endangered Species Act*; NHPA = *National Historic Preservation Act*; SHPO = State Historic Preservation Officer; USACE = U.S. Army Corps of Engineers; USFS = U.S. Department of Agriculture Forest Service; USFWS = U.S. Fish and Wildlife Service; USIBWC = U.S. Section of the International Boundary and Water Commission, U.S. and Mexico.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders.

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Air Resources	CAA	42 USC §§ 7401 et seq.	EPA	Requires sources to meet standards and obtain permits to satisfy: National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIPs), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and New Source Review (NSR). **Applicability:** No major source permit required under NESHAP or NSR. No NSPS requirements. SIP requirements may apply.
	CAA: NAAQS SIP	42 USC §§ 7409 et seq.	EPA	Requires compliance with primary and secondary ambient air quality standards governing sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, lead, and particulate matter and emission limits/reduction measures as designated in each state's implementation plan. **Applicability:** SIP requirements may apply.
Noise	*Noise Control Act*	42 USC §§ 4901 et seq.	EPA	Requires facilities to maintain noise levels that do not jeopardize the health and safety of the public. **Applicability:** Applicable.
Water Resources	CWA	33 USC §§ 1251 et seq.	ADEQ	Requires EPA or state-issued permits National Pollutant Discharge Elimination System (NPDES) and compliance with provisions of permits regarding discharge of effluents to surface waters and additional wetland protection requirements. **Applicability:** No NPDES permit required. Other requirements may apply.
	CWA	Sections 401 and 404	USACE	Requirements for discharge of dredge or fill material and wetland permit review. **Applicability:** Potentially applicable.
	Safe Drinking Water Act	42 USC §§ 300f et seq.	EPA	Requires permits for construction/operation of underground injection wells and subsequent discharging of effluents to ground aquifers. **Applicability:** Sole source Aquifer Protection Program Applicable.
	EO 11988: Floodplain Management EO 11990: Protection of Wetlands Management	42 FR 26951 May 24, 1977 42 FR 26961 May 24, 1977 10 CFR 1022 (implementing regulations)	Federal agencies	Where there is no practical alternative to development in floodplains and wetlands, Federal agencies are required to prepare a floodplains and wetlands assessment, design mitigation measures, and provide public review. For floodplain involvement, Federal agencies must issue a Floodplain Statement of Findings. **Applicability:** Applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*.

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Soil Resources	*Farmland Protection Policy Act*	7 USC §§ 4201 et seq.	NRCS	Minimizes any adverse effects to prime and unique farmlands. **Applicability:** Applicable.
Biological Resources	*Bald and Golden Eagle Protection Act*	16 USC §§ 668 et seq.	USFWS	Consultations should be conducted to determine if any protected birds are found to inhabit the area. If so, TEP must obtain a permit prior to moving any nests due to construction or operation of project facilities. **Applicability:** Applicable.
	EO 13112: Invasive Species	64 FR 6183 February 8, 1999	Federal agencies	Requires agencies, to the extent practicable and permitted by law, to prevent the introduction of invasive species; to provide for their control; and to minimize the economic, ecological, and human health impacts that invasive species cause. **Applicability:** Applicable.
	MBTA	16 USC §§ 703 et seq.	USFWS	Requires consultation to determine if there are any impacts on migrating bird populations due to construction or operation of project facilities. If so, TEP will develop mitigation measures to avoid adverse effects. **Applicability:** Applicable.
	ESA	16 USC §§ 1531 et seq.	USFWS	Requires consultation to identify endangered or threatened species and their habitats, assess impacts thereon, obtain necessary biological opinions, and, if necessary, develop mitigation measures to reduce or eliminate adverse effects of construction or operations. **Applicability:** Applicable.
Cultural Resources	NHPA	16 USC §§ 470 et seq.	DOE/Forest Supervisor of Coronado National Forest/BLM	Requires consultation with the SHPO, land management agencies, and in certain cases the Advisory Council on Historic Preservation prior to construction to ensure that no significant (that is, National Register-eligible properties, as defined in NHPA) historical properties would be affected. **Applicability:** Applicable.
	Archaeological and Historical Preservation Act	16 USC §§ 469 et seq.	DOI	Requires DOE to obtain permits for any disturbances of archaeological resources. **Applicability:** Applicable.
	Antiquities Act	16 USC §§ 431-433	DOI	Requires DOE to comply with all applicable sections of the Act. **Applicability:** Applicable.
	American Indian Religious Freedom Act	42 USC §§ 1996	DOI	Requires DOE to consult with local Native American Indian tribes prior to construction to ensure that their religious customs, traditions, and freedoms are preserved. **Applicability:** Applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*.

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Cultural Resources *(continued)*	EO 13007: Protection and Accommodation of Access to "Indian Sacred Sites"	61 FR 26771 May 29, 1996	DOI	Requires DOE to consider the potential impact of its actions on Native American sacred sites, access to sacred sites, or use of sacred sites. **Applicability:** Applicable.
	EO 13175: Consultation and Coordination With Indian Tribal Governments	63 FR 67249 November 9, 2000	DOI	Requires DOE to consult on a government-to-government basis with tribes and Nations **Applicability:** Applicable.
Worker Safety and Health	*Occupational Safety and Health Act*	5 USC §§ 5108	OSHA	Requires Agencies to comply with all applicable work safety and health legislation (including guidelines of 29 CFR 1960) and prepare, or have available, Material Safety Data Sheets. **Applicability:** Applicable.
	Hazard Communication Standard	29 CFR 1910.1200	OSHA	Requires DOE to ensure that workers are informed of, and trained to handle all chemical hazards in the DOE workplace. **Applicability:** Applicable.
Visual Resources	*Wild and Scenic Rivers Act*	16 USC §§ 1271-1287	USDA and DOI	Provides for designation and administration of wild, scenic, or recreational rivers. **Applicability:** Eligible river in project area.
	Wilderness Act	16 USC 1131-1136	DOI and USDA	Establishes determination of suitability and establishment of restrictions on activities that can be undertaken in an area designated as wilderness area, including preservation of wilderness character and natural condition. **Applicability:** Applicable.
	National Trails System Act	16 USC §§ 1241-1249	DOI and USDA	Authorizes a national system of trails to provide additional outdoor recreation opportunities and to promote the preservation of access to the outdoor areas and historic resources of the nation. **Applicability:** Applicable.
	Environmental Quality Improvement Act	42 USC §§ 4371-4375	CEQ	Requires each Federal agency conducting or supporting public works activities affecting the environment to implement policies established under existing law, to provide for enhancement of environmental quality. **Applicability:** Applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*.

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Visual Resources *(continued)*	*Surface Mining Control and Reclamation Act*	30 USC §§ 1201-1328	DOI	Establishes a program for regulating surface coal mining and reclamation activities; establishes mandatory uniform standards for those activities on state and Federal lands, including a requirement that adverse impacts on fish, wildlife, and related environmental values be minimized. **Applicability:** Applicable.
	Public Rangelands Improvement Act	43 USC §§ 1901-1908	DOI and USDA	Establishes a national policy and commitment to improve the conditions on public rangelands, requires a national inventory and consistent federal management policies, and provides funds for range improvement projects, enhancing recreational and aesthetic purposes. **Applicability:** Applicable.
Other	NEPA	42 USC §§ 4321 et seq. 40 CFR 1500-1508	CEQ	40 CFR 1500-1508 directs all Federal agencies in the implementation of NEPA. DOE NEPA regulations are in 10 CFR Part 1021, USFS NEPA regulations are in 7 CFR 1b, and BLM NEPA regulations are in BLM Manual and Handbook 1790-1 and DOI guidance (516 DM 1-7). **Applicability:** Applicable.
	Toxic Substances Control Act	42 USC §§ 2011	EPA	Requires TEP to comply with inventory reporting requirements and chemical control provisions of TSCA to protect the public from the risks of exposure to chemicals. TSCA imposes strict limitations on use and disposal of polychlorinated biphenyl-contaminated equipment. **Applicability:** Applicable.
	Hazardous Materials Transportation Act	49 USC §§ 1801 et seq.	DOT	Requires TEP to comply with the requirements governing hazardous materials and waste transportation. **Applicability:** Applicable.
	Emergency Planning and Community Right-To-Know Act	42 USC §§ 11001 et seq.	EPA	Requires the development of emergency response plans and reporting requirements for chemical spills and other emergency releases, and imposes right-to-know reporting requirements covering storage and use of chemicals which are reported in toxic chemical release forms. **Applicability:** Applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*.

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Other *(continued)*	*Pollution Prevention Act*	42 USC §§ 11001-11050	EPA	Establishes a national policy that pollution should be reduced at the source and requires a toxic chemical source reduction and recycling report for an owner or operator of facility required to file an annual toxic chemical release form under Section 313 of the *Superfund Amendments and Reauthorization Act*. **Applicability:** Potentially applicable.
	National Forest Management Act	16 USC §§ 1600-1614	USFS	Directs USFS to use an interdisciplinary approach in the planning process. Governs the Forest Plan amendment process for those corridors that would require an amendment for implementation. **Applicability:** Applicable.
	Proposed Construction and/or Alteration of Objects that May Affect the Navigation Space	FAA Advisory Circular (AC) No. 70/460-2H	FAA	This circular informs each proponent of a project that could pose an aviation hazard of the need to file the “Notice of Proposed Construction or Alteration” (Form 7640) with the FAA. **Applicability:** Potentially applicable.
	Obstruction Marking and Lighting	FAA AC No. 70/460-1G	FAA	This circular describes the FAA standards for marking and lighting objects that may pose a navigation hazard as established using the criteria in Title 14, Part 77 of the CFR. **Applicability:** Potentially applicable.
	Radio Frequency Device, Kits	47 CFR 15.25	FCC	Provisions of these regulations prohibit operation of any devices producing force fields, which interfere with radio communications, even if (as with transmission lines) such devices are not intentionally designed to produce radio-frequency energy. The FCC requires each line operator to mitigate all complaints about interference on a case-specific basis. Staff usually recommends specific conditions of certification to ensure compliance with this FCC requirement. **Applicability:** Applicable.
	EO 12088: Federal Compliance with Pollution Control Standards	43 FR 47707 October 17, 1978	Office of Management and Budget	Requires Federal agencies to consult with EPA and state agencies regarding the best techniques and methods for the prevention, control, and abatement of environmental pollution. **Applicability:** Potentially applicable.

Table 9–2. Federal Environmental Statutes, Regulations, and Orders *(continued)*.

Resource Category	Statute/ Regulation/Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Other *(continued)*	EO 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	59 FR 7629 February 16, 1994	EPA	Requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. **Applicability:** Applicable.

AC = Advisory Circular; ADEQ = Arizona Department of Environmental Quality; BLM = Bureau of Land Management; CAA = *Clean Air Act*; CEQ = Council on Environmental Quality; CFR = Code of Federal Regulations; CWA = *Clean Water Act*; DOE = U.S. Department of Energy; DOI = Department of Interior; DOT = Department of Transportation; EO = Executive Order; EPA = U. S. Environmental Protection Agency; ESA = *Endangered Species Act*; FAA = Federal Aviation Administration; FCC = Federal Communications Commission; FR = *Federal Register*; MBTA = *Migratory Bird Treaty Act*; NAAQS = National Ambient Air Quality Standards; NEPA = *National Environmental Policy Act*; NHPA = *National Historic Preservation Act*; NPDES = National Pollutant Discharge Elimination System; NRCS = Natural Resources Conservation Service; OSHA = Occupational Safety and Health Administration; SHPO = State Historic Preservation Officer; SIP = state implementation plan; TEP = Tucson Electric Power Company; TSCA = *Toxic Substances Control Act*; USACE = U.S. Army Corps of Engineers; USC = United States Code; USDA = U.S. Department of Agriculture; USFS = U.S. Department of Agriculture Forest Service; USFWS = U.S. Fish and Wildlife Service.

CHAPTER 10
LIST OF AGENCIES/PERSONS CONTACTED

Certain statutes and regulations require Tucson Electric Power Company (TEP) to consider consultations with Federal, state, and local agencies and federally recognized Native American groups regarding the potential for the proposed project to disturb sensitive resources. The consultations are generally required before any land disturbance can begin. Most of these consultations are related to biological, cultural, and Native American resources. Biological resource consultations generally pertain to the potential for activities to disturb sensitive species or habitats. Cultural resource consultations pertain to the potential for destruction of important cultural or archeological sites. Native American consultations are concerned with identifying tribal concerns and issues related to the proposed project, including the potential for disturbance of Native American ancestral sites or traditional practices or resources.

TEP, and U.S. Department of Energy (DOE) as the lead Federal agency, have initiated consultations with Federal and state agencies as well as federally recognized Native American groups regarding the potential alternatives for the Sahuarita-Nogales Transmission Line Project to disturb sensitive resources. Table 10–1 presents a summary of DOE and TEP consultation meetings. Table 10–2 presents a summary of the consultation letters sent by DOE to agencies and Native American groups. Appendix A contains copies of the consultation letters sent by DOE. All agencies and Native American groups will be provided with a copy of the Draft Environmental Impact Statement (EIS). Information from the agencies and Native American groups responses will be addressed in Chapters 3 and 4 as appropriate.

Table 10–1. DOE and TEP Consultations.

Subject	Agency	Activity	Date
Land Management	BLM	Cooperating agency, contact Keith Moon	Ongoing
	USFS	Cooperating agency, contact Jerry Conner	Ongoing
	USIBWC	Cooperating agency, contact Doug Echlin	Ongoing
Biological Resources	Arizona Game and Fish Department	Meeting with Sherry Ruther, habitat Specialist	April 19, 2002
Water Resources	USACE	Meeting with Sallie McGuire, Los Angeles District, Arizona Regulatory Section	December 17, 2002
Cultural Resources	SHPO	Letter from Matthew Bilsbarrow, SHPO, to TEP	August 13, 2001

BLM = Bureau of Land Management; SHPO = State Historic Preservation Officer; USACE = U.S. Army Corps of Engineers; USFS = U.S. Forest Service; USIBWC = U.S. Section of the International Boundary and Water Commission, U.S. and Mexico.

Table 10–2. Summary of Consultation Letters.

Subject	Consultation Letters To: Agency	Name	Date	Response
Native American Government-to-Government consultation	Tribal governments of the 12 Native American communities/tribes/nations that are likely to have traditional concerns in the area: the Ak-Chin Indian Community, Fort Sill Apache Tribe, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'Odham Nation, White Mountain Apache Tribe, Yavapai Apache Nation, and the Pueblo of Zuni	Individual tribal government contacts listed in Table 3.4–1	Began on November 20, 2001	Tribal consultations are ongoing, as documented in SWCA 2002c
Biological Resources	USFWS	David Harlow, Field Supervisor Arizona Ecological Services Field Office	April 5, 2002	The formal consultation process under Section 7(a)(2) of the ESA will begin when DOE tenders its biological assessments to USFWS
Other agencies or persons	Drug Enforcement Administration	Duty Agent, Phoenix Division	December 5, 2001	Response letter dated December 18, 2001, from Thomas W. Raffanello is in Appendix A
	U.S. Immigration and Naturalization Service	William N. Johnston, Tucson Sub-office	December 5, 2001	None
	U.S. Border Patrol	Rob Daniels, Public Information Officer	April 3, 2002	None
		Shawn Palmer, Tucson Sector	June 27, 2002	None
	Federal Aviation Administration	Chuck Pearman, Tucson Office	January 16, 2002	Response letter dated January 28, 2002, is in Appendix A

Table 10–2. Summary of Consultation Letters (*continued*).

Subject	Consultation Letters To: Agency	Name	Date	Response
	U.S. Air Force	Rusty Arbeit, Airspace Management Office, Davis Monthan Air Force Base	January 16, 2002	Email response dated February 14, 2002 from Major David Von Brock is in Appendix A
		Lieutenant Colonel Allan Steffes, 162nd Fighter Wing, Davis Monthan Air Force Base	March 20, 2002	In a telephone conversation with Mark Blauer of Tetra Tech, Lieutenant Colonel Steffes requested to be added to the draft EIS mailing list (Steffes 2002)
	EPNG	Gayle Koeninger	November 15, 2001	In a telephone conversation with Mark Blauer of Tetra Tech on February 19, 2002, Gayle Koeninger provided specifics on EPNG's pipeline and stated that the ACC's requirement for at least 100 ft between the edge of the pipeline ROW and support structures is adequate (EPNG 2002)

ACC = Arizona Corporation Commission; EPNG = El Paso Natural Gas; ESA = *Endangered Species Act*; ROW = right-of-way; USFWS = U.S. Fish and Wildlife Service.

CHAPTER 11
REFERENCES

ACC 2002 — Arizona Corporation Commission, Decision No. 64356, January 15, 2002.

ADEQ 2002 — Arizona Department of Environmental Quality, Fiscal Year 2002 Air Quality Report, http://www.adeq.state.az.us/comm/pubs/download/2002/aq.pdf. Accessed May 2003.

ADEQ 2003a — Arizona Department of Environmental Quality, Air Quality Division Planning, http://www.adeq.state.az.us/environ/air/plan/listing.html. Accessed February 7, 2003.

ADEQ 2003b — Arizona Department of Environmental Quality, Air Quality Permits Section, Email (Power Plants in Arizona) from Trevor Baggiore to Erica Ruhl, March 31, 2003.

ADES 2001 — Arizona Department of Economic Security, Arizona's Historical Labor Force & Nonfarm Jobs Data, 1995. http://www.de.state.az.us/links/economic/webpage/eaweb/cescty95.html. Accessed August 20, 2001.

ADOT 2000 — Arizona Department of Transportation, Arizona State Highway System ADT, 2000.

ADWR 1999a — Third Management Plan for Santa Cruz Active Management Area, 2000-2010, Arizona Department of Water Resources, December 1999.

ADWR 1999b — Third Management Plan for Tucson Active Management Area, 2000-2010, Arizona Department of Water Resources, December 1999.

AHA 1995 — American Hospital Association, The AHA Guide to the Health Care Field, 1995-1996 Edition, 1995.

Ahlbom 2000 — Dr. Anders Ahlbom (Karolinska Institute, Sweden), *British Journal of Cancer*, European Union, September 2000.

AMA 1995 — American Medical Association, Physician Characteristics and Distribution in the U.S., 1995-1996 Edition, 1996.

APLIC 1996 — Avian Power Line Interaction Committee (APLIC), Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996, Edison Electric Institute and Raptor Research Foundation, Washington, D.C., 1996.

Arizona 2000 — *Arizona Geology*, Vol. 30, No.1, Spring 2000.

Audubon 2001 — National Audubon Society. What is an Important Bird Area? http://www.audubon.org/bird/iba/ibaintro.html, 2001.

Bazzaz 1983 — Bazzaz, F. A., Characteristics of populations in relation to disturbance in natural and man-modified ecosystems, pp. 259-275 in Mooney, H. A. and M. Godron, eds., Disturbance and Ecosystems, Springer-Verlag, Berlin, West Germany, 1983.

BEA 1999	Bureau of Economic Analysis, *REIS: Regional Economic Information System 1969-1997 (CD-ROM)*, U.S. Department of Commerce, Economics and Statistics Division, Bureau of Economic Analysis, Washington, D.C., 1999.
BLM 1988	U.S. Bureau of Land Management, Proposed Phoenix Resource Management Plan and Final Environmental Impact Statement, Phoenix District, Arizona, December 1988.
BLM 1994	U.S. Bureau of Land Management, Noxious Weed Strategy for Oregon/Washington, USDI-BLM Lakeview District Office, Lakeview, OR, 1994.
Brown 1994	Brown, D.E. (ed.), Biotic communities: southwestern United States and northwestern Mexico, University of Utah Press, Salt Lake City, pp.342, 1994.
CANAMEX 2001	Economic Research Associates, CANAMEX Corridor Plan Working Paper Tast V: Transportation and Other Funding Sources, August 3, 2001.
Canter 1977	Canter, Larry W., *Environmental Impact Assessment*, McGraw-Hill, Inc., University of Oklahoma, 1977.
CBP 1995a	U.S. Census Bureau, *1995 County Business Patterns for Pima County, Arizona*. http://www.census.gov/epcd/cbp/map/95data/04/019.txt. Accessed August 20, 2001.
CBP 1995b	U.S. Census Bureau, *1995 County Business Patterns for Santa Cruz County, Arizona*. http://www.census.gov/epcd/cbp/map/95data/04/023.txt. Accessed August 20, 2001.
CBP 1999a	U.S. Census Bureau, *1999 County Business Patterns for Pima County, Arizona*. http://www.census.gov/epcd/cbp/map/99data/04/019.txt. Accessed August 17, 2001.
CBP 1999b	U.S. Census Bureau, *1999 County Business Patterns for Santa Cruz County, Arizona*. http://www.census.gov/epcd/cbp/map/99data/04/023.txt. Accessed August 17, 2001.
CBP 1999c	U.S. Census Bureau, *1999 County Business Patterns for Arizona*. http://www.census.gov/epcd/cbp/map/99data/04/999.txt. Accessed August 20, 2001.
CBP 1999d	U.S. Census Bureau, *1999 County Business Patterns the United States*. http://www.census.gov/epcd/cbp/view/us99.txt. Accessed August 20, 2001.
Census 2000a	U.S. Census Bureau, State and County Quickfacts, Pima County, Arizona. http://quickfacts.census.gov/qfd/states/04/04019.html. Accessed August 17, 2001.
Census 2000b	U.S. Census Bureau, State and County Quickfacts, Santa Cruz County, Arizona. http://quickfacts.census.gov/qfd/states/04/04023.html. Accessed August 17, 2001.

Census 2000c	U.S. Census Bureau, *Profiles of General Demographic Characteristics, 2000 Census of Population and Housing, Arizona*. http://www.census.gov/prod/cen2000/dp1/2kh04.pdf. Accessed August 17, 2001.
Census 2000d	U.S. Census Bureau, American Factfinder, Data Set: Census 2000 Summary file 3 – Sample Data. http://factfinder.census.gov. Accessed May 25, 2003.
Census 2001	Poverty in the United States: 2001. http://www.census.gov/prod/2002pubs/p60-219.puf. Accessed June 2003.
CEQ 1997a	Council on Environmental Quality, Executive Office of the President, Environmental Justice: Guidance Under the National Environmental Policy Act, December 10, 1997, http://ceq.eh.doe.gov/nepa/vegs/ej/ej.pdf
CEQ 1997b	Council on Environmental Quality, *Considering Cumulative Effects Under the National Environmental Policy Act*, Executive Office of the President, Washington, D.C., December 10, 1997.
City of Nogales 2000	Feasibility Analysis Draft Final Report for City of Nogales North-South/East-West Interconnectors and Frontage Road, 2000.
City of Nogales 2003	City of Nogales, Planning and Zoning Department, Personal Communication between Jamie Song and George Lineiro, April 2003.
Climate 2003	Tucson, Arizona Normals, Means, and Extremes, http://geography.asu.edu/azclimate/lcd/tucson.html, February 2003.
Criswell 2002	U.S. Forest Service, Email from Jerry Conner to Jerry Pell and Ellen Russell regarding the proposed gamma ray scope, May 29, 2002.
DHS 2002	California Department of Health Services, EMF Risk Evaluation, October 23, 2002.
Dibble 2000	Durango Area Drainage Master Plan Data Collection Report – FCD # 99-41, March 2000.
DOE 2000	DOE, Environment, Safety and Health, Office of NEPA Policy and Assistance; Clean Air Act General Conformity Requirements and the National Environmental Policy Act Process, April 2000, http://tis.eh.doe.gov/nepa/tools/guidance/caaguidance.pdf.
DOE 2001a	DOE, "Sundance Energy Project Draft Environmental Impact Statement," DOE/EIS–0322, March 2001.
DOE 2001b	DOE, Letter to twelve Native American communities/tribes/nations likely to have traditional concerns in the area, November 20, 2001.
DOE 2002	DOE, BLM, Bureau of Reclamation, USFWS, Department of the Army, Environmental Impact Statement for Schultz-Hanford Area Transmission Line Project, DOE/EIS-0325, February 2002.

ECI 2003 Electrical Consultant, Inc. Maps of Tucson Electric Power Company Study Corridors, 2003.

EDU 2001a U.S. Department of Education, National Public School District Locator, search results for Pima County, Arizona. http://nces.ed.gov/ccdweb/school/districts.asp. Accessed September 11, 2001.

EDU 2001b U.S. Department of Education, National Public School District Locator, search results for Santa Cruz County, Arizona. http://nces.ed.gov/ccdweb/school/districts.asp. Accessed September 11, 2001.

EDU 2001c U.S. Department of Education, Private School Locator 1999-2000, search results for Pima County, Arizona. http://nces.ed.gov/surveys/pss/locator/locator.asp. Accessed September 12, 2001.

EDU 2001d U.S. Department of Education, Private School Locator 1999-2000, search results for Santa Cruz County, Arizona. http://nces.ed.gov/surveys/pss/locator/locator.asp. Accessed September 12, 2001.

EMS 2002 Environmental Media Services, http://www.ems.org/roadless_areas/background.html. February 2002.

EPA 1995 Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, 1995. http://www.epa.gov/ttn/chief/ap42/index.html.

EPA 2000a U.S. Environmental Protection Agency, Region IX, Air Division; "Technical Support Document for EPA's Notice of Final Rulemaking for the Arizona State Implementation Plan Tucson Air Planning Area, Redesignation to Attainment for Carbon Monoxide, Maintenance Plan," Table 1, PAG Projections for CO Mobile Emissions and VMT; Eleanor Kaplan, April 26, 2000.

EPA 2000b U.S. Environmental Protection Agency, Office of Mobile Sources, Emission Facts, Average Annual Emissions and Fuel Consumption for Passenger Cars and Light Trucks. http://www.epa.gov/otaq/consumer/f00013.htm, April 2000.

EPA 2002 U.S. Environmental Protection Agency, Technical Support Document for the Metro Phoenix Serious Area PM-10 Plan, January 14, 2002. http://www.epa.gov/region9/air/phoenixpm/tsd20102.pdf.

EPA 2003 U.S. Environmental Protection Agency, AirData. http://www.epa.gov/air/data/index.html. Accessed February 5, 2003.

EPNG 2002 El Paso Natural Gas Pipeline in Project Vicinity, Personal Communication between Mark Blauer and Gale Koeninger, February 19, 2002.

EPRI 1982 Electric Power Research Institute (EPRI), Transmission Line Reference Book, 345-kV and Above, Second Edition, 1982.

EPRI 2001 Electric Power Research Institute, Guide to Corona and Arcing Inspection at Overhead Transmission Lines, EPRI Report 1001910, November 2001.

Golden et al. 1980	Golden, J., Onellete, R.P., Saari, S., and Cheremisinoff, P.N., *Environmental Impact Data Book*, Ann Arbor Science Publishers, Ann Arbor, MI, 1980.
Greenland et al. 2000	Greenland, Sander; Sheppard AR; Kaure WT; Poole C, Kelsh MA; University of California, Los Angeles; "A Pooled Analysis of Magnetic Fields, Wire Codes, and Childhood Leukemia; *Epidemiology*" 2000; 11:624-634.
Harrod 1994	Harrod, Richy J., Pp. 47-49 in Everett, Richard L., comp., Eastside Forest Ecosystem Health Assessment, Volume IV: Restoration of Stressed Sites, and Processes, Gen. Tech. Rep. PNW-GTR-330, USDA-FS, Portland, OR, 1994.
HEG 2001	Harris Environmental Group, Inc., *Preliminary Biological Evaluation*, TEP Proposed Sahuarita-Nogales Transmission Line Project, pp.28, 2001.
HEG 2003a	Harris Environmental Group, Inc., Draft Biological Assessment, TEP Proposed Sahuarita-Nogales Transmission Line Project, Western Corridor, May 5, 2003.
HEG 2003b	Harris Environmental Group, Inc., Draft Biological Assessment, TEP Proposed Sahuarita-Nogales Transmission Line Project, Central Corridor, May 5, 2003.
HEG 2003c	Harris Environmental Group, Inc., Draft Biological Assessment, TEP Proposed Sahuarita-Nogales Transmission Line Project, Crossover Corridor, May 5, 2003.
Hoffmeister 1986	Hoffmeister, D.F., Mammals of Arizona, University of Arizona Press, Tucson, pp. 602, 1986.
ICNIRP 2003	International Commission on Non-Ionizing Radiation Protection, Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (Up to 300 GHz). http://www.icnirp.de/downloads.htm. Accessed March 21, 2003.
Kerlinger 2000	Kerlinger, Paul, Avian Mortality at Communication Towers: A review of recent literature, research, and methodology, USFWS Office of Migratory Bird Management, 2000.
Maestros 2003	Maestros Group, Update on Power Plant of January 14, 2003, http://www.maestrosgroup.com/index.htm. Accessed March 25, 2003.
Meyer 2001a	Meyer, Andrew J., P.E., Tucson Electric Power Company, Letter to H. Mark Blauer, Ph. D., Tetra Tech, Inc., June 22, 2001.
Meyer 2001b	Meyer, Andrew J., P.E., Tucson Electric Power Company, Letter to H. Mark Blauer, Ph. D., Tetra Tech, Inc., September 7, 2001.
Nelson 1995	Nelson, Carla. ed., Biological Invasions of Alien Plants in the Interior Columbia River Basin, Columbia River Bioregion Campaign, Science Working Group, Walla Walla, Washington, 1995.
NIEHS 1999	National Institute of Environmental Health Sciences, *Health Effects from Exposure to Power-line Frequency Electric and Magnetic Fields*, June 1999.

NOAA 2003	National Oceanic and Atmospheric Administration National Climatic Data Center. http://www.ncdc.noaa.gov/oa/ncdc.html, 2003.
NRCS 2001	National Resources Conservation Service, U.S. Department of Agriculture Soil Survey for Pima and Santa Cruz County, September 2001.
NRDC 2003	Natural Resources Defense Council. http://www.nrdc.org/land/forests/roadless.asp, February 2003.
Orians 1986	Orians, G. H., in Mooney, H. A. and J. Drake, eds., Ecology of Biological Invasions of North America and Hawaii, pp. 133-148, Springer- Verlag, New York, NY, 1986.
PDEQ 2003	Pima County Department of Environmental Quality, Permits, Personal Communication between Erica Ruhl and Bernie Velasco, April 1, 2003.
Pima 2003	Pima County Comprehensive Plan. http://www.dsd.co.pima.az.us/CPupdate/Default.htm, February 2003.
Richard 2000	Richard et al., Arizona Geological Survey Map 35, Digital Graphics Files for the Geologic Map of Arizona, 2000, http://www.glg.la.asu.edu/%7Esreynolds/azgeomap/azgeomap_home.htm.
Richter 2003	What is Richter Magnitude? http://www.seismo.unr.edu/ftp/pub/louie/class/100/magnitude.htm, February 2003.
SABO 2001	Southeastern Arizona Bird Observatory, Guide to Birding Hotspots. http://www.sabo.org/birding/sites.htm. Updated November 28, 2000.
Sheley 1994	Sheley, Roger L., The Identification, Distribution, Impacts, Biology and Management of Noxious Rangeland Weeds, Scientific Contract Report, Order No. 43-OEOO-4-9150, USDA-FS-Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA, 1994.
State of Arizona 1997	List of Protected Native Plants, Arizona Department of Agriculture, Phoenix, AZ, 1997.
Steffes 2002	Lieutenant Colonel Steffes, Request to be Added to Mailing List, Personal Communication between Mark Blauer and Lieutenant Colonel Steffes, March 20, 2002.
SWCA 2002a	SWCA Environmental Consultants, Potential Impacts to Migratory Birds by the Proposed TEP Sahuarita-Nogales Transmission Line Project, December 2002.
SWCA 2002b	SWCA Environmental Consultants, USFS Management Indicator Species Analysis and Report, TEP Sahuarita-Nogales Transmission Project, 2002.
SWCA 2002c	SWCA Environmental Consultants, Summary of Tribal Responses to DOE Consultation Letter, and ongoing record of communication, 2002.

TEP 2001	Tucson Electric Power Company and Citizens Communication Company Joint Application to the Arizona Power Plant and Transmission Line Siting Committee for a Certificate of Environmental Compatibility, March 1, 2001.
TEP 2002a	Tucson Electric Power Company, Ed Beck, Letter to Dr. Jerry Pell, U.S. Department of Energy, Eastern Corridor, July 3, 2002.
TEP 2002b	Tucson Electric Power Company, Ken Wright, Response to Outstanding Action Items, October 23, 2002.
TEP 2003	TEP Data Needs Meeting Minutes and follow-up materials provided by TEP; TEP, SWCA, and Tetra Tech, Tucson, Arizona, March 4, 2003.
Terracon 2002	Terracon, Geotechnical Evaluation, Proposed Power Transmission Lines, Santa Cruz County, Arizona, 2002
Tucson 2001	City of Tucson, Director of Transportation. http://www.ci.tucson.az.us/humanre/directortran0701.htm. Accessed August 20, 2001.
UN/SCC 2000	Draft Executive Summary for the Unified Nogales/Santa Cruz County Transportation 2000 Plan, 2000.
URS 2002	URS Corporation, Tucson Electric Power Company Sahuarita-Nogales Transmission Line Project Visual Simulations, December 2002.
URS 2003a	URS Corporation, Tucson Electric Power Company Sahuarita-Nogales Transmission Line Project Roads Analysis, January 2003.
URS 2003b	URS Corporation, Email from Richard Knox, Visual Simulation Text, March 19, 2003.
USDA 1979	U.S. Department of Agriculture Soil Conservation Service and Forest Service, in cooperation with Arizona Agricultural Experimental Station, Soil Survey of Santa Cruz and Parts of Cochise and Pima Counties, Arizona.
USFS 1986	U.S. Department of Agriculture Forest Service, Land and Resource Management Plan for the Coronado National Forest, 1986, as amended.
USFS 1990	U.S. Department of Agriculture Forest Service, Recreation Opportunity Spectrum Primer and Field Guide, R6-REC-021-90, April 1990.
USFS 1992	U.S. Department of Agriculture Forest Service, FSH 1909.15 Environmental Policy and Procedures Handbook, 1909.15-92-1, September 21, 1992
USFS 1993	U.S. Department of Agriculture Forest Service, Resource Information Report, Potential Wild Scenic Recreational River Designation, Southwestern Region, September 1993.
USFS 1995	U.S. Department of Agriculture Forest Service, Landscape Aesthetics, A Handbook for Scenery Management, Agricultural Handbook No. 701, December 1995, as amended.

USFS 1999	U.S. Department of Agriculture Forest Service, Coronado National Forest Scenery Management System, 1999.
USFS 2000	U.S. Department of Agriculture Forest Service, *Roadless Area Conservation Final EIS.* http://roadless.fs.fed.us/documents/feis/, November 2000.
USFS 2001a	U.S. Department of Agriculture Forest Service Website. http://www.fs.fed.us/pages/meetfs.html, February 2001.
USFS 2001b	U.S. Department of Agriculture Forest Service, GIS Map Data, Jerry Conner, November 21, 2001.
USFS 2002a	U.S. Department of Agriculture Forest Service, Interview of Nogales Ranger Station District Ranger Keith Graves, June 4, 2002.
USFS 2002b	U.S. Department of Agriculture Forest Service, Letter from Jerry Conner (USFS) to Jerry Pell (DOE), October 4, 2002.
USFS 2002c	U.S. Department of Agriculture Forest Service, Email from Debby Kriegel to Erica Ruhl regarding impact summaries, December 4, 2002.
USFS 2002d	U.S. Department of Agriculture Forest Service, Coronado National Forest Nogales Ranger District, William B. Gillespie, *Tumacacori Uplands Ethnohistory and Traditional Uses Overview*, June 28, 2002.
USFS 2003	LaFevere, Bob, U.S. Forest Service, Personal Communication to Tom Furgason, SWCA, Mapped Floodplains on the Coronado National Forest, May 2, 2003.
USFWS 1995	U.S. Fish and Wildlife Service, Recovery Plan for the Mexican Spotted Owl (Strix occidentals lucida), Albuquerque, New Mexico, 1995. http://ifwzes.fws.gov/documents/Rzes/mso-recovery-plan.pdf. Accessed April 2003.
USFWS 1996	U.S. Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants: Review of Plants and Animal Taxa That Are Candidates or Proposed for Listing as Endangered or Threatened.
USFWS 1998	U.S. Fish and Wildlife Service and National Marines Fisheries Service Endangered Species Consultation Handbook; Procedures for conducting consultation and conference activities under Section 7 of Endangered Species Act, 1998.
USGS 1999	U.S. Geological Survey, Inventory and Regional Susceptibility for Holocene Debris Flows and Related Fast-Moving Landslides in the Conterminous U.S. http://navigation.helper.realnames.com/framer/1/112/default.asp?realname=Arizona+Geological+Survey&url=http%3A%2F%2Fwww%2Eazgs%2Estate%2Eaz%2Eus&frameid=1&providerid=112&uid=17415035. Updated 1999.
USGS 2001	U.S. Geological Survey, Water flow data for the Santa Cruz River. http://wwwdaztcn.wr.usgs.gov/rt-cgi/gen_stn_pg?station=09480500, September 2001.

USGS 2003	U.S. Geological Survey, National Earthquake Information Center. http://neic.usgs.gov/neis/general/handouts/magnitude_intensity.html, February 2003.
USIBWC 2003	U.S. Section of the International Boundary and Water Commission, Letter from Sylvia Waggoner to Dr. Jerry Pell, U.S. Department of Energy, Comments on the Tucson Electric Power Sahuarita-Nogales Transmission Line December 2002 Preliminary DEIS, January 23, 2003.
Warshall 1994	Warshall, P., The Madrean Sky Island Archipelago: A Planetary Overview, Office of Arid Lands Study, College of Agriculture, University of Arizona, Tucson, AZ, 1994.
Waveguide 2003	Waveguide, Average Exposure from Common Appliances. http://www.wave-guide.org/archives/waveguide_3/exposure.html, February 2003.
WECC 2003	Western Electricity Coordinating Council, Reliability Criteria. http://www.wecc.biz/documents/policy/wecc-reliability-criteria-802.pdf. Accessed April 2003.
Wild 1993	Wild, Alan, Soils and the Environment: An Introduction, 1993.
Wildlands Project 2000	Sky Islands Wildlands Network Conservation Plan: An extrodinary plan for a place beyond compare, The Wildlands Project, Tucson, AZ, p.16, 2000.
Yockey 2001	Yockey, Jeff, P.E., Tucson Electric Power Company, TEP-Citizens Interconnect EIS Data Request Memo to Dan Elder, DRE & Associates, June 19, 2001.

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
AADT	Annual Average Daily Traffic
AC	Alternating Current
ACC	Arizona Corporation Commission
ADA	Arizona Department of Agriculture
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADT	average daily traffic
ADWR	Arizona Department of Water Resources
AEPCO	Arizona Electric Power Company
AGFD	Arizona Game and Fish Department
AIRFA	*American Indian Religious Freedom Act*
AMA	Active Management Area
AMSL	above mean sea level
ANPL	Arizona Native Plant Law
APE	Area of Potential Effects
APP	Aquifer Protection Permit
AQCR	Air Quality Control Region
ARS	Arizona Revised Statutes
AZSITE	Arizona Online Database of Archaeological Projects and Sites
BA	Biological Assessment
BE	Biological Evaluation
BEA	U.S. Bureau of Economic Analysis
BLM	Bureau of Land Management
BMP	Best Management Practices
BPA	Bonneville Power Administration
CAA	*Clean Air Act*
CEQ	Council on Environmental Quality
CFE	Comisión Federal de Electricidad
CFR	Code of Federal Regulations
CWA	*Clean Water Act*
DHS	U.S. Department of Health Services
DNL	Day-Night Average Sound Level

DOE	U.S. Department of Energy
DOE-FE	DOE Office of Fossil Energy
DOT	U.S. Department of Transportation
EIS	Environmental Impact Statement
ELF	extremely-low-frequency
EMA	Ecosystem Management Area
EMF	electric and magnetic field
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	*Emergency Planning and Community Right-to-Know Act*
EPNG	El Paso Natural Gas
EPRI	Electric Power Research Institute
ESA	*Endangered Species Act*
FAA	Federal Aviation Administration
FLPMA	*Federal Land Policy and Management Act*
FEMA	Federal Emergency Management Agency
Forest Plan	*Coronado National Forest Land and Resource Management Plan*
FR	*Federal Register*
GIS	Geographic Information Systems
HDMS	Heritage Data Management System
IBA	Important Bird Area
IRA	inventoried roadless area
MBTA	*Migratory Bird Treaty Act*
MIS	U.S.F.S. Management Indicator Species
MSA	Metropolitan Statistical Area
NAAQS	National Ambient Air Quality Standards
NAGPRA	*Native American Graves Protection and Repatriation Act*
NEPA	*National Environmental Policy Act*
NHPA	*National Historic Preservation Act*
NIEHS	National Institute of Environmental Health Sciences
NOI	Notice of Intent
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSR	New Source Review
NWI	National Wetlands Inventory
NWS	National Weather Service

OSC	Oil Spill Contingency
OSHA	Occupational Safety and Health Administration
PDEQ	Pima County Department of Environmental Quality
PILT	Payments in Lieu of Taxes
PNM	Public Service Company of New Mexico
Project	Sahuarita-Nogales Transmission Line & Gateway and South Substations
PSD	Prevention of Significant Deterioration
PTS	Payments to States
RA	Roads Analysis of the Coronado National Forest
RCRA	*Resource Conservation and Recovery Act*
ROD	Record of Decision
ROG	reactive organic gases
ROI	region of influence
ROS	USFS Recreation Opportunity Spectrum
ROW	right-of-way
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMS	USFS Scenery Management System
SPCC	Spill Prevention Countermeasure and Control
SWCA	Company that supported DOE in preparation of this EIS
TCP	Traditional Cultural Property
TEP	Tucson Electric Power Company
TRICO	TRICO Electric Cooperative, Inc.
TSP	Total Suspended Particulates
URS	Company that prepared the Roads Analysis
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFS	U.S. Department of Agriculture Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USIBWC	U.S. Section of the International Boundary and Water Commission, U.S. and Mexico
VOC	volatile organic compounds

CHEMICALS AND UNIT ABBREVIATIONS

A	Amperes
ac-ft	acre foot or acre feet
AM	Amplitude Modulation
bcf	billion cubic feet
bsg	below surface grade
C^o	Celsius
cf/hr	cubic feet per hour
CO	carbon monoxide
dB	decibel
dBA	weighted sound levels
F^o	Fahrenheit
FM	Frequency modulation
gm	gram
gpm	gallons per minute
ha	hectares
Hz	Hertz
km	kilometer
kV	kilovolt
lbs	pounds
$\mu g/m^3$	microgram per cubic meter
m	meter
mG	milligauss
mg/L	milligram per liter
mi	miles
MMscf	million standard cubic feet
mmcf	million cubic feet
mtpy	metric tons, or tonnes, per year
MVA	million volt-amperes
MW	megawatts
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
O_3	ozone
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
Pb	lead

ppb	parts per billion
ppm	parts per million
psig	pounds per square inch gauge
SO_2	sulfur dioxide
tpy	tons per year
v	volts
yr	year
µT	microtesla

CONVERSION CHART

To Convert Into Metric If You Know	Multiply By	To Get	To Convert Into English If You Know	Multiply By	To Get
Length					
inch	2.54	centimeter	centimeter	0.3937	inch
feet	30.48	centimeter	centimeter	0.0328	feet
feet	0.3048	meter	meter	3.281	feet
yard	0.9144	meter	meter	1.0936	yard
mile	1.60934	kilometer	kilometer	0.62414	mile (Statute)
Area					
square inches	6.4516	square centimeter	square centimeter	0.155	square inch
square feet	0.092903	square meter	square meter	10.7639	square feet
square yard	0.8361	square meter	square meter	1.196	square yard
acre	0.40469	hectare	hectare	2.471	acre
square mile	2.58999	square kilometer	square kilometer	0.3861	square mile
acre-foot	1233.48	cubic meters	cubic meters	0.00081	acre-foot
Volume					
fluid ounce	29.574	milliliter	milliliter	0.0338	fluid ounce
gallon	3.7854	liter	liter	0.26417	gallon
gallon	0.0039	cubic meter	cubic meter	256.14	gallon
cubic feet	0.028317	cubic meter	cubic meter	35.315	cubic feet
cubic yard	0.76455	cubic meter	cubic meter	1.308	cubic yard
Weight					
ounce	28.3495	gram	gram	0.03527	ounce
pound	0.45360	kilogram	kilogram	2.2046	pound
short ton	0.90718	metric ton	metric ton	1.1023	short ton
Force					
dyne	0.00001	newton	newton	100,000	dyne
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor		
exa-	E	1 000 000 000 000 000 000	=	10^{18}
peta-	P	1 000 000 000 000 000	=	10^{15}
tera-	T	1 000 000 000 000	=	10^{12}
giga-	G	1 000 000 000	=	10^{9}
mega-	M	1 000 000	=	10^{6}
kilo-	k	1 000	=	10^{3}
hecto-	h	l00	=	10^{2}
deka-	da	l0	=	10^{1}
deci-	d	0.1	=	10^{-1}
centi-	c	0.01	=	10^{-2}
milli-	m	0.001	=	10^{-3}
micro-	µ	0.000 001	=	10^{-6}
nano-	n	0.000 000 001	=	10^{-9}
pico-	p	0.000 000 000 001	=	10^{-12}
femto-	f	0.000 000 000 000 001	=	10^{-15}
atto-	a	0.000 000 000 000 000 001	=	10^{-18}

GLOSSARY

Acre-foot: The volume of water that will cover an area of 1 acre to a depth of 1 foot (326,000 gallons, 1,233.5 cubic meters).

Advisory Council on Historic Preservation: A body appointed to advise the President and Congress in the coordination of actions by Federal agencies on matters relating to historic preservation. This organization participates in NHPA Section 106 consultations that are controversial or precedent setting.

Aeolian: Borne, deposited, produced, or eroded by the wind.

Aesthetics: Referring to the perception of beauty.

Affected environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air pollutant: An airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance for which emissions or atmospheric concentrations are regulated or for which maximum guideline levels have been established due to potential harmful effects on human health and welfare.

Air Quality Control Region (AQCR): Geographic subdivisions of the United States established to regulate pollution on a region or local level. Some regions span more than one state.

Air Quality Standards: The level of pollutants prescribed by regulation that may not be exceeded during a specified time in a defined area.

Alluvial deposits: Earth, sand, gravel, and other materials carried and deposited by moving surface water.

Ambient air: Any unconfined portion of the atmosphere; open air, surrounding air. That portion of the atmosphere, external to buildings, to which the general public has access.

Amperes: Measure of the flow of electric current; source of a magnetic field.

Aquifer: A body of rock or sediment in a formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Archaeological sites (resources): Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

Archaeology: A scientific approach to the study of human ecology, cultural history, and cultural process.

Artifact: An object produced or shaped by human workmanship of archaeological or historical interest.

Attainment area: An area which the EPA has designated as being in compliance with one or more of the NAAQS for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. Any area may be in attainment for some pollutants but not for others.

Atmospheric dispersion: The dispersion of particulates or gaseous species (such as air pollutants) into the troposphere. It is a function of wind and atmospheric stability.

Background noise: The total acoustical and electrical noise from all sources in a measurement system that may interfere with the production, transmission, time averaging, measurement, or recording of an acoustical signal.

Blading: The use of a steel blade or steel fork attachment on a tracked or rubber-tired vehicle that removes vegetation through a combination of pushing and/uplifting motions.

Candidate species: Plants and animals for which the U.S. Fish and Wildlife Service has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list, but cannot do so immediately because other species have a higher priority for listing.

Capacity: The load for which a generator, turbine, transformer, transmission circuit, apparatus, station, or system is rated. Capacity is also used synonymously with capability.

Carbon monoxide (CO): A colorless, odorless gas that is toxic if breathed in high concentrations over a period of time. It is formed as the product of the incomplete combustion of hydrocarbons (fuel).

Class I, II, and III Areas: Area classifications, defined by the Clean Air Act, for which there are established limits to the annual amount of air pollution increase. Class I areas include international parks and certain national parks and wilderness areas; allowable increases in air pollution are very limited. Air pollution increases in Class II areas are less limited, and are least limited in Class III areas. Areas not designated as Class I start out as Class II and may be reclassified up or down by the state, subject to Federal requirements. Specified Federal lands, including certain national parks and wilderness areas, are mandatory Class I areas and may not be redesignated to another classification. All other PSD areas of the country are designated Class II areas. Currently there are no Class III areas.

***Clean Air Act* (CAA):** (42 USC 7401 et seq.) Establishes (1) national air quality criteria and control techniques (Section 7408); (2) National ambient air quality standards (Section 7409 defines the highest allowable levels of certain pollutants in the ambient air. Because EPA must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants); (3) state implementation plan requirements (Section 4710); (4) Federal performance standards for stationary sources (Section 4711); (5) national emission standards for hazardous air pollutants (Section 7412); (6) applicability of CAA to Federal facilities (Section 7418), (Federal Agency must comply with Federal, state, and local requirements respecting control and abatement of air pollution, including permit and other procedural requirements, to the same extent as any person); (7) Federal new motor vehicle emission standards (Section 7521); (8) regulations for fuel (Section 7545); (9) aircraft emission standards (Section 7571).

***Clean Air Act* Conformity Requirement:** Section 176 (c) of the CAA requires Federal agencies to ensure that their actions conform to applicable implementation plans (in most cases, the SIP) for achieving and maintaining the National Ambient Air Quality Standards (NAAQS) for criteria pollutants.

***Clean Water Act* (CWA):** (33 U.S. Code 1251 et seq.) Establishes requirements for (1) technology-based effluent limitations (Section 301); (2) water quality-based effluent limitations (Section 302); (3) individual control strategies for toxic pollutants (Section 304[l]); (4) new source performance standards (Section 306); (5) regulation of toxics (Section 307); (6) Federal facilities' pollution control (provisions for presidential exception) (Section 313); (7) thermal discharges (Section 316); (8) permits under the NPDES (Section 402); (9) permits for the discharge or dredged or fill materials into navigable waters (Section 404).

Climatology: The science that deals with climates and investigates their phenomena and causes.

Code of Federal Regulations (CFR): All Federal regulations in force are published in codified form in the Code of Federal Regulations.

Community (biotic): All plants and animals occupying a specific area under relatively similar conditions.

Conductor: Transmission line wire strung between transmission line structures to transmit electricity from one location to another.

Corona effect: Electrical breakdown of air into charged particles. It is caused by the electric field at the surface of conductors.

Council on Environmental Quality (CEQ): Established by NEPA. CEQ regulations (40 CFR Parts 1500-1508) describe the process for implementing NEPA, including preparation of environmental assessments and environmental impact statements, and the timing and extent of public participation.

Criteria pollutant: An air pollutant that is regulated by the NAAQS. The EPA must describe the characteristics and potential health and welfare effects that form the basis for setting or revising the standard for each regulated pollutant. Criteria pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter.

Critical habitat: Habitat essential to the conservation of an endangered or threatened species that has been designated as critical by the U.S. Fish and Wildlife Service following the procedures outlined in the *Endangered Species Act* and its implementing regulations (50 CFR 424). See endangered species and threatened species.

Cultural resources: Districts, sites, structures, and objects and evidence of some importance to a culture, a subculture, or a community for scientific, traditional, religious, and other reasons. These resources and relevant environmental data are important for describing and reconstructing past lifeways, for interpreting human behavior, and for predicting future courses of cultural development.

Cumulative impact: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.17).

Current: Flow of electrical charge.

Decibel (dB): A unit for expressing the relative intensity of sounds on a logarithmic scale from zero for the average least perceptible sound to about 130 for the average level at which sound causes pain to humans. For traffic and industrial noise measurements, the A-weighted decibel (dBA), a frequency-weighted noise unit, is widely used. The A-weighted decibel scale corresponds approximately to the frequency response of the human ear and thus correlates well with loudness.

Deposition: In geology, the laying down of potential rock-forming materials; sedimentation. In atmospheric transport, the settling out on ground and building surfaces of atmospheric aerosols and particles ("dry deposition") or their removal from the air to the ground by precipitation ("wet deposition" or "rainout").

Direct embedment: Type of pole installation that requires excavation of a shaft wider than the pole using a caisson-drilling rig and then subsequent backfilling around the pole.

Distance zones: The relative visibility from travel routes or observation points.

Double-circuit: Two sets of lines (circuits) on a single tower (a single circuit consists of three conductors).

Drinking water standards: The prescribed level of constituents or characteristics in a drinking water supply that cannot be legally exceeded.

Ecology: A branch of science dealing with the interrelationships of living organisms with one another and with their nonliving environment.

Ecosystem: A community of organisms and their physical environment interacting as an ecological unit.

Effects: As used in NEPA documentation, the terms effects and impacts are synonymous. Effects can be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health; effects can be direct, indirect, or cumulative. Effects include both beneficial and detrimental impacts.

Effluent: A waste stream flowing into the atmosphere, surface water, groundwater, or soil. Most frequently the term applies to wastes discharged to surface waters.

Elevation: Height above sea level.

Eligible cultural resource: A cultural resource that has been evaluated and reviewed by an agency and the SHPO and recommended as eligible for inclusion in the National Register of Historic Places, based on the criteria of significance. The criteria of significance consider American history, architecture, archeology, engineering, and culture. The criteria require integrity and association with lives or events, distinctiveness for any of a variety of reasons, or importance because of information the property does or could hold.

Embedment: See direct embedment.

Emissions: Pollution discharged into the atmosphere from smoke stacks, other vents, and surface areas of commercial or industrial facilities, residential chimneys, and vehicle exhausts.

Emission Standards: Requirements established by a state, local government, or the EPA Administrator that limit the quantity, rate, or concentration of emissions of air pollutants on a continuous basis.

Endangered Species: Plants or animals that are in danger of extinction throughout all or a significant portion of their ranges and that have been listed as endangered by the USFWS or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). Some states also list species as endangered.

Endangered Species Act* (ESA)*: (16 U.S. Code 1531 et seq.) Provides for listing and protection of animal and plant species identified as in danger, or likely to be in danger, of extinction throughout all or a significant portion of their range. Section 7 places strict requirements on Federal agencies to protect listed species.

Environmental Impact Statement (EIS): The detailed written statement that is required by section 102(2)(C) of NEPA for a proposed major Federal action significantly affecting the quality of the human environment. A DOE EIS is prepared in accordance with applicable requirements of the CEQ NEPA regulations in 40 CFR Parts 1500-1508 and DOE NEPA regulations in 10 CFR Part 1021. The statement includes, among other information, discussions of the environmental impacts of the proposed action and all reasonable alternatives, adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources.

Environmental Justice: An identification of potential disproportionately high and adverse impacts on low-income and/or minority populations that may result from proposed Federal actions (required by Executive Order 12898).

Environmental Protection Agency (EPA): The independent Federal Agency, established in 1970, that regulates Federal environmental matters and oversees the implementation of Federal environmental laws.

Energy: That which does or is capable of doing work. It is measured in terms of the work it is capable of doing; electric energy is usually measured in kilowatt-hours.

Ephemeral stream: A stream that flows only after a period of heavy precipitation.

Erosion: Wearing away of soil and rock by weathering and the actions of surface water, wind, and underground water.

Ethnographic: Information about cultural beliefs and practices.

Fault: A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred.

Field effect: Induced currents and voltages as well as related effects that might occur as a result of electric and magnetic fields at ground level.

Floodplain: The lowlands adjoining inland and coastal waters and relatively flat areas, including at a minimum that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain.

Flow: The volume of water passing a given point per unit of time. Same as streamflow.

Formation: In geology, the primary unit of formal stratigraphic mapping or description. Most formations possess certain distinctive features.

Generation: The act or process of producing electricity from other forms of energy.

Generator: A machine that converts mechanical energy into electrical energy.

Groundwater: Water within the earth that supplies wells and springs.

Groundwater basin: Subsurface structure having the character of a basin with respect to collection, retention, and outflow of water.

Hazardous Air Pollutants (HAP): Air pollutants that are not covered by ambient air quality standards, but that may present a threat of adverse human health effects or adverse environmental effects. They are regulated under Section 112 of the *Clean Air Act*. See also National Emissions Standards for Hazardous Air Pollutants.

Hazardous waste: A category of waste regulated under RCRA. To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 40 CFR 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by EPA in 40 CFR 261.31 through 40 CFR 261.33.

Historic properties: Under the NHPA these are properties of national, state, or local significance in American history, architecture, archaeology, engineering, or culture that are worthy of preservation.

Impacts (effects): In this EIS, as well as in the CEQ regulations, the word impact is used synonymously with the word effect. See effects.

Indirect impacts: Effects that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Infrastructure: The basic installations and facilities on which the continuance and growth of a community or state (e.g., roads, schools, power plants, transportation, communication systems) are based.

Intensity (of an earthquake): A measure of the effects (due to ground shaking) of an earthquake at a particular location, based on observed damage to structures built by humans, changes in the earth's surface, and reports of how people felt the earthquake. Earthquake intensity is measured in numerical units on the Modified Mercalli scale. See Modified Mercalli Intensity scale and magnitude of an earthquake.

Intertie: A transmission line that links two or more regional electric power systems.

Interested parties: Those groups or individuals that are interested, for whatever reason, in the project and its progress. Interested parties include, but are not limited to, private individuals, public agencies, organizations, customers, and potential customers.

Invasive species: An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. "Alien species" means, with respect to a particular ecosystem, any species, including its seed, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.

Invertebrate: Animals characterized by not having a backbone or spinal column, including a wide variety of organisms such as insects, spiders, worms, clams, and crayfish.

Isolated occurrence: A grouping of less than ten archaeological artifacts or a single undatable feature. These often consist of redeposited material of questionable locational context that are not related to nearby archaeological sites.

Kilovolt (kV): The electrical unit of power that equals 1,000 volts.

Lacustrine deposits: Deposits found or formed in lakes.

Landscape: An area composed of interacting ecosystems that are repeated because of geology, land, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern which is determined by interacting ecosystems.

Lithic: A stone artifact that has been modified or altered by human hands.

Load: The amount of electric power required at a given point on a system.

Loam: A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

Low-income population: A population that is classified by the U.S. Bureau of the Census 2000 as having an aggregated mean 1999 income level for a family less than $17,463. This level is adjusted through the poverty index using a standard of living percentage change where applicable.

Magnitude (of an earthquake): A quantity characteristic of the total energy released by an earthquake, as contrasted to "intensity," which describes its effects at a particular place. Magnitude is calculated using common logarithms (base 10) of the largest ground motion. A one-unit increase in magnitude (for example, from magnitude 6 to magnitude 7) represents a 30-fold increase in the amount of energy released. Three common types of magnitude are Richter (or local) (ML), P body wave (mb), and surface wave (Ms).

Maintenance area: Area redesignated as attainment within the last 10 years under the CAA. See attainment area.

Major source: Any stationary source or group of stationary sources in which all of the pollutant- emitting activities emit, or have the potential to emit, 100 or more tons per year of any regulated air pollutant, 10 tons per year of a single HAP, or combined HAP emissions exceeding 25 tons per year.

Mammal: Animals in the class *Mammalia* that are distinguished by having self-regulating body temperature, hair, and in females, milk-producing mammary glands to feed their young.

Management Indicator Species (MIS): Species selected by the USFS for monitoring and analysis because their population changes are believed to indicate the effects of management activities

Megawatt (MW): The electrical unit of power that equals 1 million watts or 1 thousand kilowatts.

Mesa: An isolated relatively flat-topped natural elevation.

Meteorology: The science dealing with the dynamics of the atmosphere and its phenomena, especially relating to weather.

Mineral: Naturally occurring inorganic element or compound.

Minority Population: Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic are minorities (CEQ 1997). CEQ identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis.

Mitigation: The alleviation of adverse impacts on environmental resources by avoidance through project redesign or project relocation, by protection, or by adequate scientific study. Mitigation includes: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

Modified Mercalli Intensity Scale: The Modified Mercalli Intensity Scale is a standard of relative measurement of earthquake intensity, developed to fit construction conditions in most of the United States. It is a 12-step scale, with values from I (not felt except by a very few people) to XII (damage total).

National Ambient Air Quality Standards (NAAQS): Standards defining the highest allowable levels of certain pollutants in the ambient air. Because EPA must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants. The criteria pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. See *Clean Air Act.*

***National Environmental Policy Act* (NEPA):** (42 USC 4341, passed by Congress in 1969) NEPA established a national policy designed to encourage consideration of the influences of human activities (e.g., population growth, high-density urbanization, industrial development) on the natural environment. NEPA also established the CEQ. NEPA procedures require that environmental information be made available to the public before decisions are made. Information contained in NEPA documents must focus on the relevant issues in order to facilitate the decision-making process.

***National Historic Preservation Act* (NHPA):** (16 USC 470) Provides for an expanded National Register of Historic Places (NRHP) to register districts, sites, buildings, structures, and objects significant to American history, architecture, archaeology, and culture. Section 106 requires that the President's Advisory Council on Historic Preservation be afforded an opportunity to comment on any undertaking that adversely affects properties listed in the NRHP.

National Pollutant Discharge Elimination System (NPDES) Permit: Federal regulation (40 CFR Parts 122 and 125) that requires permits for the discharge of pollutants from any point source into the waters of the United States regulated through the *Clean Water Act*.

National Register of Historic Places (NRHP): A list maintained by the Secretary of the Interior of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance. The list is expanded as authorized by Section 2(b) of the *Historic Sites Act* of 1935 (16 U.S.C. 462) and Section 101(a)(1)(A) of the *National Historic Preservation Act*.

Native American: Person culturally identified with a tribe that is indigenous to the United States and who belongs to a federally recognized tribe consulted on TEP's proposed project.

Native vegetation: Plant life that occurs naturally in an area without agricultural or cultivation efforts. It does not include species that have been introduced from other geographical areas and have become naturalized.

Noise: Unwanted or undesirable sound, usually characterized as being so loud as to interfere with, or be inappropriate to, normal activities such as communication, sleep, or study. (See background noise.)

Non-attainment area: An area that EPA has designated as not meeting one or more of the NAAQS for criteria pollutants. An area may be in attainment for some pollutants, but not others.

Noxious weed: Invasive plant species regulated under Federal or state law. See invasive species.

Obligate species: Plant species that almost always occur in wetlands (i.e., greater than 99 percent of the time).

Ozone (O_3): The triatomic form of oxygen. In the upper atmosphere, ozone protects the earth from the sun's ultraviolet rays, but in the lower levels of the atmosphere, ozone is considered an air pollutant. In the lower atmosphere, ozone is formed primarily from a photochemical reaction between nitrogen oxides and volatile organic compounds. Small amounts of ozone can be formed from corona effects on transmission lines.

Particulate Matter: Any finely divided solid or liquid material, other than uncombined pure water.

Peak capacity: The maximum capacity of a system to meet loads.

Peak demand: The highest demand for power during a stated period of time.

Permeability: The ability of rock or soil to transmit a fluid.

pH: A measure of the relative acidity or alkalinity of a solution, expressed on a scale from 0 to 14, with the neutral point at 7.0. Acid solutions have pH values lower than 7.0, and basic (i.e., alkaline) solutions have pH values higher than 7.0. Because pH is the negative logarithm of the hydrogen ion (H+) concentration, each unit increase in pH value expresses a change of state of 10 times the preceding state. Thus, pH 5 is 10 times more acidic than pH 6, and pH 9 is 10 times more alkaline than pH 8.

$PM_{2.5}$: Airborne particulate matter with an aerodynamic diameter less than or equal to 2.5 microns; regulated under the NAAQS.

PM_{10}: Airborne particulate matter with an aerodynamic diameter less than or equal to 10 microns; regulated under the NAAQS.

Prehistoric: Of, relating to, or existing in times antedating written history. Prehistoric cultural resources are those that antedate written records of the human cultures that produced them.

Present value: The worth of future returns or costs in terms of their current value. To obtain a present value, an interest rate is used to discount these future returns and costs.

Prevention of Significant Deterioration (of air quality) (PSD): Regulations established to prevent significant deterioration of air quality in areas that already meet NAAQS. Among other provisions, cumulative increases in sulfur dioxide, nitrogen dioxide, and PM_{10} levels after specified baseline dates must not exceed specified maximum allowable amounts.

Prime farmland: Soil types with a combination of characteristics that make them particularly productive for agriculture.

Project: Involves the expansion of TEP's existing South Substation in Sahuarita, construction of the new Gateway Substation west of Nogales, and construction of approximately 60 miles of double-circuit 345-kv AC transmission lines from the South Substation to the Gateway Substation and extending south to the U.S.-Mexico border.

Public Involvement Plan: Methodology used by the agency to encourage public participation.

Quaternary: A subdivision of geological time (the Quaternary period) including roughly the last two million years up to the present.

Raptor: Birds of prey including various types of hawks, falcons, eagles, vultures, and owls.

Record of Decision (ROD): A concise public document that records a Federal agency's decision concerning a proposed action for which the agency has prepared an EIS. The ROD is prepared in accordance with the requirements of the CEQ NEPA regulations (40 CFR 1505.2). A ROD identifies the alternatives considered in reaching the decision, the environmentally preferable alternatives, factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not.

Reliability: The ability of the power system to provide customers uninterrupted electric service. Includes generation, transmission, and distribution reliability.

Region of Influence (ROI): The geographical region that would be expected to affect a specific resource in some way by the proposed action and/or alternative(s).

Right-of-way (ROW): An easement for a certain purpose over the land of another, such as a strip of land used for a transmission line, roadway or pipeline.

Riparian: Of or pertaining to the bank of a river, stream, lake, or other water bodies.

Runoff: The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and may eventually enter streams.

Saturated zone: The zone in which the voids in the rock or soil are filled with water at a pressure greater than atmospheric pressure. The water table is the top of the saturated zone in an unconfined aquifer.

Scenery Management System (SMS): Visual resource tool used by USFS for the inventory and analysis of aesthetic values of national forest lands as outlined in *Landscape Aesthetics: A Handbook for Scenery Management*.

Scoping: An early, open part of the NEPA process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

Section 106 process: A NHPA (16 U.S.C. §470 et seq.) review process used to identify, evaluate, and protect cultural resources eligible for nomination to the NRHP that may be affected by Federal actions or undertakings.

Sediment: Material deposited by wind or water.

Sedimentation: The process of deposition of sediment, especially by mechanical means from a state of suspension in water.

Seismic: Pertaining to any earth vibration, especially an earthquake.

Sensitive species: Those plants and animals identified by the USFS Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trend in populations or density and significant or predicted downward trend in habitat capability.

Socioeconomics: The social and economic condition in the study area.

Solid waste: In general, solid wastes are non-liquid, non-soluble discarded materials ranging from municipal garbage to industrial wastes that contain complex and sometimes hazardous substances. Solid wastes include sewage sludge, agricultural refuse, demolition wastes, and mining residues.

State Historic Preservation Officer (SHPO): The official within each state, authorized by the state at the request of the Secretary of the Interior, to act as liaison for purposes of implementing the NHPA.

Step-up transformer: Transformer in which the energy transfer is from a low- to a high-voltage winding or windings. (Winding means one or more turns of wire forming a continuous coil for a transformer, relay, rotating machine, or other electric device.)

Stratigraphic: Of, relating to, or determined by stratigraphy; the superposition of layers (soil, rock, and other materials) often observed at archaeological sites.

Substation: Facility with transformers where voltage on transmission lines changes from one level to another.

Surface water: All bodies of water on the surface of the earth that are open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

Switchyard: Facility with circuit breakers and automatic switches to turn power on and off on different transmission lines.

Tap: To tie a substation into an existing transmission line through a connection.

Tap Point: The point where two transmission lines interconnect.

Tesla: Unit of measurement of magnetic field.

Threatened species: Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the *Endangered Species Act* and its implementing regulations (50 CFR Part 424).

Traditional Cultural Property/Use Area: Areas of significance to the beliefs, customs, and practices of a community of people that have been passed down through generations.

Transformer: A device for transferring energy from one circuit to another in an alternating-current system. Its most frequent use in power systems is for changing voltage levels.

Transmission line: The structures, insulators, conductors, and other equipment used to transfer electrical power from one point to another.

Tribe: A federally recognized American Indian political entity. All those consulted in TEP's proposed project are collectively termed the "tribes," even though many are Nations or Communities. DOE and cooperating agencies recognize that each tribe is an individual, sovereign nation with a unique trust relationship to the U.S. government.

Vertebrate: Animals that are members of the subphylum Vertebrata, including the fishes, amphibians, reptiles, birds, and mammals, all of which are characterized by having a segmented bony or cartilaginous spinal column.

Volatile Organic Compounds (VOCs): A broad range of organic compounds that produce vapors at relatively low temperatures, such as gasoline and solvents.

Volt: The unit of voltage or potential difference. It is the electromotive force which, if steadily applied to a circuit having a resistance of one ohm, will produce a current of one ampere.

Voltage: Potential for an electric charge to do work; source of an electric field.

Water rights: Permits or licenses issued by the State Water Resources Control Board.

Watt: The absolute meter-kilogram-second unit of power equal to the work done at the rate of one joule per second or to the power produced by a current of one ampere across a potential difference of one volt.

Wetland: An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

Yield: A measure of the availability of water to meet authorized purposes, sometimes defined in terms of the ability to meet project needs within specific time periods.

CHAPTER 13
LIST OF PREPARERS AND CONTRIBUTORS

The Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Project Environmental Impact Statement (EIS) was prepared under the supervision of the U.S. Department of Energy (DOE) Office of Fossil Energy. The individuals who contributed to the preparation of this document are listed below, accompanied by their organization, education, years of experience, and project role.

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CHAPTER 14
INDEX

A

Arizona Game and Fish Department (AGFD) 3-26, 4-52
Air Quality Control Region (AQCR) 3-79
Ak-Chin Indian Community 3-52
Amado 3-6
Arizona Ambient Air Quality Standard 3-79
Arizona Department of Environmental Quality 4-82
Arizona Department of Transportation (ADOT) 3-91

B

Bureau of Land Management (BLM) 1-1, 1-6, 1-7, 2-2, 2-6, 2-7

C

Central Corridor 1-6, 1-11, 2-6
Chiltipene Botanical Area 3-4, 3-5, 3-6, 4-3
Citizens Communication Company/Citizens Utility Company 1-1, 1-7, 1-8, 2-8, 2-10
Class I, II, and III Areas 3-82, 4-86
Clean Air Act (CAA) 3-82, 4-86, 4-87, 4-88
Clean Water Act (CWA) 3-73, 4-82
Comisión Federal de Electricidad (CFE) 1-1, 1-6
Code of Federal Regulations (CFR) 1-1, 1-6, 1-7
Conformity Requirements 4-87
corona effects 3-86, 3-88, 4-101, 4-108
Council on Environmental Quality (CEQ) 1-1, 1-7, 1-12, 2-10
criteria pollutants 4-87
Crossover Corridor 1-6, 1-11, 2-7

D

Day-Night Average Sound Level (DNL) 3-83, 4-95
double-circuit 1-7, 1-9, 2-1, 2-14
drainage 3-75, 3-76, 4-83, 4-84
dry washes 3-75, 3-76, 4-83, 4-84

E

electric and magnetic field (EMF) 3-86, 4-101
El Paso Natural Gas Company pipeline 1-6, 2-2
Endangered Species Act (ESA) 3-26, 3-32, 4-56, 4-65
Environmental Justice 3-96, 3-97, 4-118
excavation 2-14, 2-18

F

federally listed species 3-37, 3-42
fiber optic facilities 1-1, 1-9
field effects 3-87, 4-106

floodplains 3-70, 3-74, 4-81, 4-82, 4-83
Fort Sill Apache Tribe 3-52
fugitive dust 4-86, 4-87, 4-88, 4-89

G

Gateway Substation 1-1, 2-1, 2-6
Gila River Indian Community 3-52, 3-55, 4-70
Goodding Research Natural Area 3-4, 3-5, 3-6
Green Valley 4-16

H

Hazardous Air Pollutants (HAP) 3-79
health effects 3-87, 3-88
Hopi Tribe 3-52, 3-55, 3-57

I

inventoried roadless areas (IRAs) 3-2, 3-6, 4-3, 4-5, 4-15

M

magnetic field (see electric and magnetic field)
Mescalero Apache Tribe 3-52, 3-54, 3-57
mitigation 2-1, 2-12, 2-21

N

National Ambient Air Quality Standards (NAAQS) 4-87, 4-88
National Environmental Policy Act (NEPA) 1-1, 1-6, 1-7, 2-28
National Register of Historic Places (NRHP) 3-48, 4-69
Native American 3-48, 4-63, 4-69
Nogales 2-6, 2-10
Notice of Intent (NOI) 1-10, 2-10

O

Occupational Safety and Health Administration (OSHA) 4-98, 4-99, 4-100
Oil Spill Contingency (OSC) Plan 2-13
Ozone (O_3) 3-79

P

Pajarita Wilderness 1-11, 2-6, 3-4, 3-5, 3-6, 3-7, 3-10, 4-3, 4-8
particulate matter (PM_{10} or $PM_{2.5}$) 3-79, 3-81, 3-82, 4-86, 4-88, 4-89
Pascua Yaqui Tribe 2-25, 3-52, 3-53, 3-54, 3-56, 3-57, 4-71
Peña Blanca Lake Recreation Area 3-4, 3-5, 3-6, 3-10, 3-11, 4-3, 4-19, 4-21, 4-23, 4-25, 4-28, 4-33
Pima County 1-1, 1-12, 2-6, 2-11, 2-20, 2-22
Pima County Department of Environmental Quality (PDEQ) 1-12, 3-82
Pima County Comprehensive Plan 3-1, 4-3
prehistoric 3-49, 3-50, 3-51, 3-52, 3-55, 4-70

Presidential Permit 1-1, 1-7, 1-8, 1-12, 2-8, 2-12
Prevention of Significant Deterioration (PSD) 3-82
Public Service Company of New Mexico (PNM) 1-12, 2-8, 2-9
Pueblo of Zuni 2-25, 3-52, 3-53, 3-57

R

recreation 2-11, 2-23, 2-24, 3-1, 3-2, 3-4, 3-5, 3-6, 4-1, 4-3, 4-4, 4-5, 4-6
region-of-influence (ROI) 3-58, 3-59, 3-60, 4-72, 4-75, 5-1, 5-4, 5-5
right-of-way (ROW) 1-1, 1-6, 1-9, 2-1, 2-2, 2-6, 2-7, 2-8, 2-10, 2-11
Rio Rico 1-11, 2-11
roadless areas (see inventoried roadless areas) 3-2, 4-3

S

Sahuarita 1-1, 1-6, 1-9, 1-10, 2-1, 2-2, 2-3, 2-6, 3-1, 3-5, 3-6
Salt River Pima – Maricopa Indian Community 2-25, 3-52, 3-53, 3-55
San Carlos Apache Tribe 2-25, 3-52, 3-53, 3-57
Santa Cruz County 1-7, 2-6, 2-11
Santa Cruz River 3-70, 3-73, 3-76
Sonoran Desert Conservation Plan 3-1
Spill Prevention Countermeasure and Control (SPCC) Plan 2-13
State Historic Preservation Officer (SHPO) 3-48, 3-49, 4-68
support structures 2-2, 2-6, 2-7, 2-11, 2-12, 2-19
Sycamore Canyon 3-4, 3-5, 3-6, 3-7, 3-10

T

Tohono O'Odham Nation San Xavier District 2-25, 3-52, 3-53, 3-55, 3-56, 4-70,
Traditional Cultural Property (TCP) 3-56, 3-57, 4-71
Tubac 1-11, 2-7, 2-8, 2-10, 2-11, 2-24, 2-26
Tucson Electric Power Company (TEP) 1-1, 2-1
Tumacacori 1-8, 2-6, 2-7, 2-8, 2-10, 2-11

U

U.S. Army Corps of Engineers (USACE) 2-36, 3-73, 3-75
U.S. Bureau of Land Management (BLM) 1-1, 1-6, 1-7, 1-8, 1-9, 1-10
U.S. Department of Agriculture Forest Service (USFS) 1-1, 1-6, 1-7, 1-8, 1-9
U.S. Department of Energy (DOE) 1-1, 1-7, 1-8, 1-10, 1-11, 1-12
U.S. Environmental Protection Agency (EPA) 2-26, 2-37, 2-40
U.S. Fish and Wildlife Service (USFWS) 2-21, 2-22, 2-25
U.S. Section of the International Boundary and Water Commission (USIBWC) 1-1, 1-7, 1-8, 1-10, 1-11, 2-15

V

volatile organic compounds (VOCs) 3-79

W

Western Corridor 1-6, 1-7, 1-11, 2-1, 2-2, 2-6, 2-7, 2-8
wetland 3-70, 3-73, 3-75, 4-80
White Mountain Apache Tribe 2-25, 3-52, 3-53, 3-57

Y

Yavapai Apache Nation 2-25, 3-52, 3-53, 3-57

Appendix A

Consultation Letters

APPENDIX A
CONTENTS

A-2 Letter from the State Historic Preservation Office regarding Certificate of Environmental Compatibility Case No. 111: The Proposed Tucson Electric Power Company (TEP) South Substation to Nogales Transmission Line, Pima and Santa Cruz Counties, Arizona

A-6 Letter from Tetra Tech, Inc. to El Paso Natural Gas, regarding the Proposed Tucson Electric Power Transmission Line Adjacent to an El Paso Natural Gas Company Pipeline

A-8 Letter from Tetra Tech, Inc. to the Drug Enforcement Administration, regarding the Proposed Tucson Electric Power Transmission Line near Nogales, Arizona

A-10 Letter from Tetra Tech, Inc. to the U.S. Immigration and Naturalization Service, regarding the Proposed Tucson Electric Power Transmission Line near Nogales, Arizona

A-12 Response letter from U.S. Department of Justice to Tetra Tech, regarding letter sent to the Drug Enforcement Administration

A-13 Letter from Tetra Tech, Inc. to Davis Monthan Air Force Base, regarding the Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

A-15 Letter from Tetra Tech, Inc. to Federal Aviation Administration, regarding the Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

A-17 Letter from U.S. Department of Transportation Federal Aviation Administration to Tetra Tech

A-18 E-mail from Davis-Monthan Airspace Manager to Tetra Tech

A-19 Letter from Tetra Tech, Inc. to 162nd Fighter Wing, regarding the Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

A-21 Letter from Tetra Tech, Inc. to U.S. Immigration and Naturalization Service, regarding the Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

A-23 Letter from U.S. Department of Energy to Arizona Ecological Services Field Office U.S. Fish and Wildlife Service, regarding the Preparation of an Environmental Impact Statement, Tucson Electric Power Company (TEP)

A-25 Letter from Tetra Tech, Inc. to U.S. Border Patrol, Tucson Sector regarding the regarding the Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

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"Managing and conserving natural, cultural, and recreational resources"

FAXED 8/13/01

In reply, please refer to
SHPO-2001-2129 (7456)
more information requested

August 13, 2001

Laurie A. Woodall, Chairperson, Power Plant and Transmission Line Siting Committee
Assistant Attorney General, Environmental Enforcement Section
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RE: Certificate of Environmental Compatibility Case No. 111: The Proposed Tucson Electric Power Company (TEP) South Substation to Nogales Transmission Line, Pima and Santa Cruz Counties, Arizona

Dear Ms. Woodall:

Thank you for having the committee's applicant (i.e., TEP) initiate consultation with this office regarding the above-mentioned state plan and associated certificate of environmental compatibility. The proposed plan includes three possible routes or alignments between the Sahuarita and Nogales areas that cross various federal, state, and private lands; the preferred route follows Ruby Road and the westerns slope of the Tumacacori Mountains, and the two alternative routes roughly parallel Interstate-19. Historian Bill Collins and I have reviewed the documents submitted and offer the following comments pursuant to the State Historic Preservation Act (i.e., A.R.S. § 41-861 to 41-864) and the committee's factors to be considered (i.e., A.R.S. § 40-360.06.A.5).

This plan also represents a federal undertaking, and the U.S. Department of Energy, as the lead federal agency, will consult directly with this office in regards to the National Historic Preservation Act. Our advice to the committee should not be interpreted or construed to infringe upon role of the lead federal agency regarding the scope and adequacy of identification efforts, eligibility determinations, effect findings, and treatment options.

Please inform the committee's applicants that this office normally has 30 working days in which to review state plans as stated in A.R.S. § 41-864. At the applicant's request, we have expeditiously reviewed the documents submitted on August 3, 2001.

The analysis of potential impacts to known historic properties (i.e., any prehistoric or historic district, site, building, structure, traditional cultural place, or object included in, or eligible for inclusion in the National or State Registers of Historic Places) resulted in a archaeological sensitivity map that also shows the general location of historic-period properties in relation to the proposed corridors. The map is a good visual tool for conveying the information that was gathered. However, the cultural assessment would have been greatly aided by having the archaeological consultant discuss the map's underlying assumptions and limitations, discuss the results, and provide conclusions and recommendations in relation to the proposed routes; My technical comments on the analysis and the map are presented on the attached page; we are not requesting revisions at this time.

The preferred route completely avoids two important historic properties, Tumacacori National Historic Landmark and Tubac Presidio State Historic Park. The two other

Letter to Siting Committee, 8/13/01, Page 2
Certificate of Environmental Compatibility Case No. 111: The Proposed Tucson Electric Power Company South Substation to Nogales Transmission Line, Pima and Santa Cruz Counties, Arizona

alternative routes occur near enough to one or both of these properties to raise concerns about potential impacts, especially visual ones. Tumacacori, which was founded in 1753, was a Pima community organized around a Spanish mission; the first mission building at the site was built in 1757. Tubac Presidio was constructed in 1752 to protect Spanish colonists and the Pima attending the Missions at Tubac and Tumacacori. Both park managers have expressed concerns to this office about proposed nearby transmission lines. Furthermore, National Historic Landmarks, such as Tumacacori, showcase the very best properties listed in the National Register of Historic Places.

However, less is apparently known about the presence or absence of historic properties situated within or near the preferred route, relative to the two alternative routes. Thus, the absence of archaeologically sensitive areas on the map along the preferred route is likely due to the lack of previous archaeological survey and Native American consultation in this area and not necessarily the absence of such properties. For example, I would expect rock art sites, Archaic-period camp sites, and shrines to occur in settings such as those along the preferred route. In contrast, many historic building surveys and archaeological surveys have occurred as part of other state plans and federal undertakings located along the two alternative routes.

We agree in principle that avoidance and preservation-in-place is an appropriate treatment; in fact, the transmission line may help protect historic properties by inhibiting other kinds of development within the proposed corridor. However, the location of the poles and access roads is unknown at this time, and thus it is unclear if avoidance of all eligible properties present is feasible. Avoidance of archaeological sites usually entails the taking positive steps, such as erecting temporary fences and establishing buffer zones, to insure that plan-related, ground-disturbing activities, such as trench excavation and vehicular movement on unpaved roads, do not occur within the external boundaries of sites. Avoidance of historic-period resources generally entails taking precautions to ensure that the characteristics that contribute to property's eligibility are not impacted.

Given the identification effort to date and current planning stage, this office recommends that the preferred route be selected, because it will minimize and/or lessen impacts to known historic properties. We cannot complete the assessment the plan's effects and cannot concur with determination of impact until further studies and planning stages are completed. Unless all historic properties can be avoided, a determination of negative impacts is likely.

We offer the following stipulations for the committee's consideration:

1) The applicant will participate as a consulting party, on committee's behalf, with the lead federal agency, the State Historic Preservation Office (SHPO), and the state and federal land-managing agencies in the federal compliance process (i.e., 36 C.F.R. 800) to reach a finding of effect and to resolve adverse effects, if any.

2) Should federal involvement in any part or all of this plan be removed or not occur, the applicant will continue to consult, on committee's behalf, with SHPO in the state compliance process to reach a determination of impact and resolve impacts, if any.

Letter to Siting Committee, 8/13/01, Page 3
Certificate of Environmental Compatibility Case No. 111: The Proposed Tucson Electric Power Company South Substation to Nogales Transmission Line, Pima and Santa Cruz Counties, Arizona

3) The lead federal agency and/or the applicant on behalf of the committee, will consult with Indian tribes regarding the potential impacts to historic properties, particularly traditional cultural places, that may be present within or adjacent to the proposed corridor, and resolve adverse effects, if any. Such consultation should be done in a sensitive manner respectful of tribal sovereignty and concerns regarding confidentiality.

4) The applicant will include in the geographic area affected by the plan (i.e., area of potential effect), the final right-of-way and buffer zone, new and existing access roads, material source pits (if any), and equipment staging areas.

5) The applicant will sponsor the necessary studies to complete the identification effort as part of the federal or state compliance process. This may include a cultural resources survey, archaeological testing, or ethnographic study performed under the direction of professional that meets the Secretary of the Interior's qualification standards and permitting requirements of the appropriate land-managing entities.

6) If a historic property, cannot be avoided, the applicant will sponsor the necessary studies or take the appropriate actions to lessen or mitigate the impacts as part of the federal or state compliance process. This may include archaeological data recovery (i.e., excavations), archival research and structure documentation.

7) After construction, the applicant, in conjunction with the land-managing agency, if any, will allow Arizona Site Stewards, a volunteer-staffed SHPO program, to periodically inspect the sites present within the corridor for vandalism or damage.

We look forward to the lead federal agency initiating consultation regarding this undertaking and appreciate the committee's cooperation with this office in considering the effects of state plans on cultural resources situated in Arizona. If you have any questions, please contact me at (602) 542-7137 or electronically via mbilsbarrow@pr.state.az.us.

Sincerely,

Matthew H. Bilsbarrow, RPA
Compliance Specialist/ Archaeologist
State Historic Preservation Office

attachment

cc. w/attachment
Bill Collins, SHPO
Daniel R. Elder, DRE & Associates; 8765 East Bear Place; Tucson, Arizona 85749
Ellen Russell, NEPA Document Manager, Office of Fossil Energy (FE-27), U.s. Department of Energy; 1000 Independence Ave, SW; Washington, DC 20585

Letter to Siting Committee, 8/13/01, Page 4
Certificate of Environmental Compatibility Case No. 111: The Proposed Tucson Electric Power Company South Substation to Nogales Transmission Line, Pima and Santa Cruz Counties, Arizona

General and Technical Comments on "Exhibit E-1: Historical and Archaeological Map for the TEP-Citizens Interconnect Project" prepared by Professional Archaeological Services and Technologies and DRE & Associates, dated February 2001

General Comments

1) Overall the map is a wonderful way of presenting the information gathered.

2) The method of assessing significance (i.e., site worth) based on site value, arbitrarily assigned from one and 10, multiplied by site area, which ranges from 0.1 to 438 acres, gives too much weight to size and is somewhat redundant. Site size is often related to site function, which is already included when considering site value. For example, habitation sites are usually larger that field house sites, and habitation sites were already valued higher the field house sites. Furthermore, small sites dating to the Paleo-Indian or Archaic-periods are more or equal in importance as a large Hohokam habitation site.

3) The separation of archaeological sites from historic-period buildings as shown on the map is not completely clear. It appears the some historical buildings, such as Canoa Ranch, that may also have archaeological site numbers were treated as archaeological sites rather than as historic sites.

4) The lack of information on an area is not represented on the map and not discussed in the document. The archaeological sensitivity of areas that have not been surveyed or otherwise inventoried should be clearly marked as being of unknown sensitivity on the map.

5) The documentation lacks the consulting archaeologist's conclusions and recommendations regarding the individual routes. A summary of properties situated within or adjacent to each route would have been helpful.

Technical Comments

1) Two historic sites numbered 36 are present on the map in the vicinity of Nogales; The one situated in Nogales marks the Grimm House location.

2) The Titan II missile silo, which is a National Historic Landmark and situated north of Green Valley, is not marked on the map.

TETRA TECH, INC.

November 15, 2001

Mr. Gayle Koeninger
El Paso Natural Gas
7776 South Pointe Parkway West, Suite 185
Phoenix, AZ 85044

Subject: Proposed Tucson Electric Power Transmission Line Adjacent to an El Paso Natural Gas Company Pipeline

Dear Mr. Koeninger:

We are currently preparing an Environmental Impact Statement under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power Company 345-kV transmission line in southern Arizona that overlaps approximately 50 miles with an El Paso Natural Gas pipeline right-of-way. Our environmental analysis will include a description of any particular environmental health and safety concerns that will be encountered in the area of overlap with the natural gas pipeline.

As such, your input in this area would be most helpful. We would be happy to provide you with additional design information as needed for your analysis. In addition, a description of any past experience you have with overlapping transmission line and gas pipeline right-of-ways would be helpful. For example, was cathodic protection for the pipeline required in the past? What specific construction or maintenance practices were required for the pipeline and/or transmission lines? What distance was maintained between the pipeline and the transmission lines?

To help identify the proposed right-of-way overlap, the referenced gas pipeline runs from approximately 8 miles west of Sahuarita, Arizona, extending south through a portion of the Coronado National Forest and continuing to just west of Nogales, Arizona. The proposed area of overlap is within Pima and Santa Cruz Counties.

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

I look forward to hearing from you in the near future and thank you for your response. If you have any questions, please call me at (315) 682-3268 or (703) 931-9301 or email me at hmblauer@erols.com. If you prefer to mail information to me, please use:

4640 Ringnecked Path
Manlius, NY 13104-9603

Sincerely,

Erica Rohl for

Dr. H. Mark Blauer
Deputy Project Manager

cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, DOE

O01-408
HMB.er

TETRA TECH, INC.

TETRA TECH, INC.

December 5, 2001

Attn: Duty Agent
Phoenix Division
Drug Enforcement Administration
3010 North Second Street, Suite 301
Phoenix, Arizona 85012

Subject: Proposed Tucson Electric Power Transmission Line near Nogales, Arizona

Dear Sir or Madam:

Tetra Tech is preparing an Environmental Impact Statement under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power (TEP) transmission line that would cross the U.S.-Mexico border near Nogales, Arizona. As part of our analysis, we are seeking input from the U.S. Drug Enforcement Administration regarding potential impacts of the proposed transmission line on illegal immigration and drug related activities. We have provided below a basic description of the project, and would be happy to provide additional details as needed for your consideration.

The transmission line would extend south from Sahuarita, Arizona for approximately 60 miles, crossing the U.S.-Mexico border west of Nogales, Arizona and continuing approximately 60 miles into the Sonoran region of Mexico. The border crossing is within Santa Cruz County, a few miles west of Interstate 19. The double-circuit 345-kV line would be strung on a single set of support structures approximately 125 feet high. Upon completion of construction, a right-of-way (ROW) up to 150 feet wide would be maintained below the length of the line to provide maintenance access to TEP.

Specifically, could the proposed ROW from the project impact illegal immigration and drug related activities? We are also contacting the U.S. Immigration and Naturalization Service and other Federal and state agencies for input on this proposed project. If you have any questions, please call me at (315) 682-3268 or (703) 931-9301 or email me at

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

A-9

hmblauer@erols.com. If you prefer to mail information to me, please use the address below.

Sincerely,

H Mark Blauer

Dr. H. Mark Blauer
Deputy Project Manager
4640 Ringnecked Path
Manlius, NY 13104-9603

Atch

Cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, U.S. Department of Energy

NO1-432

TETRA TECH, INC.

December 5, 2001

Mr. William N. Johnston
Officer-in-Charge
U.S. Immigration and Naturalization Service
Tucson Sub Office
6431 South Country Club Road
Tucson, AZ 85706-5907

Subject: Proposed Tucson Electric Power Transmission Line near Nogales, Arizona

Dear Mr. Johnston:

Tetra Tech is preparing an Environmental Impact Statement under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power (TEP) transmission line that would cross the U.S.-Mexico border near Nogales, Arizona. As part of our analysis, we are seeking input from the U.S. Immigration and Naturalization Service regarding potential impacts of the proposed transmission line on illegal immigration and drug related activities. We have provided below a basic description of the project, and would be happy to provide additional details as needed for your consideration.

The transmission line would extend south from Sahuarita, Arizona for approximately 60 miles, crossing the U.S.-Mexico border west of Nogales, Arizona and continuing approximately 60 miles into the Sonoran region of Mexico. The border crossing is within Santa Cruz County, a few miles west of Interstate 19. The double-circuit 345-kV line would be strung on a single set of support structures approximately 125 feet high. Upon completion of construction, a right-of-way (ROW) up to 150 feet wide would be maintained below the length of the line to provide maintenance access to TEP.

Specifically, could the proposed ROW from the project impact illegal immigration and drug related activities? We are also contacting the U.S. Drug Enforcement Administration and other Federal and state agencies for input on this proposed project. If you have any questions, please call me at (315) 682-3268 or (703) 931-9301 or email me

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

at hmblauer@erols.com. If you prefer to mail information to me, please use the address below.

Sincerely,

Dr. H. Mark Blauer
Deputy Project Manager
4640 Ringnecked Path
Manlius, NY 13104-9603

Atch

Cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, U.S. Department of Energy

NO1-431

U. S. Department of Justice
Drug Enforcement Administration
3010 North Second Street
Phoenix, Arizona 85012-3055

DEC 18 2001

Dr. H. Mark Blauer
Deputy Project Manager
4640 Ringnecked Path
Manlius, New York 13104-9603

Dear Dr. Blauer:

With reference to your December 5, 2001 letter regarding the proposed Tucson Electric Power Transmission Line near Nogales, Arizona, the Drug Enforcement Administration defers all comments to the U.S. Immigration and Naturalization Service and the U.S. Customs Service in regards to intrusions between ports of entry by illegal immigrants.

DEA currently doesn't have enough information regarding the extent of this project to give a credible response. If however, Tetra Tech proposes to excavate this proposed land site so it is less obtrusive by removing plants and flattening the land, then this would be a concern of DEA, in that it would help facilitate border crossings by drug traffickers and illegal immigrants..

If further assistance is needed in this matter, please call me at 602-664-5600.

THANKS FOR
CONSULTING W/US.
Call W/QUESTIONS

Sincerely,

Tom Raffanello

Thomas W. Raffanello
Special Agent in Charge

cc: Ed Beck, Tucson Electron Power Company
Mr. Jerry Pell, U.S. Department of Energy

TEP-2001-38

TETRA TECH, INC.

January 16, 2002

Mr. Rusty Arbeit
Air Space Manager
Air Space Management Office
Davis Monthan Air Force Base
Tucson, AZ 85707

Subject: Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

Dear Mr. Arbeit:

Tetra Tech is preparing an Environmental Impact Statement under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power (TEP) transmission line that would originate in Sahuarita, Arizona and extend south to cross the U.S.-Mexico border near Nogales, Arizona. As part of our analysis, we are seeking input from Davis Monthan Air Force Base regarding potential impacts of the proposed transmission line on military flight operations. We have provided below a basic description of the project and will provide additional details if needed.

The transmission line would extend south from Sahuarita, Arizona for approximately 60 miles, crossing the U.S.-Mexico border west of Nogales, Arizona and continuing approximately 60 miles into the Sonoran region of Mexico. The enclosed map shows the three routes currently under consideration for the proposed transmission line. The double-circuit 345-kV line would be strung on a single set of support structures approximately 125 feet high, with a maximum height of 150 feet as necessary for ground clearance requirements. Upon completion of construction, a right-of-way (ROW) up to 150 feet wide would be maintained below the length of the line to provide maintenance access to TEP.

Would there be any impacts on military flight operations from the proposed project? Would visual markers or lights be required on the support structures or transmission lines? We are also contacting the Federal Aviation Administration and other Federal and state agencies for input on this proposed project. If you have any questions, please call

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

me at (315) 682-3268 or (703) 931-9301 or email me at hmblauer@erols.com. If you prefer to mail information to me, please use the address below.

Sincerely,

Erica Rohl for

Dr. H. Mark Blauer
Deputy Project Manager
4640 Ringnecked Path
Manlius, NY 13104-9603

cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, U.S. Department of Energy

Atch

NO2-008

TETRA TECH, INC.

January 16, 2002

Mr. Chuck Pearman
Airways Facilities Technician Supervisor
Federal Aviation Administration
7081 South Plumer Ave.
Tucson, AZ 85706

Subject: Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

Dear Mr. Pearman:

Tetra Tech is preparing an Environmental Impact Statement under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power (TEP) transmission line that would originate in Sahuarita, Arizona and extend south to cross the U.S.-Mexico border near Nogales, Arizona. As part of our analysis, we are seeking input from the FAA regarding potential impacts of the proposed transmission line on flight operations. We have provided below a basic description of the project and will provide additional details if needed.

The transmission line would extend south from Sahuarita, Arizona for approximately 60 miles, crossing the U.S.-Mexico border west of Nogales, Arizona and continuing approximately 60 miles into the Sonoran region of Mexico. The enclosed map shows the three routes currently under consideration for the proposed transmission line. The double-circuit 345-kV line would be strung on a single set of support structures approximately 125 feet high, with a maximum height of 150 feet as necessary for ground clearance requirements. Upon completion of construction, a right-of-way (ROW) up to 150 feet wide would be maintained below the length of the line to provide maintenance access to TEP.

Would there be any impacts on flight operations from the proposed project? Would visual markers or lights be required on the support structures or transmission lines? We are also contacting Davis Monthan Air Force Base and other Federal and state agencies

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

for input on this proposed project. If you have any questions, please call me at (315) 682-3268 or (703) 931-9301 or email me at hmblauer@erols.com. If you prefer to mail information to me, please use the address below.

Sincerely,

Erica Rohl for

Dr. H. Mark Blauer
Deputy Project Manager
4640 Ringnecked Path
Manlius, NY 13104-9603

cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, U.S. Department of Energy

Atch

NO2-007

U.S. Department
Transportation

Federal Aviation
Administration

Southern Arizona
System Support Unit

7081 S. PLUMER
Tucson, AZ 85706

January 28, 2002

Dr. H. Mark Blauer
Deputy Project Manager
4640 Ringnecked Path
Manlius, NY 13104-9603

Subject: Proposed Tucson Power Transmission Line

Dr. Blauer:

The Air Traffic Control manager at Tucson Airport and myself has reviewed the plans, which you submitted to me in regards to above subject. To the best of our knowledge, your plans would not affect air traffic due to location and height of towers. The closest airport to them would be the Nogales International and their pattern would in no way conflict with the transmission line. The only requirements would be to adhere to Arizona State statutes in regard to tower construction.

Sincerely,

Charles W. Pearman
AF Coordinator
Federal Aviation Admin.
7081 S. Plumer
Tucson, Az. 85706

Subject: [Fwd: Proposed Tucson Electric Power Transmission Line]
From: "H. Mark Blauer" <hmblauer@erols.com>
Date: Mon, 18 Feb 2002 07:41:50 -0500
To: hmbinc@erols.com

-------- Original Message --------
Subject: Proposed Tucson Electric Power Transmission Line
Date: Thu, 14 Feb 2002 15:07:35 -0700
From: Von Brock David C Maj 355 OSS/OSTT <David.Vonbrock@dm.af.mil>
To:"'hmblauer@erols.com'" <hmblauer@erols.com>
CC: Von Brock David C Maj 355 OSS/OSTT <David.Vonbrock@dm.af.mil>, "'alan.steffes@aztucs.ang.af.mil'" <alan.steffes@aztucs.ang.af.mil>

Dr. Blauer,

Thanks for soliciting inputs for the proposed TEP Transmission Line.

I have solicited inputs on behalf of the 355th Wing at Davis-Monthan AFB. We can't comment on the visual marker or light requirements (I would refer to Title 14 CFR Part 77 and Federal Aviation Regulation 7400.2), but we can comment on potential impacts to local military flight operations.

Davis-Monthan does not have any relevant issues with any of the three power line routes proposed in you letter of 16 Jan 2002. The proposed westerly te could impact the FUZZY Military Operating Area (MOA) that allows flight operations down to 100ft. The 162nd Fighter Group at Tucson International is responsible for the FUZZY MOA. I have passed on your proposal to the 162nd FG Airspace Manager but cannot comment in regard to their area of responsibility. I recommend contacting them directly.

162FG Airspace Manager: Lt Col Allan Steffes (520) 295-6894, Fax 295-6293
email: alan.steffes@aztucs.ang.af.mil

Please contact me if you have any further questions.

DAVID VON BROCK, Major, USAF
355 OSS/OSOA
Davis-Monthan Airspace Manager
(520) 228-5868

--
Mark Blauer
315-682-3268

****

TETRA TECH, INC.

March 20, 2002

Lieutenant Colonel Allan Steffes
162nd Fighter Wing
1660 East El Tigre Way
Tucson, AZ 85734

Subject: Proposed Tucson Electric Power Transmission Line south of Tucson, Arizona

Dear Lieutenant Colonel Steffes:

As we discussed on March 19, 2002, Tetra Tech is preparing an Environmental Impact Statement (EIS) under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power (TEP) transmission line that would originate in Sahuarita, Arizona and extend south to cross the U.S.-Mexico border near Nogales, Arizona. As part of our analysis, we are seeking input from the U.S. Air Force regarding potential impacts of the proposed transmission line on military flight operations, specifically on the FUZZY Military Operating Area (MOA) in the proposed project area. We have provided below a basic description of the project and will provide additional details if needed. As we discussed, the Arizona Corporation Commission (ACC) has only granted TEP permission for the Western Corridor. However, under the direction of the lead Federal agency, the Department of Energy, the EIS will analyze potential impacts from all three corridors.

The transmission line would extend south from Sahuarita, Arizona for approximately 60 miles, crossing the U.S.-Mexico border west of Nogales, Arizona and continuing approximately 60 miles into the Sonoran region of Mexico. Project information, including depictions of the support structures being proposed, can be found on DOE's project website, on the Fact Sheet at http://www.ttclients.com/tep. The website also includes a map of the three 2-mile wide study corridors that will be analyzed in the EIS as potential routes for the 150 to 200-feet wide transmission line right-of-way (ROW). The double-circuit 345-kV line would be strung on a single set of support structures approximately 125 feet high, with a maximum height of 150 feet as necessary for ground clearance requirements. A majority of the support structures would be single monopoles, with lattice support structures used as dictated by terrain or geology. Upon completion of construction, a ROW up to 200-feet wide would be maintained along the length of the transmission line to provide maintenance access to TEP.

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

We would like to understand if there would be impacts on military flight operations from the proposed project. Would visual markers, lights, or other mitigation be required on the support structures or transmission lines? Please provide input as soon as possible for analyses before public issuance of the Draft EIS, tentatively scheduled for June 2002. As discussed, we will add you to the mailing list to receive a copy of the Draft EIS. Two public meetings will be held in the proposed project area during the 45-day Draft EIS public comment period as an additional forum for comments. If you have any questions, please call me at (315) 682-3268 or (703) 931-9301 or email me at hmblauer@erols.com. If you prefer to mail information to me, please use the address below.

Sincerely,

H Mark Blauer

Dr. H. Mark Blauer
Deputy Project Manager
4640 Ringnecked Path
Manlius, NY 13104-9603

cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, U.S. Department of Energy

NO2-065

TETRA TECH, INC.

April 3, 2002

Mr. Rob Daniels
Public Information Officer, U.S. Border Patrol
U.S. Immigration and Naturalization Service
1970 West Ajo Way
Tucson, AZ 85713

Subject: Proposed Tucson Electric Power Transmission Line near Nogales, Arizona

Dear Mr. Daniels:

Tetra Tech is preparing an Environmental Impact Statement under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power (TEP) transmission line that would cross the U.S.-Mexico border near Nogales, Arizona. As part of our analysis, we are seeking input from the U.S. Immigration and Naturalization Service (INS) regarding potential impacts of the proposed transmission line on illegal immigration and drug related activities. We were referred to you as the proper contact by Kathy Williams in the INS Tucson sub-office. We have provided below a basic description of the project, and would be happy to provide additional details as needed for your consideration.

The transmission line would extend south from Sahuarita, Arizona for approximately 60 miles, crossing the U.S.-Mexico border west of Nogales, Arizona and continuing approximately 60 miles into the Sonoran region of Mexico. The border crossing is within Santa Cruz County, a few miles west of Interstate 19. The double-circuit 345-kV line would be strung on a single set of support structures approximately 125 feet high. Upon completion of construction, a right-of-way (ROW) up to 150 feet wide would be maintained below the length of the line as needed to provide maintenance access to TEP. Locked gates and fences would be installed at specified ROW locations as required to limit access. Project information, including depictions of the support structures being proposed, can be found on DOE's project website, on the Fact Sheet at http://www.ttclients.com/tep. The website also includes a map of the three 2-mile wide study corridors that will be analyzed in the EIS as potential routes for the 150 to 200-feet wide transmission line right-of-way (ROW).

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

Specifically, could the proposed ROW from the project impact illegal immigration and drug-related activities? What type of mitigation measures, if any, such as limiting ROW access, would be suggested? We have also contacted the U.S. Drug Enforcement Administration, who referred us to the INS, along with other Federal and state agencies. If you have any questions, please call me at (703) 931-9301, or email me at erica.ruhl@tetratech.com. Your prompt input would be appreciated, as it would be preferable to include it in the Draft EIS to be issued for public review, tentatively scheduled for June 2002.

Sincerely,

Erica Ruhl

Erica Ruhl
Environmental Engineer

cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, U.S. Department of Energy

NO2-071

5 April 2002

Mr. David Harlow
Field Supervisor
Arizona Ecological Services Field Office
U.S. Fish and Wildlife Service
2321 West Palm Road, Suite 103
Phoenix, AZ 85701

RE: Preparation of an Environmental Impact Statement,
Tucson Electric Power Company (TEP)

Dear Mr. Harlow:

Tucson Electric Power Company (TEP) has applied to the Department of Energy (DOE) for a Presidential Permit to construct a double-circuit, 345,000 volt (345 kV), transmission line that would originate in Sahuarita, Arizona, and extend for approximately 60 miles within one of three alternative corridors to cross the U.S.-Mexico border near Nogales, Arizona.

DOE has determined that the issuance of a Presidential permit for this project would constitute a major Federal action that could have significant impacts upon the human environment within the meaning of the National Environmental Policy Act of 1969 (NEPA). Accordingly, on 10 July 2001 DOE published in the *Federal Register* a "Notice of Intent to Prepare an Environmental Impact Statement (EIS) and to Conduct Public Scoping Meetings and Notice of Floodplain and Wetlands Involvement" (66 FR 35950). Public scoping meetings were held in Sahuarita and Rio Rico, Arizona, on July 30 and 31, 2001, respectively; the public comment period closed on Friday 31 August 2001.

As defined by 40 CFR 1501.5, DOE is the lead Federal Agency in preparation of the EIS, and the U.S. Department of Agriculture Forest Service (USFS), the Bureau of Land Management (BLM), and the United States Section of the International Boundary and Water Commission, U.S. and Mexico (USIBWC), are Cooperating Agencies.

I am writing to you now in order to officially initiate consultation with the U.S. Fish and Wildlife Service in accordance with the Interagency Cooperation on the Endangered Species Act of 1973 (50 CFR 402.07), which states that, "When a particular action involves more than one Federal agency, the consultation and conference responsibilities may be fulfilled through a lead agency … The Director shall be notified of the designation in writing by the lead agency."

Under DOE direction, Tetra Tech, Inc., is providing EIS preparation support and will be involved in ongoing consultations on this project. The Tetra Tech Project Manager is Dr. Mark Blauer; team members include Dan Elder and Erica Ruhl.

The TEP application, including associated maps and drawings, can be viewed and downloaded in its entirety from the Fossil Energy web site (http://www.fe.doe.gov; choose "Electricity Regulation," then "Pending Procedures," then scroll down to Pending Presidential Permit Application PP-229). Additional project information, including depictions of the support structures being proposed, can be found on the project web site, maintained for us by Tetra Tech at http://www.ttclients.com/tep.

TEP contracted with the Harris Environmental Group, Inc., (Harris) to conduct a preliminary biological evaluation of the three corridors that were originally proposed. I believe that this evaluation included correspondence with you in October 2000, and also contacts with the Arizona Game and Fish Department and the USDA Forest Service, Coronado National Forest. The preliminary biological evaluation conclusion states that, "Based on our correspondence with these agencies, photo-interpretation, and our professional knowledge of the area, we believe potential habitat for 65 rare and endangered species may exist within the project area." I am asking Tetra Tech to provide you with a copy of this Harris document under separate cover.

We are seeking input from the U.S. Fish and Wildlife Service on the process required for analysis of potential impacts to biological resources in the proposed project area, and with regard to any other concerns of the Service with regard to this proposed project. A Tetra Tech representative will contact you to follow up on this consultation letter.

Also, please note that I am convening an informal working meeting with the cooperating agencies, the applicant, and the support contractors in Tucson on 23-25 April. If you like, you or your staff are cordially invited to attend. (If so, please advise, and location, etc., information will be provided.)

At any time, please feel free to contact me directly by e-mail at Jerry.Pell@hq.doe.gov, by phone at 202-586-3362, or by fax at 202-318-7761.

Very truly yours,

Jerry Pell

Dr. Jerry Pell
Manager, Electric Power Regulation
Office of Coal & Power Import and Export
Office of Fossil Energy, FE-27
U.S. Department of Energy
Washington, D.C. 20585

cc: Tetra Tech

TETRA TECH, INC.

June 27, 2002

Mr. Shawn M. Palmer
U.S. Border Patrol, Tucson Sector
1500 W. La Quinta Road
Nogales, AZ 85621

Subject: Proposed Tucson Electric Power Transmission Line near Nogales, Arizona

Dear Mr. Palmer:

Tetra Tech is preparing an Environmental Impact Statement under the *National Environmental Policy Act* (NEPA) for a proposed Tucson Electric Power (TEP) transmission line that would cross the U.S.-Mexico border near Nogales, Arizona. As part of our analysis, we are seeking input from the U.S. Border Patrol regarding potential impacts of the proposed transmission line on illegal immigration and drug related activities. Keith Graves, Coronado National Forest District Ranger, provided basic information on U.S. Border Patrol operations in this area in a recent interview, as reflected in the attached notes, and referred us to contact you. We have provided below a basic description of the project, and would be happy to provide additional details as needed for your consideration.

The transmission line would extend south from Sahuarita, Arizona for approximately 60 miles, crossing the U.S.-Mexico border west of Nogales, Arizona and continuing approximately 60 miles into the Sonoran region of Mexicó. The border crossing is a few miles west of Interstate 19, in the vicinity of an El Paso Natural Gas Company pipeline within Section 24, Township 24 South, Range 13 East. The double-circuit 345-kV line would be strung on a single set of support structures approximately 140 feet high. During construction, new access roads will be built where no access currently exists and some existing roads and trails may be closed in an effort to mitigate overall project impacts on forest land. Upon completion of construction, a 125 to 200-feet wide right-of-way (ROW) would be maintained below the length of the line, as needed, to provide maintenance access for TEP Locked gates and fences would be installed at specified ROW locations as required to limit access. Project information, including depictions of the support structures being proposed, can be found on DOE's project website, on the Fact Sheet at http://www.ttclients.com/tep. The website also includes a map of the study corridors that will be analyzed in the EIS as potential routes for the transmission line ROW. Note that each alternative has the same location for crossing the U.S.-Mexico border, as described above.

One Skyline Place, 5205 Leesburg Pike, Suite 1400, Falls Church, VA 22041
Tel 703.931.9301 Fax 703.931.9222

Specifically, please provide any corrections or additions to the attached interview notes with Mr. Graves regarding potential project impacts on illegal immigration and drug-related activities. Also, please indicate what type of mitigation measures, if any, the U.S. Border Patrol would recommend. We have also contacted the U.S. Drug Enforcement Administration, who referred us to the INS, along with other Federal and state agencies. If you have any questions, please call me at (315) 682-3268, or email me at hmblauer@erols.com. Your prompt attention to this matter is appreciated, as we will include your comments in the Draft EIS to be issued for public review, tentatively scheduled for September 2002.

Sincerely,

Erica Ruhl for

H. Mark Blauer Ph.D.
Project Manager

cc: Ed Beck, Tucson Electric Power Company
Dr. Jerry Pell, U.S. Department of Energy

NO2-149

Appendix B

Electric and Magnetic Fields Background Information

Electric and Magnetic Fields

Extensive research has been conducted to determine if exposure to electric or magnetic fields may cause or promote adverse health effects. Much of this research has focused on determining whether or not electric and magnetic fields (EMF) exposure at some level has adverse health effects, rather than on identifying the specific exposure level at which such effects may occur. The National Institute of Environmental Health Sciences (NIEHS) was mandated by Congress to conduct a research program, literature review, and health assessment on EMF effects, including an extensive scientific and public review processes. Following 6 years of research, the NIEHS released its report in June 1999 entitled *Health Effects from Exposure to Power-line Frequency Electric and Magnetic Fields* (NIEHS 1999). The report studied the effects of the extremely low frequency range (ELF) fields generated by the power lines in the United States.

The NIEHS report's Executive Summary concludes that "The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak." The report continues, "The probability that EMF exposure is truly a health hazard is currently small." The report also states that ELF-EMF exposure "cannot be recognized as entirely safe," given that epidemiological studies (studies of disease patterns in people) demonstrate a fairly consistent pattern of small increased risk with increasing exposures for chronic lymphocytic and childhood leukemia. On the other hand, the report explains that the results of laboratory experiments fail to demonstrate any consistent pattern supporting the epidemiological findings. The report continues that the epidemiological findings are weakened by this lack of support from laboratory data, though the epidemiological findings cannot be completely discounted.

The most significant source for the NIEHS report was the NIEHS Working Group Report, which resulted from a 9-day meeting in June 1998. The Working Group considered all literature relevant to the potential effects of power-frequency EMF on health, including cancers of several types, adverse pregnancy outcomes, chronic illnesses (for example, Alzheimer's disease and amyotrophic lateral sclerosis also known as Lou Gehrig's disease), and neurobehavioral changes (for example, depression, learning, and performance). The Working Group found limited support for a causal relationship between childhood leukemia and residential exposure to EMF, and between adult chronic lymphocytic leukemia and employment with potentially high-magnetic field exposure. Based on this assessment and charged with ranking EMF, according to the International Agency for Research on Cancer criteria, the Working Group assigned EMF a 2B ranking, which translates to "possible human carcinogen." For all other health outcomes, the Working Group concluded that the evidence was inadequate.

The NIEHS report included an assessment of EMF exposures measured in the United States from home and office appliances. Based on data from 24-hour personal monitors worn by individuals, exposures measured within the home averaged 0.8 milligauss (mG) for time not in bed and 0.5 mG for time spent in bed. Personal exposures at work averaged 1.0 mG. A number of common household appliances generate EMF, with the highest fields typically coming from microwave ovens, toaster ovens, ceiling heaters, and refrigerators. While this exposure information may provide a basis of comparison for evaluating EMF exposure associated with power lines, uncertainty exists on whether long-term, lower exposures (typically associated with power lines) and short-term, higher exposures (typically associated with appliances) are comparable in their potential effects on human health (NIEHS 1999).

An independent paper by Dr. Sander Greenland (University of California, Los Angeles) and colleagues, entitled "A Pooled Analysis of Magnetic Fields, Wire Codes, and Childhood Leukemia," (Greenland et al. 2000) has been published in the journal *Epidemiology*. The work was funded by NIEHS. The authors concluded: (1) an effect of magnetic fields below 3.0 mG is unlikely or too small to be detected in epidemiological studies; and (2) there is suggestive evidence that an association between magnetic fields greater than 3.0 mG and childhood leukemia exists.

Another paper describing the results of a pooled analysis of magnetic fields and childhood leukemia was published in the September 2000 issue of *British Journal of Cancer*. Dr. Anders Ahlbom (Karolinska Institute, Sweden) and colleagues conducted the analysis funded by the European Union (Ahlbom 2000). This pooled analysis is based on original, individual-level data rather than a review of existing studies. The study examined whether there is an association between magnetic fields and leukemia. The authors concluded "We did not find any evidence of an increased risk of childhood leukemia at residential magnetic field levels less than 4.0 mG. We did, however, find a statistically significant relative risk estimate of two for childhood leukemia in children with residential exposure to EMF greater than 4.0 mG during the year prior to diagnosis. Less than one percent of subjects were in this highest exposure category." The report also states that the explanation for the elevated risk is unknown but suggests that selection bias may have accounted for some of the increase.

In light of the literature review and studies conducted by NIEHS and presented in its summary report, the NIEHS encourages passive regulatory action on EMF. This includes a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS states that the power industry should continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

An additional comprehensive review of existing studies, which included review and comment by the public, was recently completed on behalf of the California Public Utilities Commission led by three scientists who work for the California Department of Health Services (DHS). This Risk Evaluation, available in its entirety on the Internet at http://www.dhs.ca.gov/ehib/emf/RiskEvaluation/riskeval.html, provides an evaluation of the animal, laboratory and human evidence that shows how exposure to 50/60 Hz magnetic fields may or may not increase human health risks. Like many other evaluations, the focus was on determining whether or not EMF exposure at some level has adverse human health effects, rather than on identifying the specific exposure level at which such potential health effects may occur. Three DHS scientists reviewed studies covering EMFs from power lines, wiring in buildings, some jobs, and appliances. The DHS study Executive Summary states, "With the exception of miscarriage, which is common, the other diseases for which EMFs may be a contributing cause (childhood leukemia, adult brain cancer, Lou Gehrig's Disease) have low incidence… The vast majority (99% to 99.9%) of highly exposed (EMF) people would still not contract these diseases… However, if EMFs do contribute to the cause of these conditions, even the low fractions of attributable cases and the size of accumulated lifetime risk of highly-exposed individuals could be of concern to regulators" (DHS 2002).

Appendix C

Floodplain/Wetlands Assessment

Floodplains and wetlands are protected from adverse Federal actions by a variety of laws, regulations, and orders. This Floodplain/Wetlands Assessment identifies the floodplains and wetlands potentially affected under each of the alternatives addressed in the Tucson Electric Power Company (TEP) Sahuarita-Nogales Transmission Line Draft EIS discusses the effects of the proposed action on the floodplain and wetlands and considers alternatives to the proposed action and mitigation, which may avoid adverse affects and incompatible development in the floodplains and wetlands. A detailed description of the proposed project, including project purpose and need, is provided in Chapter 1. The alternatives identified in this assessment are the same corridor alternatives described in detail in Chapter 2. Because the final siting and engineering of the transmission line has not yet been completed, alternatives that specifically address floodplain/wetland impacts have not yet been developed. Therefore, measures to avoid and minimize wetland impacts can only be discussed in general terms (see Section C.3, Impact Avoidance).

C.1 INTRODUCTION AND METHODS

This assessment was prepared to comply with Executive Order (EO) 11988, *Floodplain Management*, and E.O. 11990, *Protection of Wetlands*. Under EO 11988, Federal agencies must "...provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains…" Furthermore, "If an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains." Under E.O. 11990, Federal agencies "…shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities..."

The U.S. Department of Energy (DOE) requirements for compliance with EOs 11988 and 11990 are found in Title 10, *Code of Federal Regulations* (CFR), Part 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements." A floodplain/wetlands assessment consists of a description of the proposed action, a discussion of its effects on the floodplain and wetlands, and consideration of the alternatives. The EOs direct Federal agencies to implement floodplain and wetland requirements through existing procedures, such as those established to implement the *National Environmental Policy Act* of 1969 (NEPA) to the extent practicable.

If DOE determines that there is no alternative to implementing a proposed project in a floodplain, a brief statement of findings must be prepared. This statement of findings would include a description of the proposed action, an explanation indicating why the project must be located in a floodplain, a list of alternatives considered, measures that will be taken to comply with state and local floodplain protection standards, and a description of the steps to be taken to minimize adverse impacts to the floodplain.

For the purposes of this assessment, the extent of the 100-year floodplain along the Santa Cruz River and its tributaries was determined from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). The maps in this floodplain document are based on 2002 digital FIRM files for Pima and Santa Cruz counties. The FIRM files for Pima and Santa Cruz counties do not cover tribal or U.S. Department of Agriculture Forest Service (USFS) lands. In addition, the County FIRM files do not include delineations for a large portion of the "Southlands" area of Pima County[1]. In an attempt to address these deficiencies in coverage, SWCA contacted the Coronado National Forest (CNF) and requested information regarding the location of any floodplains and wetlands on USFS lands within any of the alternative corridors; there are no tribal lands in the project area. According to B. Lefevre, CNF

[1] "Southlands" refer to recently annexed lands in Pima County located south of Interstate-10 and east of Interstate-19.

Watershed Specialist, the CNF has not mapped any floodplains and wetlands on CNF lands (USFS 2003). SWCA also reviewed soil survey maps of Pima and Cochise Counties in an attempt to find any useful floodplain information (USDA 1979). However, these maps proved unsatisfactory because the material is dated, the soil information was mapped at a scale that was inadequate for the purposes of this project, and there was a weak correlation between soils that are associated with floodplains and floodplain boundaries as defined by FEMA.

C.1.1 Floodplains Potentially Affected

The FIRM maps indicate that the following tributaries occurring in the project area could be part of the 100-year floodplain: Sopori, Toros, Diablo, Las Chivas, and Mariposa Canyon Wash (Figures 1-5). Additional unmapped floodplains may also occur in the project area. In those areas where the regulatory floodplains have not been delineated, the county engineer may require the project proponent to establish the regulatory floodplain and floodway limits through a hydrologic and hydraulic study prepared by an Arizona registered professional civil engineer.

C.1.2 Wetlands Potentially Affected

Wetlands are a subset of waters of the United States. Waters of the United States are defined in the *Clean Water Act* (CWA) as "surface waters, including streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, and other ephemeral watercourses and wetlands" (33 CFR Part 328). Waters of the United States on the project area are under the jurisdiction of the U.S. Army Corps of Engineers (USACE), and activities that result in impacts to waters of the United States must be permitted by USACE under Section 404 of the CWA. A Section 404 Permit must be obtained by any person, agency, or entity, either public or private, proposing a project that will result in a discharge of dredged or fill material into waters of the United States, including wetlands.

C.1.2.1 Ephemeral Watercourses

Each of the proposed corridor alternatives crosses numerous ephemeral watercourses (an ephemeral watercourse flows briefly in direct response to precipitation in the immediate vicinity). No perennial streams (a stream that flows throughout the year; a permanent stream), lakes, or reservoirs occur within the proposed corridors.

C.1.2.2 Wetlands

Wetlands are defined in EO 11990 as "areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds."

To be a jurisdictional wetland (one subject to regulation by USACE), an area must meet three criteria according to the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*: presence of hydric soils, hydrophytic vegetation, and wetland hydrology. Hydric soils are soils with the seasonal high-water table within one inch (2.5 cm) of the surface of the ground for at least one week of the growing season. Hydrophytic vegetation may grow in soils at least periodically depleted of oxygen as a result of water saturation. Hydrophytic vegetation might be able to grow only in wetlands (obligate wetlands vegetation) or may be found in upland environments as well (facultative wetlands vegetation). Wetlands hydrology requires permanent or temporary inundation of soils for at least one week during the growing season and the resultant depletion of oxygen.

Wetlands serve a variety of functions within the ecosystem. Consideration of these functions is essential in the evaluation of potential impacts. Wetland functions and values include water quality preservation, flood protection, erosion control, biological productivity, fish and wildlife habitat, cultural values, aesthetic values, economic values, and scientific values.

No wetlands (either within or outside of USACE jurisdiction) were found in the proposed project corridors during field surveys to identify habitat for wetland-dependent plant and animal species, and none were identified by USFS (USFS 2003). There may be small areas of potential wetlands within the proposed corridors that are associated with manmade stock ponds and impoundments.

C.2 POTENTIAL IMPACTS ON FLOODPLAINS AND WETLANDS

The following discussion evaluates the potential impacts of each alternative to floodplains in the project area. TEP would site the transmission line to avoid any wetlands, so that no wetlands would be impacted by the proposed project. The discussion of impacts to floodplains is organized by geographic area in order to take advantage of geographic overlap between the three corridor alternatives: Western, Crossover, and Central. These geographic areas are the North Segment, North Central Segment, South Central Segment, East-West Segment, and South Segment (Figure 1). Common to all three corridor alternatives are the North Segment and the South Segment.

All of the corridor alternatives involve some construction in floodplains. The four activities to be conducted in floodplains are pole placement, and the construction of pole laydown areas, access roads, and the South Substation expansion (located in the North Segment of all three corridor alternatives). For the purposes of this assessment, the following assumptions were made regarding these potential impacts: (1) the impact of individual pole placement would be 25 ft^2 (2.3 m^2) (see Table 4.1–1 for overall pole footprints); (2) pole laydown areas would each require about 1,850 ft^2 (172 m^2); (3) access roads would be 12 ft (3.7 m) wide; and (4) the South Substation expansion would require 58,500 ft^2 (5,440 m^2). Projected impacts to floodplains were based on maps provided by Electrical Consultants Inc. showing locations of poles, pole laydown areas, and access roads (ECI 2003).

As permanent structures in floodplains, the South Substation expansion and corridor access roads could directly impact floodplain values by increasing flood elevation and frequency. An increase in flood elevation could result in an increase in downstream flood loss and a long-term negative impact on lives and property. Impacts resulting from pole placement and construction of laydown areas would be negligible. Neither activity would negatively impact flood elevation or flood frequency. Consequently, there would be no direct or long-term effects on floodplain values or lives and properties.

C.2.1 Western Corridor

Based on FEMA flood maps, the Western Corridor and Crossover Corridor alternatives would have the greatest potential impact on floodplains in the project area (see Table C.2.1–1). For these two alternative corridor routes, total potential impact within the 100-year floodplain is estimated at about 1.97 acres (0.80 ha).

Table C.2.1–1. Estimated Impacts to Floodplains by Alternative.

Segment	Western (acres)	Crossover (acres)	Central (acres)
North	1.34	1.34	1.34
North Central	0.54	0.54	0.15
South Central	0.00	0.00	0.00
East-West	-	0.00	-
South	0.09	0.09	0.09
TOTAL	**1.97**	**1.97**	**1.58**

"-" means corridor does not pass through this segment.

North Segment. There would be no poles, pole laydown areas, or new access roads in the 100-year floodplain. The South Substation expansion would impact 58,500 ft^2 (5,440 m^2) of 100-year floodplain.

North Central Segment. There would be three poles confirmed and one likely additional pole, four pole laydown areas, and 1,327 ft (404 m) of new access roads (total of 15,924 ft^2 [1,480 m^2]) in the 100-year floodplain.

South Central Segment. There would be no poles, pole laydown areas, or new access roads in the 100-year floodplain.

South Segment. There would be one pole, one pole laydown area, and 184 ft (56 m) of new access roads

C.2.2 Central Corridor

The Central Corridor Alternative would have the least impact to the 100-year floodplain, approximately 1.58 acres (0.64 ha).

North Segment. There would be no poles, pole laydown areas, or new access roads in the 100-year floodplain. The South Substation expansion would impact 58,500 ft^2 (5,440 m^2) of 100-year floodplain.

North Central Segment. There would be five poles confirmed and two poles probable, no laydown areas, and 543 ft (166 m) of new access roads (6,516 ft^2 [605 m^2]) in the 100-year floodplain.

South Central Segment. There would be no poles, pole laydown areas, or new access roads in the 100-year floodplain.

South Segment. There would be one pole, one pole laydown area, and 184 ft (56 m) of new access roads (total of 2,208 ft^2 [205 m^2]) in the 100-year floodplain.

C.2.3 Crossover Corridor

North Segment. There would be no poles, pole laydown areas, or new access roads in the 100-year floodplain. The South Substation expansion would impact 58,500 ft^2 (5,440 m^2) of 100-year floodplain.

North Central Segment. There would be three poles confirmed and one likely pole, four pole laydown areas, and 1,327 ft (404 m) of new access roads (total of 15,924 ft^2 [1,480 m^2]) in the100-year floodplain.

East-West Segment. There would be no poles, pole laydown areas, or new access roads in the 100-year floodplain.

South Central Segment. There would be no poles, pole laydown areas, or new access roads in the 100-year floodplain.

South Segment. There would be one pole, one pole laydown area, and 184 ft (56 m) of new access roads (total of 2,208 ft^2 [205 m^2]) in the 100-year floodplain.

C.2.4 No Action Alternative

Under the No Action Alternative, there would be no immediate change in potential impacts to floodplains in the proposed corridors. However, future proposals to develop land parcels in the project area could affect floodplains.

C.3 IMPACT AVOIDANCE

There are no large areas of wetlands in the proposed project corridors. The transmission line would be sited to avoid any small areas of wetlands in the proposed project corridors. Impacts to floodplains would be avoided to the extent possible by siting access roads and pole laydown areas outside floodplains, and spanning floodplains where feasible. Impacts to floodplains resulting from the South Substation expansion would be unavoidable, however, because the South Substation was originally constructed in the 100-year floodplain, and the proposed project is designed to connect to the existing electrical grid at this location.

TEP would be required to comply with the floodplain protection standards of Pima and Santa Cruz Counties, the Arizona Department of Environmental Quality, and the USFS. These standards require that all structures associated with the power line installation be flood-proofed or elevated at least 1 ft (0.3 m) above the base flood elevation. In the project area, this would apply to the South Substation expansion and corridor access roads. As discussed earlier, the poles, though permanent structures, would not require any specific mitigation since they would not have an effect on flood elevations. Similarly, the pole laydown areas would not affect flood elevations because they would be temporary. Finally, getting a Floodplain Permit for this project would be contingent on concurrent acquisition of any CWA Section 401 (state certification) and 402 (National Pollutant Discharge Elimination System) permits, if necessary.

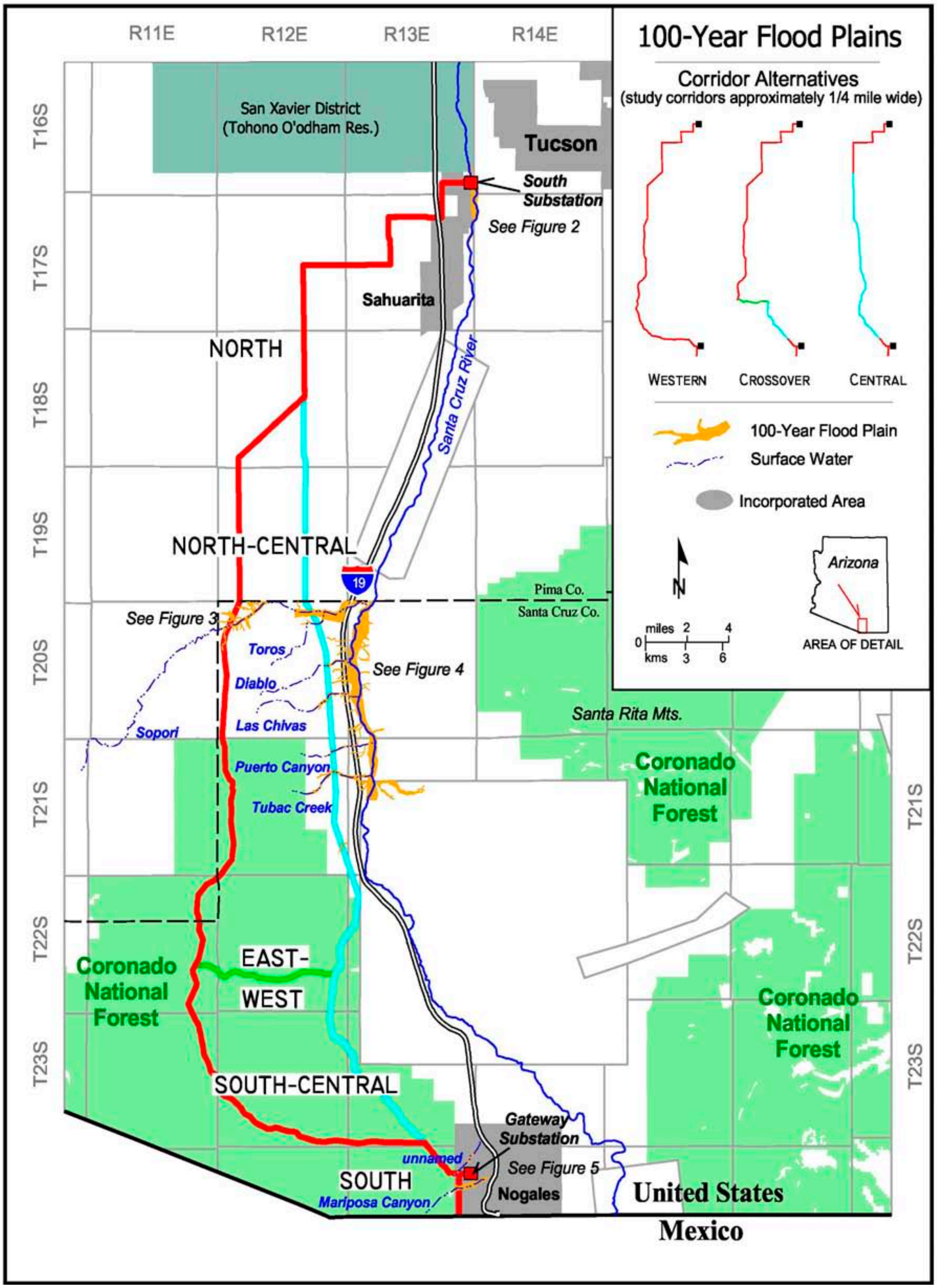

Figure 1. 100-year Floodplains and Associated Surface Waters Crossed by the Corridor Alternatives.

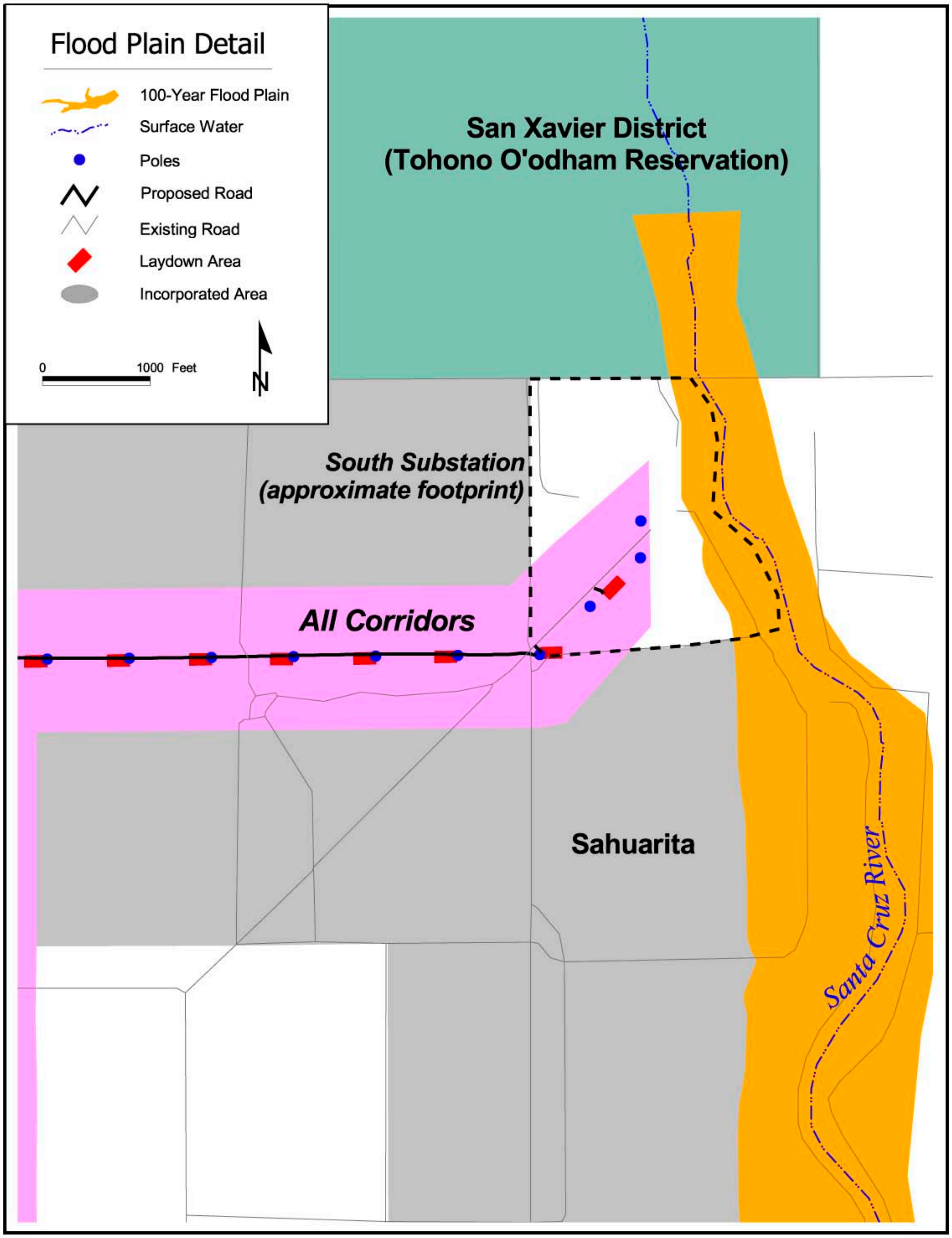

Figure 2. Detailed View of Corridor Alternative Relative to 100-year Floodplain.

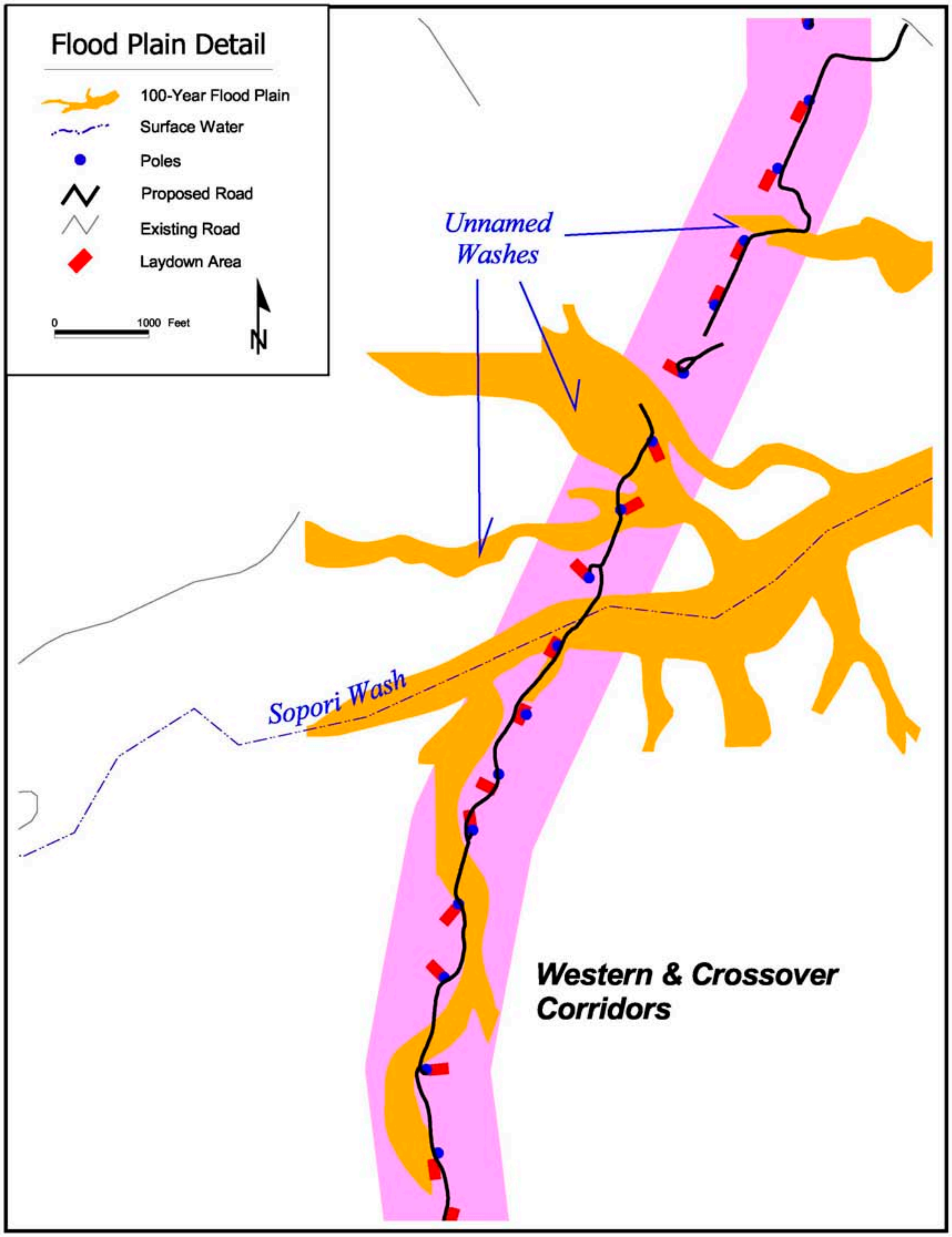

Figure 3. Detailed View of Corridor Alternative Relative to 100-year Floodplain.

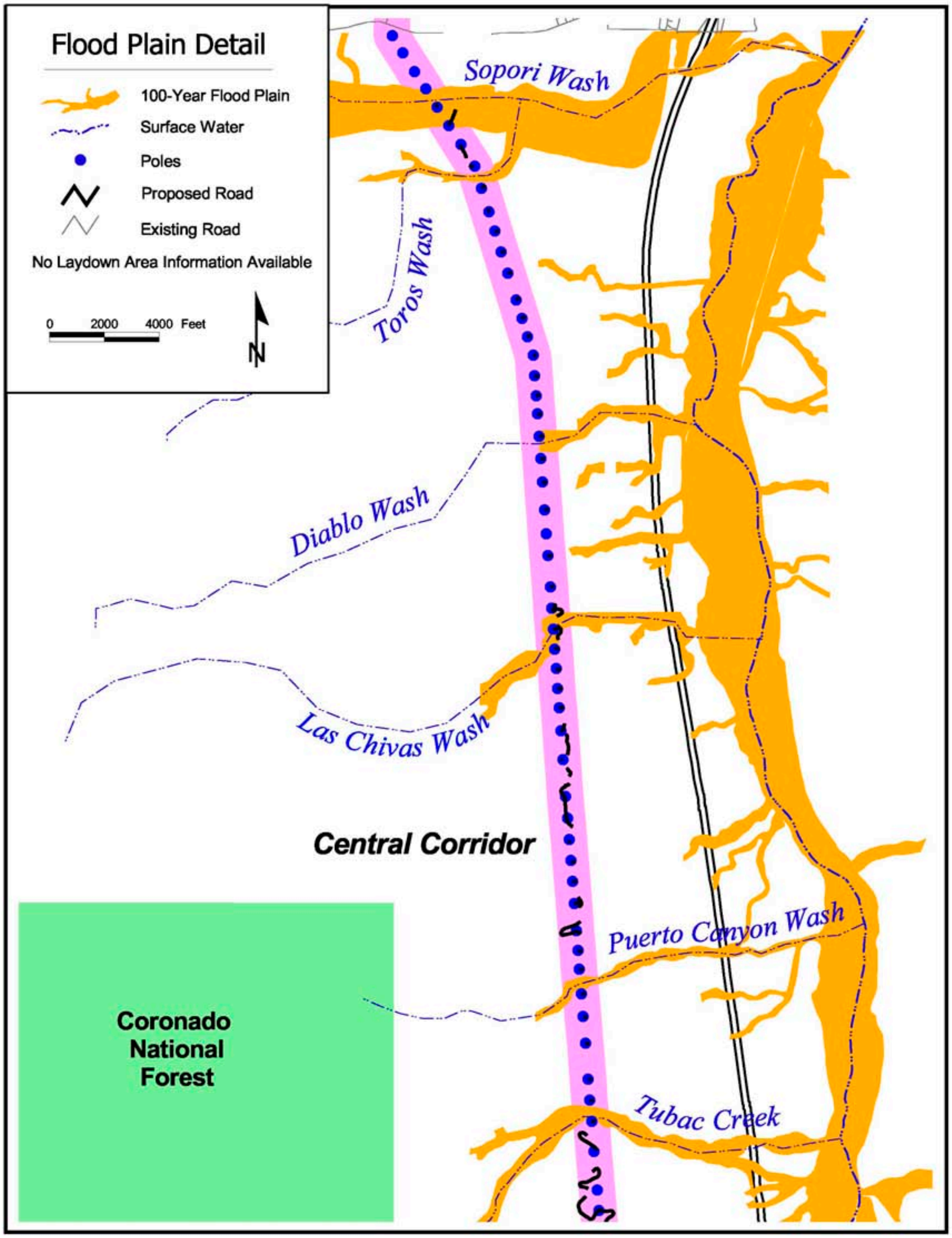

Figure 4. Detailed View of Corridor Alternative Relative to 100-year Floodplain.

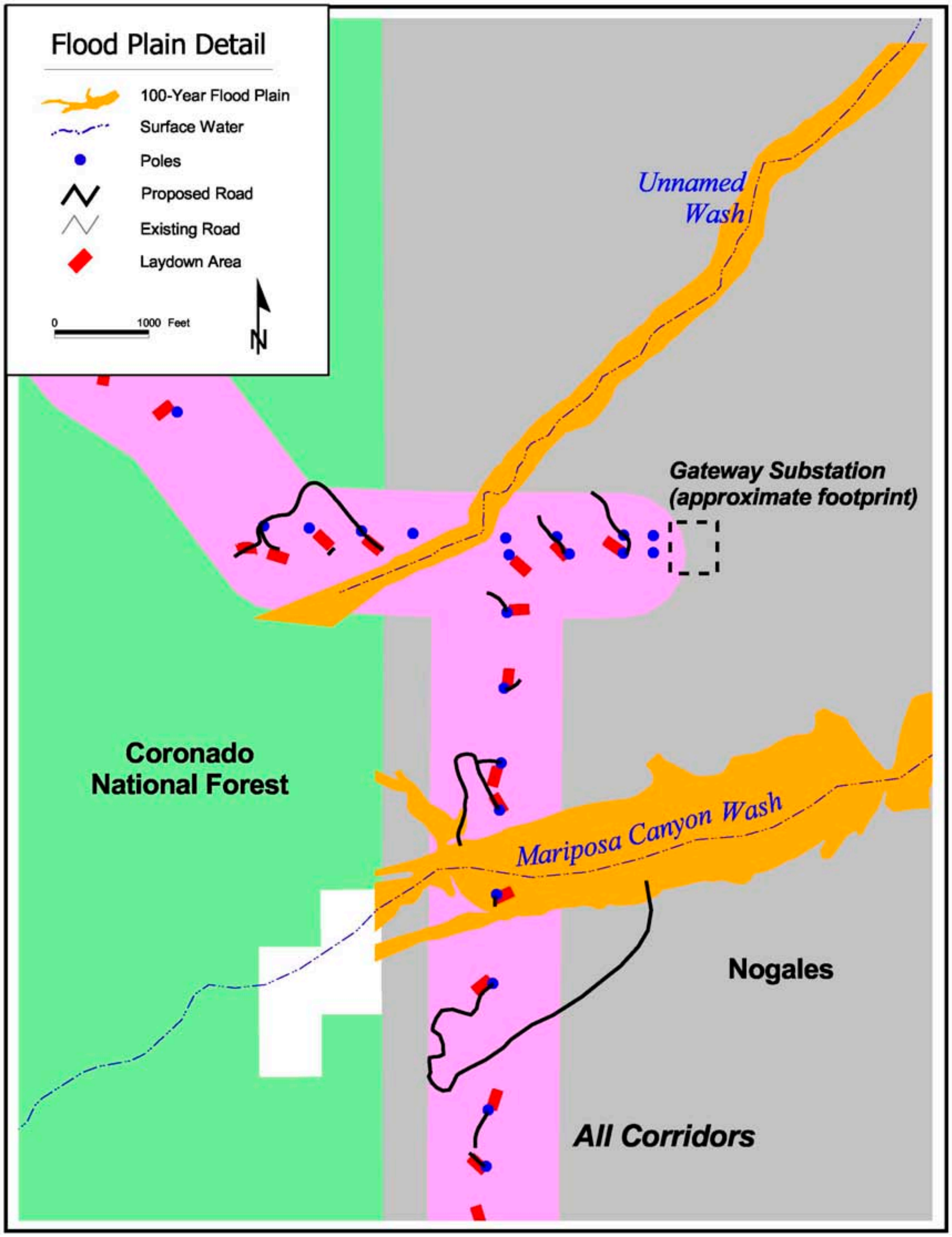

Figure 5. Detailed View of Corridor Alternative Relative to 100-year Floodplain.

Appendix D

Harris Environmental Group, Inc.
Draft Biological Assessment
TEP Proposed Sahuarita-Nogales
Transmission Line Project
Western Corridor (HEG 2003a)

BIOLOGICAL ASSESSMENT

OF THE

TUCSON ELECTRIC POWER

SAGUARITA – NOGALES TRANSMISSION LINE

WESTERN CORRIDOR

DRAFT
15 MAY 2003

PREPARED FOR:

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TABLE OF CONTENTS

EXECUTIVE SUMMARY 4
1.0 PROJECT DESCRIPTION 7
1.1 Proposed Action 7
1.2 Project Location 10
1.3 Project Area 12
1.4 Conservation Measures 15
2.0 FEDERALLY LISTED SPECIES 19
2.1 Mexican spotted owl (*Strix occidentalis lucida*) (Threatened) 21
2.1a Action Area 21
2.1b Natural History and Distribution 21
2.1c Critical Habitat 22
2.1d Current Status Statewide 23
2.1e Environmental Baseline 23
2.1f Effects of Proposed Action on the MSO 24
2.1g Cumulative Effects 27
2.1h Effects Determination and Incidental Take 28
2.2 Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) (Endangered) 29
2.2a Action Area 29
2.2b Natural History and Distribution 29
2.2c Critical Habitat 31
2.2d Current Status Statewide 31
2.2e Environmental Baseline 32
2.2f Effects of Proposed Action on the CFPO 33
2.2g Cumulative Effects 36
2.2h Effects Determination and Incidental Take 36
2.3 Southwestern willow flycatcher (*Empidonax traillii extimus*) (Endangered) 37
2.3a Action Area 37
2.3b Natural History and Distribution 37
2.3c Critical Habitat 38
2.3d Current Status Statewide 38
2.3e Environmental Baseline 39
2.3f Effects of Proposed Action on the SWFL 40
2.3g Cumulative Effects 41
2.3h Effects Determination and Incidental Take 41
2.4 Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) (Endangered) 42
2.4a Action Area 42
2.4b Natural History and Distribution 42
2.4c Critical Habitat 44
2.4d Current Status Statewide 44
2.4e Environmental Baseline 45
2.4f Effects of Proposed Action on the LLNB 45
2.4g Cumulative Effects 47

2.4h Effects Determination and Incidental Take 48
2.5 Chiricahua leopard frog (*Rana chiricahuensis*) (Threatened) 49
2.5a Action Area 49
2.5b Natural History and Distribution 49
2.5c Critical Habitat 51
2.5d Current Status Statewide 51
2.5e Environmental Baseline 52
2.5f Effects of Proposed Action on the CLF 53
2.5g Cumulative Effects 54
2.5h Effects Determination and Incidental Take 55
2.6 Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) (Endangered) 56
2.6a Action Area 56
2.6b Natural History and Distribution 56
2.6c Critical Habitat 56
2.6d Current Status Statewide 56
2.6e Environmental Baseline 57
2.6f Effects of Proposed Action on the PPC 57
2.6g Cumulative Effects 59
2.6h Effects Determination 59
2.7 Sonora chub (*Gila ditaenia*) (Threatened) 60
2.7a Action Area 60
2.7b Natural History and Distribution 60
2.7c Critical Habitat 61
2.7d Current Status Statewide 61
2.7e Environmental Baseline 62
2.7f Effects of Proposed Action on the Sonora Chub and Critical Habitat 63
2.7g Cumulative Effects 64
2.7h Effects Determination and Incidental Take 64
2.8 Jaguar (*Panthera onca*) (Endangered) 66
2.8a Action Area 66
2.8b Natural History and Distribution 66
2.8c Critical Habitat 67
2.8d Current Status Statewide 67
2.8e Environmental Baseline 67
2.8f Effects of Proposed Action on the Jaguar 68
2.8g Cumulative Effects 70
2.8h Effects Determination and Incidental Take 70
2.9 Gila Topminnow (*Poeciliopsis occidentalis occidentalis*) (Endangered) 71
2.9a Action Area 71
2.9b Natural History and Distribution 71
2.9c Critical Habitat 73
2.9d Current Status Statewide 73
2.9e Environmental Baseline 74
2.9f Effects of Proposed Action on the Gila topminnow 75
2.9g Cumulative Effects 75
2.9h Effects Determination and Incidental Take 76

2.10 Mexican Gray Wolf (*Canis lupus baileyi*) (Endangered)........ 77
2.10a. Action Area........ 77
2.10b. Natural History and Distribution........ 77
2.10c Critical Habitat........ 78
2.10d Current Status Statewide........ 78
2.10e Environmental Baseline........ 78
2.10f Effects of Proposed Action on the Mexican Gray Wolf........ 79
2.10g Cumulative Effects........ 80
2.10h Effects Determination and Incidental Take........ 80
3.0 USFS SENSITIVE SPECIES........ 81
3.1 Plants........ 87
3.2 Invertebrates........ 99
3.3 Birds........ 100
3.4 Reptiles And Amphibians........ 102
3.5 Mammals........ 103
4.0 BLM SENSITIVE SPECIES........ 105
4.1 Plants........ 107
4.2 Birds........ 107
4.3 Reptiles & Amphibians........ 103
4.4 Mammals........ 108
5.0 AGFD WILDLIFE OF SPECIAL CONCERN........ 111
6.0 LITERATURE CITED........ 118
7.0 LIST OF ACRONYMS........ 144
APPENDIX A........ 147
APPENDIX B........ 152
APPENDIX C........ 146
APPENDIX D........ 153

EXECUTIVE SUMMARY

Tucson Electric Power (TEP) and Citizens Communications (Citizens) are proposing to build a new, dual-circuit, 345,000-volt (345-kV) transmission line from the TEP South Substation in the vicinity of Sahuarita, Arizona to interconnect with Citizens system at a Gateway Substation that TEP will construct west of Nogales, Arizona. From the Gateway Substation, the proposed transmission line will continue south across the United States – Mexico border for approximately 60 miles (mi) (98 kilometers [km]) into the Sonoran region of Mexico, connecting with the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico) at the Santa Ana Substation. The proposed transmission line will improve Citizens' service in Nogales and allow for the transfer of blocks of electrical energy between the United States and Mexico. Southern Arizona and Sonora, Mexico have experienced rapid growth, and forecasts predict this growth will continue. Citizens' customers have already experienced outages due to limited transmission facilities into the region. TEP recognizes the need to improve transmission into the southern Arizona region and proposes to assist Citizens in meeting an Arizona Corporation Commission (ACC) mandate to improve the reliability and service of its Nogales electrical system. The ACC has ordered Citizens to improve its system by the end of 2003. The TEP Sahuarita – Nogales Transmission Line, a double-circuit 345-kV transmission line will provide the additional reliability that Citizens requires while providing additional capacity into the southern Arizona region for future needs.

This Biological Assessment (BA) was prepared to meet the requirements of Section 7 of the Endangered Species Act (ESA) of 1973, 16 U.S.C. Section 1536(a)(2). Section 7 requires all federal agencies to consult with the United States Fish and Wildlife Service (USFWS) if an action may affect listed species or their designated critical habitat. Section 7 consultation is required for any project that requires a federal permit or receives federal funding. Action is defined broadly to include funding, permitting and other regulatory actions. All activities associated with construction of the TEP Sahuarita - Nogales Transmission Line are included in the proposed action being evaluated for this BA. Because TEP has applied for a Presidential Permit to construct the transmission line across the international border, the Department of Energy (DOE) is preparing a Draft Environmental Impact Statement (DEIS) (Tetra Tech 2003) concurrently with this document.

Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. This is accomplished through consultation with the USFWS. If such species may be present, the applicant must conduct a BA to determine if a proposed action is likely to adversely affect listed species, or designated critical habitat. The USFWS will review this BA and issue a biological opinion (BO). DOE is the permitting agency for this proposed action, and therefore the lead federal agency on Section 7 consultation with USFWS.

The proposed action crosses a variety of land jurisdictions: including private, Arizona State Land Department (ASLD), Bureau of Land Management (BLM), and United States Department of Agriculture Forest Service (USFS). Because each jurisdiction has different requirements for environmental review of the proposed action, this document is subdivided by agency. SECTION 2 addresses species that receive protection under the ESA. SECTION 3 reviews the potential effects of the proposed action on those species classified as "Sensitive" by the USFS. SECTION 4 reviews the potential effects of the proposed action on those species classified as "Sensitive" by the BLM. SECTION 5 addresses those species that are considered "Wildlife of Special Concern" by the Arizona Game and Fish Department (AGFD). Because habitats often overlap different jurisdictions, many species have classifications within each agency. In these instances, the species is evaluated under the jurisdiction which affords the highest level of protection.

We contacted federal (USFWS) and state (AGFD) natural resource agencies to request information on possible special status species (sensitive, threatened, and endangered) that may exist on or near the proposed Western Corridor of the TEP Sahuarita – Nogales Transmission Line. Agency correspondence is presented in Appendix A.

SUMMARY OF DETERMINATIONS FOR FEDERALLY LISTED SPECIES

Based on contact with USFWS, USFS, BLM, and AGFD, 10 federally listed species may be affected by the proposed action. Upon review of the current status of these species, the environmental baseline of the project area, the effects of the proposed actions on the species as well as cumulative effects, the following determinations are made for the 10 affected species (Table 1).

Table 1. Effects of the proposed action on federally-listed species.

Species	**Potential Effect**
Mexican spotted owl	The proposed action may affect, but is not likely to adversely affect this species.
Cactus ferruginous pygmy-owl	The proposed action may affect, and is likely to adversely affect this species.
Southwestern willow flycatcher	The proposed action may affect, but is not likely to adversely affect this species.
Lesser long-nosed bat	The proposed action may affect, and is likely to adversely affect this species.
Chiricahua leopard frog	The proposed action may affect, and is likely to adversely affect this species.
Pima pineapple cactus	The proposed action may affect, and is likely to adversely affect this species.
Sonora chub	The proposed action may affect, and is likely to adversely affect this species. The proposed action may affect, but is not likely to adversely modify critical habitat for this species.
Jaguar	The proposed action may affect, but is not likely

	to adversely affect this species.
Gila topminnow	The proposed action may affect, but is not likely to adversely affect this species.
Mexican gray wolf	The proposed action may affect, but is not likely to adversely affect this species.

1.0 PROJECT DESCRIPTION

1.1 PROPOSED ACTION

The proposed TEP Western Corridor Sahuarita – Nogales Transmission Line will consist of twelve transmission line wires, or conductors, and two neutral ground wires that will provide lightning protection and fiber optic communication, on a single set of support structures. The transmission line will originate at TEP's existing South Substation, in the vicinity of Sahuarita, Arizona, and interconnect with Citizens system at a Gateway Substation that TEP will construct west of Nogales, Arizona. The double-circuit transmission line will continue from the Gateway Substation south to cross the United States – Mexico border and extend approximately 60 mi (98 km) into the Sonoran region of Mexico, connecting with the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico) at the Santa Ana Substation. Figure 1 shows the overall proposed project location.

The South Substation in Sahuarita will be upgraded and expanded to provide interconnection between a new TEP 345-kV transmission line and the new Gateway Substation west of Nogales. The South Substation will be expanded by approximately 1.3 acres (0.53 ha) to add a switching device that will connect to the proposed transmission line, with a 100 ft (30 m) expansion of the existing fence line for the addition of the second 345-kV circuit. The new Gateway Substation will include a 345-kV to 115-kV power transformer to provide power to the local area. The new Gateway Substation will be constructed within a developed industrial park north of Mariposa Road (State Route 189), approximately 0.5 mi (0.8 km) east of the Coronado National Forest (CNF) boundary (Northeast ¼ of Section 12, Township 24 South, Range 13 East). The TEP portion of the site is approximately 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has purchased the substation site and preliminary construction activities have been completed. TEP is flexible in the placement of a fiber-optic regeneration site, but it will likely be located in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita on private land. The fiber optic regeneration site will consist of an approximate 0.5-acre (0.2-ha) fenced yard, containing a 10 ft (3 m) by 20 ft (6 m) concrete pad with an equipment house. The cleared area for the equipment house will be approximately 20 ft (6 m) by 30 ft (9 m). There will be three 3 acre (1.2 ha) construction staging areas (located near the South and Gateway Substations and the Interstate 19 [I-19]/Arivaca Road interchange) and an 80 acre (32 ha) temporary laydown yard (also near the I-19/Arivaca Road interchange) used during construction of the proposed line.

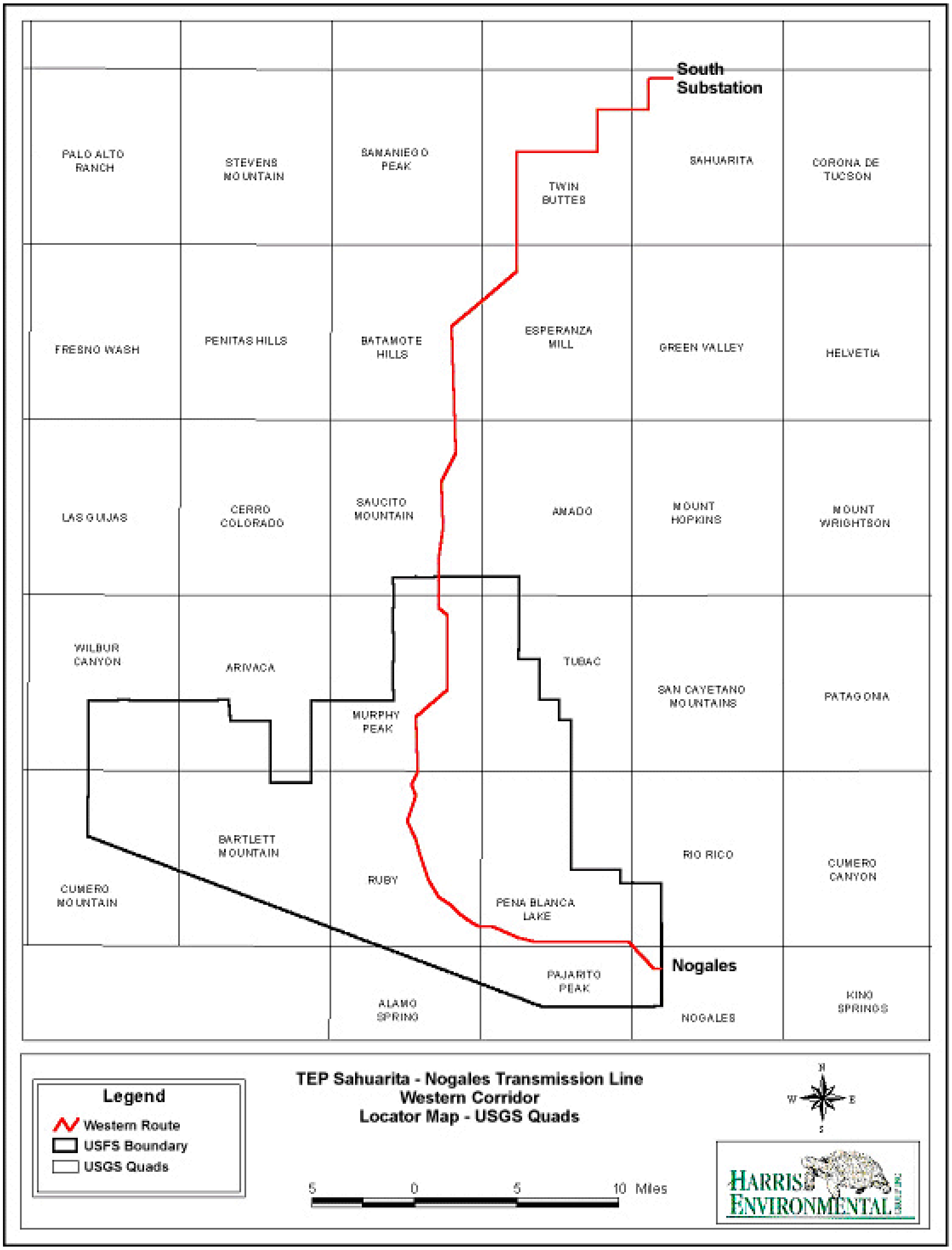
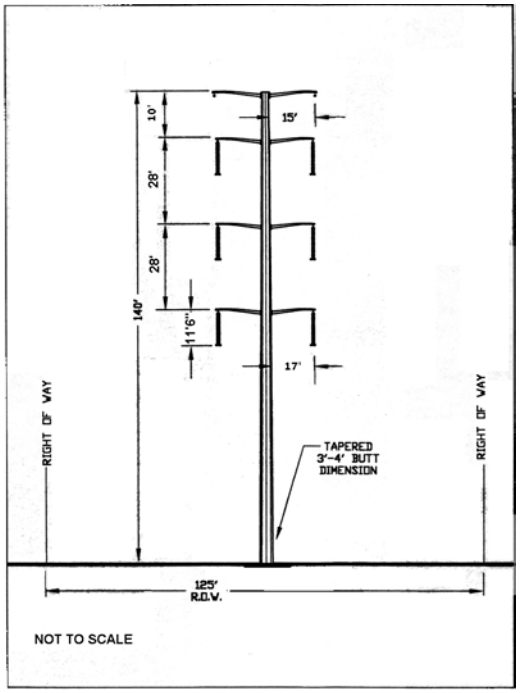


Figure 1. Map of TEP Sahuarita – Nogales Transmission Line Western

The primary support structures to be used for the transmission line are self-weathering steel single structures, or monopoles (Figure 2). Dulled, galvanized steel lattice towers (Figure 3) will be used in locations where their use will minimize overall environmental impacts, in accordance with Arizona Corporation Commission (ACC) Decision No. 64356 (ACC 2001).



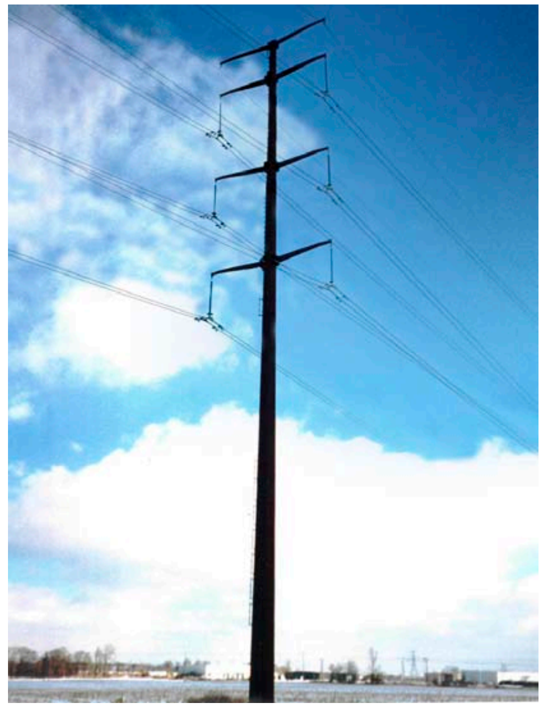


Figure 2. Monopole Transmission Line Structure Drawing and Photo.

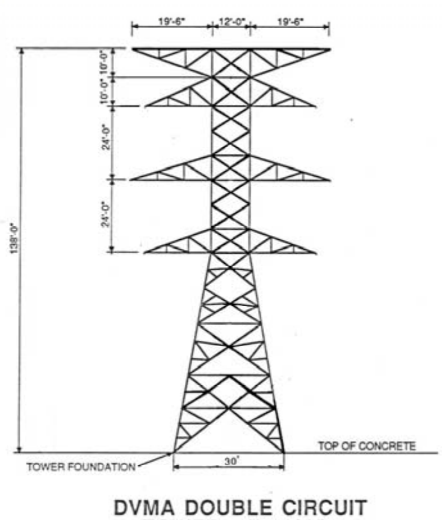


Figure 3. Lattice Tower Transmission Line Structure Drawing and Photo.

1.2 PROJECT LOCATION

The Western Corridor extends for approximately 65.7 mi (105 km), from the South Substation to the United States – Mexico border, including 9.3 mi (15 km) along the El Paso Natural Gas Company (EPNG) gasline right-of-way (ROW). The length of the Western Corridor is 29.5 mi (47.5 km) within the CNF, and approximately 1.25 mi (2.01 km) on BLM land. The Western Corridor will require approximately 446 support structures, including approximately 191 within the CNF and 9 on BLM land.

The Western Corridor exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceeds westerly for approximately 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). The corridor turns west across I-19 and continues through Pima County to the southwest, crossing approximately 1.25 mi (2.01 km) of federal land managed by BLM parallel to two existing TEP transmission lines (138-kV and 345-kV). The Western Corridor turns south to parallel the EPNG gasline ROW for approximately 5.8 mi (9.3 km) and passes just east of the existing TEP Cyprus Sierrita Substation.

The Western Corridor continues past the Cyprus Sierrita Substation to the southwest, then turns south and enters Santa Cruz County after 6.3 mi (10 km). The Western Corridor enters the CNF 6.0 mi (9.7 km) south of the Santa Cruz County line. The Western Corridor passes south along the west side of the Tumacacori and Atascosa mountains, then meets and runs along the south side of Ruby Road as it turns gradually east, north of the Pajarita Wilderness. The Western Corridor continues south of Ruby Road then intersects the EPNG gasline ROW.

The Western Corridor continues through USFS land, paralleling the EPNG gasline ROW to the southeast for several miles to the CNF boundary. The proposed corridor exits USFS land onto private land and proceed 0.5 mi (0.8 km) east to the Gateway Substation. From the Gateway Substation, the proposed corridor returns to the west through private land and then turns south to parallel the CNF boundary. The proposed corridor meets the United States – Mexico border approximately 3,300 ft (1,006 m) west of Arizona State Highway 189 in Nogales, Arizona.

TEP will use existing utility maintenance roads and ranch access roads, where feasible,and new access ways where no access currently exists. Approximately 20 mi (32 km) of new temporary roads will be built for construction of the Western Corridor on the CNF (URS 2003a); spur roads off existing access roads adjacent to TEP transmission lines will provide project access on BLM land. On the CNF, transmission line tensioning and pulling and fiber-optic splicing sites will also disturb land.

The total new temporary area of disturbance on the CNF during construction of the Western Corridor will be approximately 197 acres (79.7 ha) (URS 2003a). Following construction, TEP will close roads not required for project maintenance and will limit access to maintenance roads, in accordance with agreements with land owners or managers (e.g., BLM or USFS). On USFS land, TEP will close existing road mileage equal to that required for project maintenance, to avoid impacting the current road density. The maintenance access required by TEP will be limited to roads to selected structures, rather than a single cleared ROW leading to the United States – Mexico border. Transmission line tensioning and pulling sites, fiber-optic splicing sites, and construction yard areas will be obliterated within six months of the project becoming fully operational (URS 2003a).

1.3 PROJECT AREA

The project area includes the location where all construction and associated activities will occur along the ROW. Action areas are locations affected directly or indirectly by these activities and often include sites outside the immediate area of construction. Action areas are unique for each listed species and are outlined in SECTION 2.0 of this document.

Between Sahuarita and Nogales, the proposed action crosses four distinct biotic communities, or biomes (Brown 1994). A complete list of plant species documented during field surveys in 2002 is presented in Appendix B.

Figure 4. Sonoran desertscrub.

The northern end of the corridor contains vegetation characteristic of the Sonoran desertscrub biome (Figure 4). This biome is typically represented by saguaro (*Carnegiea gigantea*), cholla and prickly pear (*Opuntia* spp.) cacti, ocotillo (*Fouquieria splendens*), mesquite (*Prosopis velutina*), acacia (*Acacia* spp.) paloverde (*Parkinsonia* spp.), (*Larrea tridentata*), triangle-leaf bursage (*Ambrosia deltoidea*), and brittlebush (*Encelia farinosa*).

Vegetation south of the ASARCO mine transitions into the semidesert grassland biome (Figure 5). This area is dominated by grama (*Bouteloua* spp.), lovegrass (*Eragrostis* spp.), and three-awn (*Aristida* spp.) grasses, with low shrubs such as mesquite and acacia locally co-dominant. Agave (*Agave* spp.) and yucca (*Yucca* spp.) are also common in this biome. These grasslands are transected by desert riparian scrub dominated by mesquite and netleaf hackberry (*Celtis reticulata*).

Figure 5. Semidesert grassland.

Figure 6. Madrean oak woodland.

The higher elevations (above 3,500 ft [1,067 m])of the project area are within the madrean oak woodland biome (Figure 6). Representative plants of this biome within the project area include Mexican blue oak (*Quercus oblongifolia*) and emory oak (*Q. emoryi*) trees, side-oats grama (*B. curtipendula*), hairy grama (*B. hirsuta*), and fluffgrass (*Erioneuron pulchellum*).

The 4th biome represented within the project area is the Sonoran deciduous riparian forest (Figure 7), which is located south of Arivaca Road in Sopori Wash, Peck Canyon, and Sycamore Canyon. The high water table in these areas supports stands of cottonwood (*Populus fremontii*), ash (*Fraxinus pennsylvanica* ssp. *velutina*), sycamore (*Platanus wrightii*), walnut (*Juglans major*), and willow (*Salix* spp.) trees.

Figure 7. Sonoran deciduous riparian forest.

The proposed ROW begins at an elevation of approximately 2,674 ft (815 m) at the TEP South Substation and reaches its maximum elevation of approximately 4,500 ft (1,372 m) south of Atascosa Peak. Much of the northern portion of the proposed ROW consists of gently rolling hills and bajadas. The most significant topographical feature crossed by the proposed ROW in Pima County is Tinaja Peak (4,321 ft [1,317 m]) located southwest of the ASARCO Mine complex. The southern portion of the proposed ROW passes near the Tumacacori and Atascosa Mountains, both of which contain steep, rugged terrain. The maximum elevation within these ranges is Atascosa Peak (6,440 ft [1,963 m]).

The Tumacacori Ecosystem Management Area (EMA) contains the following Special Management Areas: Pajarita Wilderness Area, Sycamore Canyon, Goodding Research Natural Area (RNA), Chiltepine Botanical Area, and Inventoried Roadless Areas.

The Pajarita Wilderness Area (designated in 1984) encompasses 7,448 acres (3,014 ha) southwest of the Western Corridor and north of the international border. More than 660 plant species have been documented in this area, including 17 species not found anywhere else on earth. This area is valued for its nearly pristine nature and remoteness, with little disturbance resulting from human access. To maintain this landscape, motorized access in this area is prohibited; however, livestock grazing is permitted within Pajarito Wilderness outside of the Goodding RNA.

Sycamore Canyon, which runs through the Pajarita Wilderness Area, contains unique habitats of many plants and animals that are not found in the surrounding areas or are at the periphery of their natural environment. Sycamore Creek, one of the few perennial streams in southern Arizona, runs along the floor of Sycamore Canyon. A 1,759 acre (712-ha) section of Sycamore Creek and its immediate environment was nominated in 1993 as a Wild and Scenic River under the National Wild and Scenic Rivers System Act of 1968. This nomination is in recognition of the exceptional scenic, recreational, ecological, and social values supported by Sycamore Creek.

The Goodding RNA (established in July 1970) encompasses 2,207 acres (893 ha) primarily within the Pajarita Wilderness Area and along Sycamore Canyon. This special designation was placed on the area because it is characterized by Mexican floral and faunal elements that did not otherwise occur, or were elsewhere rare, in the United States.

The Chiltepine Botanical Area is a 2,836 acre (1,148 ha) reserve located approximately 2 mi (1.2 km) west of the Western Corridor, in the northern portion of the Tumacacori EMA. This area was established in June 1999 for the purpose of protecting and facilitating the study of chiltepines. These wild chiles typically are found in tropical environments between Mexico and South America. This area has been noted as the northernmost occurrence of chiltepine in the world.

Inventoried Roadless Areas have been identified within the Tumacacori EMA, encompassing 21,363 ha (52,788 acres). These areas were established by a Record of Decision on 12 January 2001 on the Roadless Area Conservation Final EIS.

1.4 CONSERVATION MEASURES

PROJECT-WIDE CONSERVATION MEASURES

1. Environmental Training - All construction supervisors will be required to attend environmental training, which will outline their obligation to obey applicable laws and regulations regarding wildlife and habitats (Appendix C).

2. Erosion Control Measures - TEP is in consultation with CNF regarding development of Best Management Practices (BMPs) for minimizing project impacts on geologic, soil, and water resources on national forest land, in accordance with the USFS "Soil and Water Conservation Practices Handbook" (USFS 1990). Specific BMPs will be identified after coordination with Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, for the entire length of the selected corridor.

3. Fire Prevention Plan - A Fire Prevention Plan is under development to minimize the risk of accidental wildfire. All construction activities will adhere to this plan and fire suppression equipment will be available to all work crews. On CNF lands, the Fire Prevention Plan will comply with Forest Service Manual 5100.

4. Hazardous Material Spill Response Plan - A Hazardous Material Spill Response Plan is under development which will describe the measures and practices to prevent, control, cleanup, and report spills of fuels, lubricants, and other hazardous substances during construction operations. This plan will ensure that no hazardous materials are stored, dispensed, or transferred in streams, watercourses, or dry washes, and vehicles are regularly inspected and maintained to prevent leaks.

5. Invasive Species Control - An Invasive Species Management Plan in accordance with Executive Order 13112 is under development in coordination with CNF, ASLD, and BLM to identify problem areas and mitigation measures.

6. Road Closure/Obliteration - TEP has committed to obliterate and permanently close 1 mi (1.6 km) of existing road on the CNF (to be identified by CNF) for every 1 mi (1.6 km) of proposed new road used in the construction, operation, or long-term maintenance of the proposed action. TEP will monitor road closures during regularly scheduled inspection flights and/or ground inspections, and repair or replace road-closure structures as necessary following construction. Furthermore, TEP will cooperate with land owners on all reseeding and ongoing road closure maintenance.

   The following selective criteria and techniques for closing roads are taken from Section 1.3.2 of the RA (URS 2003) and applies to access roads on CNF. Administrative roads will be closed to the general public but made available to TEP and its assigned contractors for the evaluation, maintenance, or upgrading of existing facilities.

Closure methods for administrative roads will include the following:

a. Placement of heavy pipe posts with an attached, locked chain in a manner that blocks entrance on the road.

b. Placement of heavy pipe posts with an attached, locked gate in a manner that blocks entrance on the road.

c. Placement of a pipe barricade across the roadbed, locked in place in multiple locations in concrete sleeves.

The following methods may be used for the long-term closure of transmission line access roads used during construction and those roads required to be closed by the CNF. These roads may be reopened for emergency repair of transmission facilities, but will not be used intermittently as with administrative roads. Techniques include:

a. Placement of boulders or other natural impediments across the road.

b. Placement of a berm or trench across the road.

c. Rip, obliterate, and reseed/revegetate portions of roadbed as needed. This effort could be applied to the initial visual portion of roadway (e.g., first 100 ft [30 m]) to effectively obscure the roadway. This could be accomplished by transplanting native species of medium and large vegetation from the general area and reseeding with native grasses. By obscuring visible portions of roadway, future vehicular travel could be more effectively discouraged than by placing berms or other unnatural impediments to an otherwise visually inviting roadway.

7. Additional mitigation measures are outlined in Table 2.2-2 of the DEIS (Tetra Tech 2003).

SPECIES-SPECIFIC CONSERVATION MEASURES

Mexican spotted owl (MSO)

1. Breeding season restriction – no construction activity will occur between Structures #24 and #45 of Segment 4 from 1 March to 31 August.

2. Protocol surveys will be conducted in the year immediately before construction in Sycamore Canyon north of Ruby Road to determine the presence /absence of MSO in this area. If MSO are detected, USFWS will be consulted for further guidance.

3. No trees over 9 in (22.8 cm) diameter breast height (DBH) in MSO habitat will be removed.

Cactus ferruginous pygmy-owl (CFPO)

1. Protocol surveys – Two consecutive years of protocol surveys will be conducted before construction activities can be begin within 1,969 ft (600 m) of designated habitat. If a CFPO is detected, USFWS has determined that certain continued construction activities will not harm or harass a CFPO as defined by ESA regulations. In areas where two consecutive years of protocol surveys cannot be completed, construction will occur outside of the breeding season.

   Four zones are described (Zone I through Zone IV) that are based upon the distance of construction activity from a known nest or activity center. Certain levels of construction can occur within each zone without resulting in harm or harassment of the species. Situations that do not comply with the restrictions provided for each zone will require USFWS authorization before construction continues. Specific development restrictions that apply to each of the four zones are described in the sections below:

   Zone I: 0 to 328 ft (100 m) from the CFPO Activity Center

   1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

   2. Construction-related activities may continue on land that has been cleared of vegetation provided that they do not exceed the level and/or intensity of activity that was occurring during the period of time that the territory was established.

   3. Activities that will be more intense or cause more noise disturbance than was occurring during the period of time that the territory was established cannot proceed without authorization from USFWS and relevant land management agencies.

   Zone II: 328 ft (100 m) to 1,312 ft (400 m) from the CFPO Activity Center

   1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

   2. No restrictions on the nature or type of construction activity (excluding the clearing of vegetation) from 1 August through 31 January of the following calendar year.

   3. Construction activities during the breeding season (1 February to 31 July) cannot exceed the levels or intensity of activities that occurred at the time the territory was established.

   Zone III. 1,312 ft (400 m) to 1,969 ft (600) from the CFPO Activity Center

1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

2. No restrictions on the levels or intensity of construction activity (excluding the clearing of vegetation) at any time of the year.

Zone IV: Greater than 1,969 ft (600 m) from the CFPO Activity Center
1. No restrictions – any activity consistent with the project description provided to USFWS (as amended by the supplemental reports) is allowed. For the purposes of this consultation, USFWS assumes that all construction or construction-related activities referred to under each zone description will be limited to those described in the project description in this BA.

2. All saguaros within construction areas will be transplanted or mitigated with minimum 6.5 ft (2 m) specimens. Within riparian desertscrub and deciduous riparian areas, tree and shrub removal will be minimized to the greatest extent possible.

Southwestern willow flycatcher (SWFL)

1. Damaged deciduous riparian vegetation will be mitigated with structure plantings of willow or cottonwood at a 2:1 ratio by species.

Lesser long-nosed bat (LLNB)

1. Agave within construction areas will be transplanted or replaced with similar age and size class individuals.

Chiricahua leopard frog (CLF)

1. To prevent the spread of disease, equipment-cleaning stations will be established at sites to be determined in consultation with CNF and USFWS.

Pima pineapple cactus (PPC)

1. Purchase of credits in a USFWS-approved conservation bank for PPC at a ratio to be determined in consultation with USFWS.

Jaguar

1. Five remote cameras will be donated to the Jaguar Conservation Team to assist with monitoring of jaguar movements across the Arizona-Mexico border. These cameras will be placed within the Tumacacori EMA under permit from CNF. If female jaguar or cubs are documented by the Jaguar Management Team within the Tumacacori EMA, consultation with USFWS will be reinitiated.

2.0 FEDERALLY LISTED SPECIES

Special status species are plant and wildlife species that are of concern because their populations are either in jeopardy of extinction or are declining in number. AGFD and USFWS were contacted concerning information on possible threatened and endangered species that may exist on or near the proposed action. In a letter dated 14 May 2002, USFWS listed 18 endangered species, seven threatened species, and two proposed species that occur in Pima and Santa Cruz counties, Arizona (Table 2). Agency correspondence is presented in Appendix A. Species included in USFWS correspondence, but excluded from evaluation are addressed in Appendix D.

Meetings with USFWS and USFS personnel were held on 9 April, 13 May, 3 December 2002, and 28 March 2003 to discuss the potential effects of the proposed action on special status species. BLM personnel also attended the 3 December 2002 meeting. Additional meetings were held with USFWS on 30 May, 6 November, 10 December 2002, and 19 March 2003, and with AGFD on 19 April 2002.

Table 2. Federally listed species that may occur near the proposed action.

SPECIES	STATUS	*DRAFT* DETERMINATION
Canelo Hills ladies' tresses	Endangered	No Effect
Cactus ferruginous pygmy-owl	Endangered	May affect, likely to adversely affect
Desert pupfish	Endangered	No Effect
Gila topminnow	Endangered	May affect, not likely to adversely affect
Huachuca water umbel	Endangered	No Effect
Jaguar	Endangered	May affect, not likely to adversely affect
Jaguarundi	Endangered	No Effect
Kearney's blue star	Endangered	No Effect
Lesser long-nosed bat	Endangered	May affect, likely to adversely affect
Masked bobwhite	Endangered	No Effect
Mexican gray wolf	Endangered	May affect, not likely to adversely affect
Nichols turk's head cactus	Endangered	No Effect
Northern aplomado falcon	Endangered	No Effect
Ocelot	Endangered	No Effect
Pima pineapple cactus	Endangered	May affect, likely to adversely affect
Sonoran pronghorn	Endangered	No Effect
Sonoran tiger salamander	Endangered	No Effect
Southwestern willow flycatcher	Endangered	May affect, not likely to adversely affect
Bald eagle	Threatened	No Effect
California brown pelican	Threatened	No Effect
Chiricahua leopard frog	Threatened	May affect, likely to adversely affect
Loach minnow	Threatened	No Effect
Mexican spotted owl	Threatened	May affect, not likely to adversely affect
Sonora chub	Threatened	May affect, likely to adversely affect
Spikedace	Threatened	No Effect
Mountain plover	Proposed	No Effect
Gila chub	Proposed	No Effect

2.1 MEXICAN SPOTTED OWL (*Strix occidentalis lucida*) (Threatened)

2.1a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. The action area for the MSO includes those areas of MSO habitat that may be directly impacted by construction as well as protected activity centers (PAC) within 1 mi (1.6 km) of the proposed action that may be subject to noise disturbance during construction. The entire action area for this species is within the Tumacacori EMA.

2.1b Natural History and Distribution

The MSO is one of three subspecies of spotted owl currently recognized by the American Ornithologists' Union in their most recent treatise on subspecies (A.O.U. 1957). However, Dickerman (1997), in a recent taxonomic review of *S. o. lucida*, has identified three subspecies throughout the species' range, including resurrecting the use of *S. o. huachucae* as the subspecies in the southwestern United States and northern Mexico. Although this new revision is probably valid, the currently accepted taxonomy was followed. The MSO (Figure 8) is a medium-sized owl with a round head lacking ear tufts; light brown to dark brown plumage, and dark eyes. It has white spots on the head and nape, and white mottling on the breast and abdomen; thus, the name spotted owl (Pyle 1997). All three subspecies of spotted owl inhabit mountainous, forested regions of western North America.

Figure 8. Mexican spotted owl.

A detailed account of the spotted owl, inclusive of the three currently recognized subspecies, is given by Gutiérrez et al. (1995). Ganey (1998) presents a synthesis of what is presently known about the MSO, particularly in Arizona. The MSO Recovery Plan (USFWS 1995a) and technical supporting chapters on distribution and abundance (Ward et al. 1995), population biology (White et al. 1995), landscape analysis and metapopulation structure (Keitt et al. 1995), habitat relationships (Ganey and Dick 1995), and prey ecology (Ward and Block 1995) also are important summary documents. The following brief species account was obtained from these and other more current references.

The MSO is widely but patchily distributed in forested mountains and canyons from southern Utah and central Colorado, south into Arizona, New Mexico, extreme western Texas, and into Mexico to near Mexico City (McDonald et al. 1991, Gutiérrez et al. 1995, Ward et al. 1995, Dickerman 1997). The MSO nests, roosts, forages, and disperses in a variety of habitats in Arizona from about 3,770 ft (1,236 m) to 9,600 ft (3,150 m). Nest and roost habitats include forests and woodlands that are structurally complex, unevenly aged and multistoried, with mature or old-growth stands containing trees older than 200 years with a high (>70 percent) canopy closure, including many snags and fallen logs (Ganey and Dick 1995). According to Ganey (1998), they appear to be most common in mature and old growth forests in steep canyons, but also are found in canyons that include prominent cliffs with little forested habitat. The MSO preys on small mammals, birds, reptiles, and insects, with woodrats (*Neotoma* spp.) and white-footed mice (*Peromyscus* spp.) constituting the bulk of its diet by biomass (Ward and Block 1995, Ganey et al. 1992, Reichenbacher and Duncan 1992).

Adult MSO are considered to have a relatively high survival rate, with an estimated probability of adult survival rate of 0.8 to 0.9 from one year to the next (White et al. 1995). Juveniles on the other hand, have a much lower survival probability rate, ranging from 0.06 to 0.29 (Ganey et al. 1998, White et al. 1995). There is a great deal of spatial and temporal variation in reproductive output, but one estimate places the general reproductive rate at 1.001 fledglings per pair (White et al. 1995). Typical of *K*-selected species (Ricklefs 1990), the MSO is long-lived with low reproductive output and generally maintains population densities near carrying capacity. The high survival rate of *K*-selected species enables MSO to maintain stable populations over time despite variable recruitment rates (White et al. 1995).

In 1993, the MSO was federally listed as a threatened species by the USFWS. The listing was based primarily on historical and ongoing habitat alteration due to timber management practices, specifically the use of even-aged silviculture, the threat of these practices continuing as prescribed in National Forest Plans, and the threat of additional habitat loss from catastrophic wildfire (USFWS 1993a).

The primary administrator of lands supporting MSO in the United States is the USFS. According to the recovery plan, 91 percent of MSO known to exist in the United States between 1990 and 1993 occurred on land administered by USFS (USFWS 1995a). The majority of known MSO have been found within Region 3 of the USFS, which includes 11 National Forests in New Mexico and Arizona. USFS Regions 2 and 4, including two National Forests in Colorado and three in Utah, support fewer MSO.

2.1c Critical Habitat

Critical habitat was designated for the MSO in 1995 (USFWS 1995b). However, it was revoked by court order in 1998 for failing to complete the National Environmental Policy Act process (USFWS 1998a). USFWS (USFWS 2000a) again proposed to designate 13.5 million acres (5.6 million ha), mostly on USFS land, as critical habitat for the species in 2000. The final rule published in the Federal Register on 1 February 2001 designated approximately 4.6 million acres (1.9 million ha) in Arizona, Colorado, New Mexico, and Utah on federal land outside of the USFS system (USFWS 2001a). The reason given for not designating critical habitat on USFS land was that current Forest Plans conform to management guidelines outlined in the recovery plan, which have undergone consultation with the USFWS, whereas other federal agencies have yet to formally adopt these guidelines. On 13 January 2003, a federal judge stated that the USFWS final rule designating critical habitat for the MSO violated the ESA. Subsequent court orders have mandated the USFWS to again propose critical habitat within nine months (13 October 2003) and publish a final designation within 15 months (13 June 2004). If any part of the area designated as critical habitat could be impacted by the proposed action, the DOE and USFWS will include that habitat in their formal Section 7 consultation.

While the proposed action does not pass through currently designated critical habitat, it does pass through areas previously proposed as critical habitat. If the newly proposed critical habitat is similar to that originally proposed in 2000, the ROW may cross areas that will eventually be designated as critical habitat. However, the areas the ROW passes through do not contain constituent elements required for MSO habitat (see SECTION 2.1e below), and no adverse modification to any such designated habitat is likely.

2.1d Current Status Statewide

In Arizona, MSO have been documented throughout much of the state except for the arid southwestern portion. The greatest concentration of owls occurs along the Mogollon Rim from the White Mountains region to the peaks near Flagstaff and Williams (Ward et al. 1995, Ganey 1998). The majority of owls are located on federal lands managed by the USFS (USFWS 1995a).

There are three Recovery Units (RU) identified in Arizona. From north to south they are the Colorado Plateau, Upper Gila Mountains, and Basin and Range-West. No current estimate of the number of MSO within its entire range is available, but between 1990 and 1993, 103 MSO sites were recorded during planned surveys and incidental observations in the Basin and Range-West RU in Arizona (USFWS 1995a).

2.1e Environmental Baseline

The proposed action occurs in the Basin and Range - West RU. Within this RU, MSO are mainly associated with steep, rocky canyons containing cliffs and stands of oak, Mexican pine, and broad-leaved riparian vegetation (Ganey and Balda 1989). Most MSO habitat in this RU occurs on the CNF.

The proposed action passes through the Tumacacori EMA of the CNF, which currently contains five PACs. The majority of the EMA crossed by the proposed action is madrean evergreen woodland; however, much of it lacks the features typically associated with MSO habitat. Range condition in areas crossed by the proposed action is moderately high with a stable or unknown trend. Native grasses dominate groundcover throughout the action area, but some non-native species, such as Lehmann's lovegrass (*Eragrostis lehmanniana*), tree of heaven (*Ailanthus altissima*), and salt cedar (*Tamarix* spp.) occur within the EMA (USFS 2002). Lehmann's lovegrass was seeded in many areas to prevent erosion (Cox et. al. 1984) but has extended in range far beyond the seeded areas (Cox and Ruyle 1986).

Livestock stocking rates for the allotments within the Tumacacori EMA range from 1,320 Animal Unit Months (AUM) in the Peña Blanca Allotment to 2,400 AUMs in the Bear Valley Allotment. Allotment Management Plans for Bear Valley and Sardinia Allotments are currently being revised.

The proposed action passes within 1 mi (1.6 km) of PAC #0502015 and #0502016, which are immediately adjacent to each other and south of Ruby Road. PAC #0502015 contains portions of USFS roads 4195 and 4196, as well as small segments of unclassified roads. Additionally, numerous roads and campgrounds, both designated and user-created, occur within 1.6 km (1 mi) of this PAC. Multiple unclassified roads created by the U.S. Border Patrol also occur throughout the area south of Ruby Road and east of the Pajarito Wilderness Area (URS 2003).

Figure 9. Area burned in Walker fire.

The Walker Fire, a human-caused fire, burned 16,369 acres (6,624 ha) along the United States-Mexico border between 12 June and 22 June 2002. The majority of PAC #0502016 and the western portion of PAC #0502015 were within the Walker Fire perimeter. Portions of the Walker fire were very hot, especially near the international border, and the upper slopes of ridges, while areas like Walker Canyon burned relatively cool (T. Newman, CNF, pers. comm., 26 November 2002). While vegetation has begun to recover in some areas, other areas are highly susceptible to erosion due to lost groundcover (Figure 9).

The following MSO survey information was provided by CNF. PAC #0502015 has been surveyed or informally monitored twice (1999 and 2001) over the past five years, with MSO pair occupancy inferred or confirmed in 1999. No response was detected in 2001. Since 1998, PAC #0502016 was only informally monitored in 2001, with no response by MSO. Additionally, CNF personnel received reports of MSO calling in Sycamore Canyon north of Ruby Road in 2001. Following similar reports, the presence of an MSO in Rock Corral Canyon could not be confirmed after informal monitoring by CNF personnel.

2.1f Effects of Proposed Action on the MSO

Direct Effects

Vehicle and Powerline Collisions

Because MSO are primarily nocturnal and likely will not be active during daylight when construction occurs, the probability of MSO collisions with construction related vehicles is extremely low. To minimize the risk of powerline collisions, TEP will construct the proposed transmission line following the guidelines outlined in “Suggested practices for raptor protection on powerlines: the state of the art in 1996” (APLIC 1996). While there is always some risk of a MSO collision with powerlines, raptors have lower rates of collision with powerlines than passerine birds (McNeil et al. 1985). This reduced collision rate may be due to visual acuity, maneuverability, and non-flocking tendencies (Nobel 1995). The risk of bird collisions with towers has been associated with birds being attracted to red lights used for aircraft avoidance (Kerlinger 2000). The towers used in the proposed action will not contain any lighting. No guy wires will be used in the construction of the proposed action, further reducing the potential for collisions.

Electrocution

Because power structures and towers are attractive perching and nesting sites for some raptor species, significant raptor mortality from electrocution has been reported in North America (Harness and Wilson 2000). Electrocution occurs when a bird simultaneously touches two phase conductors or a conductor and a ground wire (Bevanger 1994). Most electrocutions occur on distribution lines (34-kV or less) rather than on transmission lines (69-kV or more). This occurs because clearance between wires on distribution lines are less, and distribution lines have an array of uninsulated, structure-mounted equipment (Marti 2002). To minimize the risk of raptor electrocutions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested practices for raptor protection on powerlines: the state of the art in 1996" (APLIC 1996). Furthermore, on the structures to be used in the proposed action, the distance between the powerlines is at least 18 ft (5.5 m). Because the average wingspan of an adult MSO is 3.3 ft (1 m), there is no foreseeable risk of electrocution.

Construction Noise and Activity

Human activity within breeding and nesting territories may affect some raptors by altering home range movements (Anderson et al. 1990) and causing nest abandonment (Postovit and Postovit 1987). Disturbance from construction activities may discourage MSO from foraging or nesting in suitable habitat. The greatest noise disturbance will result from the use of helicopters during installation of transmission lines; however, Delaney et al. (1999) found that MSO were disturbed more by ground-based disturbance, such as chain saws, than by helicopter overflights. Ground-based disturbance could result from heavy machinery or large groups of construction personnel working near MSO habitat.

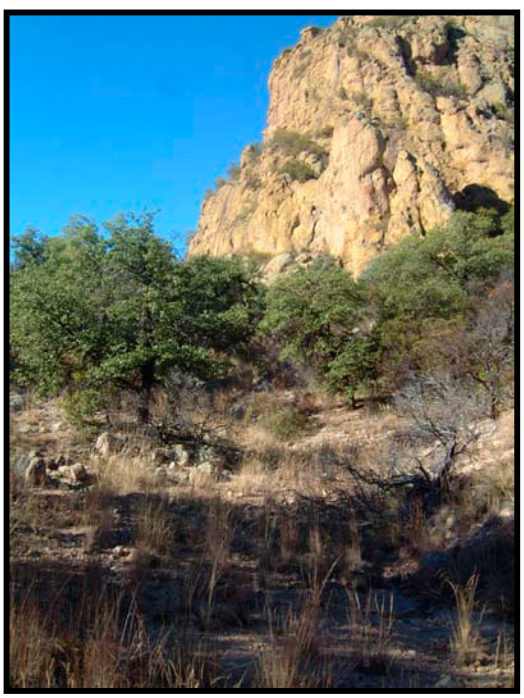


Figure 10. Location of proposed road within MSO PAC #0502015.

To prevent the disturbance of breeding MSO, no construction activities will occur within 1.6 km (1 mi) of PAC #0502015 (Figure 10) and #0502016 during the breeding season (1 March to 31 August), as outlined in the conservation measures (SECTION 1.4). Construction during non-breeding season will be short term in duration.

Furthermore, protocol surveys in the area of reported MSOs in Sycamore Canyon north of Ruby Road will prevent disturbance of MSOs outside of known PACs. If MSO are detected during the future surveys in this area, USFWS will be consulted for guidance regarding the implementation of construction restrictions.

<u>Indirect Effects</u>

Habitat Modification and Fragmentation

The proposed action requires the construction of 0.07 mi (0.113 km) of access roads within PAC #0502015. However, the location of this proposed road contains only manzanita (*Arctostaphylos* sp.) and small oak trees that are of insufficient size to function as MSO habitat (Figure 12). Therefore, no direct impacts to the functional composition or structure of occupied or potential MSO nesting habitat are anticipated.

Increased Legal and Unauthorized Access to MSO Habitat

Incidental encounters between MSO and non-motorized recreationists are relatively insignificant in most cases (USFWS 1995a). Most MSO appear to be relatively undisturbed by small groups (< 12 people) passing nearby (USFWS 1995a) as long as the disturbance is not for an extended period of time. The potential for hikers to disturb MSOs is greatest where hiking is concentrated in narrow canyon bottoms occupied by nesting or roosting MSOs. Noise from recreationists using off-highway vehicles (OHV) on closed access roads are much more likely to disturb MSOs, especially if their activity occurs over an extended period of time in occupied MSO habitat. Increased access to MSO habitat may subject the species to poaching or other harassment.

The road closure techniques outlined in the RA (URS 2003) should minimize unintended use of temporary construction roads but probably will not prevent it entirely. However, because only a small segment of a construction road will occur within a PAC, and forest service roads already exist within the PAC, no significant increase in unauthorized vehicular access by recreationists into occupied MSO habitat is anticipated.

Accidental Wildfire

Because of their mobility, MSO will not likely be directly impacted by wildfires. However, fire suppression efforts over the past century have created a situation that may encourage catastrophic, large-scale fires. Efforts to limit such fires are of great importance to MSO conservation. Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). The short-term effects of wildfires may affect MSO prey species through direct mortality from the fire or habitat destruction. Herbaceous plant species that serve as cover and forage for small mammals could be drastically reduced. However, because of reduced groundcover, predation upon surviving small mammals by MSO may actually increase in the short term. Furthermore, increased herbaceous production in the years following a fire may improve habitat for small mammals.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak efficacy in southern California came to similar conclusions (Green 1977).

If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of down woody material, which is capable of carrying wildfires across the landscape. Furthermore, the measures being developed for the Fire Prevention Plan will minimize the risk of wildfire associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in MSO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.1g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Because the action area for this species lies entirely on USFS land, all activities are managed according to the MSO recovery plan guidelines, and future actions will be subject to the consultation requirements established under Section 7, and are not considered cumulative to the proposed action.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the MSO action area, an increase in population in Nogales, and other regional population centers may translate into an increased demand for outdoor recreation, and therefore more recreational use of USFS land.

An undetermined level of border crossings by undocumented immigrants (UDI) occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.1h Effects Determination and Incidental Take

Construction noise and activities may affect non-breeding MSO but is not likely to adversely affect the species, because construction will occur during a non-critical life stage and will be short term in duration.

Because the proposed action is not likely to adversely affect the MSO, no take is anticipated.

2.2 CACTUS FERRUGINOUS PYGMY-OWL (*Glaucidium brasilianum cactorum*) (Endangered)

2.2a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. The action area for the CFPO includes those areas of habitat below 4,000 ft (1,219 m) in elevation that may be directly impacted by construction as well as potential nesting sites within 1,312 ft (400 m) of the proposed action (USFWS 2000b.) that may be subject to noise disturbance during construction. In addition, a 7.08 mi (11.4 km) buffer area surrounding the project area is included in the action area because juvenile CFPO have been documented traveling up to 7.08 mi (11.4 km) during dispersal (M. Wrigley, USFWS, pers. comm., May 2001).

2.1b Natural History and Distribution:

USFWS listed CFPO in Arizona on 10 March 1997 (USFWS 1997a) as endangered. Listing was based on historical and current evidence that suggested a significant population decline of this subspecies had occurred in Arizona. USFWS considered the loss and alteration of habitat as the primary threat to the remaining population. A recovery plan for the species is currently in development by the CFPO recovery team.

CFPO (Figure 11) are small brown birds with a cream-colored belly streaked with paler brown (Pyle 1997). The *cactorum* race; however, is described as "a well-marked, pale grayish extreme for the species" (Phillips et al. 1964). The call for this mostly diurnal owl is heard chiefly near dawn and dusk. The best field identification features are its small size, eyespots on the nape of the neck, and long reddish-barred tail, which is often nervously wagged or twitched (Monson 1998).

Figure 11. Cactus ferruginous pygmy-owl.

Originally CFPO were described as a separate subspecies based on specimens from Arizona and Sonora, Mexico. CFPO were first documented in the United States from a collection by Lieutenant Charles E. Bendire on 24 January 1872 in the "heavy mesquite thickets along creek" near the present day site of historic Camp Lowell, Tucson (Coues 1872, Bendire 1892).

Very little is known about the life history of CFPO in Arizona (Cartron et al. 2000a). Little or no literature currently exists concerning life history variables such as longevity, age distribution, and recruitment. Current studies undertaken by AGFD, USFWS, and The University of Arizona are examining these variables.

The diet of CFPO is not well understood, but they are believed to be prey generalists (Cartron et al. 2000a). Observations, stomach content analysis, and records of Texas pygmy-owls suggest that these owls have a diverse diet that includes mammals, birds, reptiles, and insects (Proudfoot and Beasom 1997).

CFPO nest in cavities of larger trees (typically defined as a tree with a trunk at least 6 in [15 cm] diameter at breast height [DBH]) or large columnar cactus. Cavities may be naturally formed (e.g. knotholes) or excavated by woodpeckers. CFPO do not construct their own nest holes. All currently known CFPO nest sites in Arizona are in woodpecker excavated cavities in saguaros. Historically, the species also has been documented nesting in cottonwood, paloverde, and mesquite trees in Arizona.

Nesting activity for this owl species in Arizona begins in late winter to early spring (Lesh and Corman 1995, Abbate et al. 1996). Little is known about its courtship flight behavior. Egg laying begins by late April with three to four eggs typically laid. It is uncertain if only one brood is hatched per year. Nestlings have been observed through the end of July. During nesting, the male brings food to the female and young (Glinski 1998).

Historically, CFPO occurred from the lowlands of central Arizona, south through western Mexico to the states of Colima and Michoacan, and from southern Texas south through the Mexican states of Tamaulipas and Nuevo Leon. In Arizona, the species was documented as far north as New River and Cave Creek in northern Maricopa County (Harris and Duncan 1999). Elsewhere in Maricopa County, the species has been found near the Yuma County line along the Gila River at Agua Caliente, along the Salt River at Phoenix, and near the Verde River confluence. The eastern most verifiable record was along the Gila River at Old Fort Goodwin, located approximately 2 mi (1.2 km) southwest of present day Geronimo, Graham County, Arizona (Aiken 1937). In the southeastern part of the state, the species has been documented in recent times near Dudleyville along the lower San Pedro River between 1985 and 1987 (Harris and Duncan 1999), and probably also along lower Aravaipa Creek in 1987 (Monson 1987). Other localities in south central Arizona include historical records in Pinal County near Sacaton and Blackwater on the Gila River Indian Reservation, and at Casa Grande (Harris and Duncan 1999). Near the Mexican border, the species has been found in Santa Cruz County near Patagonia and in Sycamore Canyon west of Nogales. A likely accidental sighting was documented once on 10 April 1955 in eastern Yuma County near the Mexican border at Cabeza Prieta Tanks on the Cabeza Prieta National Wildlife Refuge (Monson and Phillips 1981, Harris and Duncan 1998).

Surveys conducted by University of Arizona biologists in Sonora, Mexico found 280 CFPO during the 2000 survey season. CFPO within Sonora, Mexico and Arizona may have been the same population prior to agricultural expansion within the last 75 years. However, due to isolation, the genetic connection of the Arizona population to owls in the nearby state of Sonora, Mexico may be tenuous (USFWS 2002a).

CFPO have been documented in several habitat types in the northern portion of its range in Arizona and adjacent Mexico. In Arizona, these include streamside Sonoran riparian deciduous forest and woodland associations and Sonoran desertscrub. CFPO also inhabit

Sinaloan deciduous forest and thornscrub in Mexico (not discussed here). The streamside associations include such species as cottonwood, ash, netleaf hackberry, willows, velvet mesquite, and others. The Sonoran desertscrub associations are composed of relatively dense saguaro cactus stands associated with short trees such as paloverde, mesquite, and ironwood (*Olneya tesota*), and an open understory of triangle-leaf bursage, creosote, and various other cacti and shrubs. Throughout its range, CFPO occur at low elevations, generally below 4,000 ft (1,219 m).

CFPO found in Sonoran desertscrub habitats are typically associated with structurally diverse stands of desert riparian scrub with saguaros along washes (Wilcox et al. 2000). Such habitat is often referred to as xeroriparian vegetation (Johnson and Haight 1985). These washes have no permanent water flow. Instead, flow is intermittent and based on seasonal rainfall as well as strength and duration of individual storms. Desert riparian scrub vegetation is easily recognizable by the presence of a linear assemblage of trees and shrubs that grow along the wash. Density is higher and taller than the sparse desertscrub vegetation that typically exists in the adjacent uplands. Before listing the species as endangered, all known CFPO were documented in such Sonoran desertscrub habitat (Lesh and Corman 1995, Abbate et al. 1996).

At the northern periphery of the subspecies range in southern Arizona, CFPO distribution and preferred habitat is not well understood. It is believed CFPO require the cover of denser wooded areas with understory thickets, like riparian habitat, for nesting, foraging, and predator avoidance (Abbate et al. 2000). Riparian habitat also is known for its high density and diversity of animal species that constitute the prey base of CFPO.

A significant decline in the Arizona population has occurred over the past several decades (USFWS 1997a, Richardson et al. 2000). Loss or modification of habitat from woodcutting, agriculture, groundwater pumping, and related human activities has presumably contributed to the population decline (USFWS 1997a).

2.1c Critical Habitat

On 12 July 1999, USFWS designated approximately 731,712 ac (296,113 ha) of critical habitat supporting riverine, riparian, and upland vegetation in seven critical habitat units, located in Pima, Cochise, Pinal, and Maricopa counties of Arizona (USFWS 1999). However, on 21 September 2001, the U.S. District Court for the State of Arizona vacated this final rule designating critical habitat for CFPO, and remanded its designation back to the USFWS for further consideration. On 27 November 2002, USFWS proposed designating 1.2 million ac (485,000 ha) of critical habitat for CFPO in southern Arizona (Federal Register Vol. 67, No 229:71031-71064). The proposed action does not enter any areas proposed as critical habitat.

2.1d Current Status Statewide

USFWS determined that CFPO in Arizona were endangered because of the following factors (USFWS 1997a):

- present or threatened destruction, modification, or curtailment of its habitat or range;
- inadequacy of existing regulatory mechanisms;
- other natural and manmade factors, which include low genetic viability.

Surveys conducted statewide during the 2002 season confirmed a total of 18 adult CFPO and three nests in Arizona. Similar to the previous four years, there was greater than 50 percent fledgling mortality documented in 2002, with only one juvenile confirmed surviving dispersal (S. Richardson, USFWS, pers. comm., 3 December 2002).

One of most urgent threats to CFPO in Arizona is thought to be the loss and fragmentation of habitat (USFWS 1997a, Abbate et al. 1999). The complete removal of vegetation and natural features required for many large-scale and high-density developments directly and indirectly impacts CFPO survival and recovery (Abbate et al. 1999). In recent decades, CFPO riparian habitat has continually been modified and destroyed by agricultural development, woodcutting, urban expansion, and general watershed degradation (Phillips et al. 1964, Brown et al. 1977, State of Arizona 1990, Bahre 1991, Stromberg et al. 1992, Stromberg 1993a and 1993b). Sonoran desertscrub has been affected to varying degrees by urban and agricultural development, woodcutting, and livestock grazing (Bahre 1991). Pumping of groundwater and the diversion and channelization of natural watercourses are also likely to have reduced CFPO habitat.

Proudfoot and Slack (2001) found that CFPO in northwestern Tucson may be isolated from other populations in Arizona and Mexico. Low genetic variability can lead to a reduction in reproductive success and environmental adaptability. In 1998 and 1999, two cases of sibling CFPO pairing and breeding were documented (Abbate et al. 1999). In both cases, young were fledged from the nesting attempts. These unusual pairings may have resulted from extremely low numbers of available mates within dispersal range, and/or from barriers (including fragmentation of habitat) that have influenced dispersal and limited the movement of young owls (Abbate et al. 1999).

Soule (1986) notes that very small populations are in extreme jeopardy due to their susceptibility to a variety of factors, including variations in birth and death rates that can result in extinction. In small populations such as with CFPO, each individual is important for its contribution to the genetic variability of that population.

2.1e Environmental Baseline

CFPO habitat north of Sahuarita Road consists of Sonoran desertscrub with relatively high species diversity and structural diversity, including scattered saguaro cacti containing potential nesting cavities. This area is within Survey Zone 1 (USFWS 2000) and has the highest potential for occupancy of the entire action area. Land status in this area is a mixture of private and state land. The Mission Mine Complex also is located within this section of the proposed action and grazing occurs on much of the state lands in the area.

CFPO habitat south of Sahuarita Road consists primarily of semi-desert grassland dominated by mesquite and acacia trees, mixed-cacti, ocotillo, yucca, and grasses, including non-native Lehmann's lovegrass (*Eragrostis lehmanniana*). The area is primarily undeveloped, but does contain some existing electrical distribution lines and associated roads (Figure 12) as well as low density housing developments. These grasslands are transected by desert riparian scrub dominated by mesquite and netleaf hackberry trees. Some areas of deciduous riparian forests are also found south of Arivaca Road in Sopori Wash and Peck Canyon. Land jurisdictions in this area include private, state, BLM, and USFS.

Figure 12. Example of existing disturbance within corridor.

CFPO surveys were conducted by Harris Environmental Group, Inc. (HEG) biologists in 2001 and 2002 (data previously submitted to USFWS) in accordance with the approved protocol (USFWS 2000b). Surveys were conducted in Sonoran desertscrub habitat where saguaros were present and in desert riparian scrub and deciduous riparian habitat that contained large trees (over 15.2 cm [6 in] DBH). No surveys have been conducted in deciduous riparian habitat within Sopori Wash. Surveys were conducted at 142 call points in 2001 and 140 call points in 2002. No CFPOs were detected during either survey year.

The only historical records of CFPO within the Nogales Ranger District (RD) of the CNF are in Sycamore Canyon (CNF 2000) and a dispersing juvenile in the Jarillas Alloment. USFS surveys in Sycamore Canyon in 1997 and 1998 did not locate CFPO. Additionally, USFS personnel surveyed 2,300 ac (930 ha) in 1999 with negative results and conducted 58 habitat assessments for CFPO habitat (CNF 2000). The habitat assessments identified four areas that ranked high enough to warrant CFPO surveys. No CFPO have been detected during surveys of these four areas (T. Newman, CNF, pers. comm., 9 October 2002).

2.1f Effects of Proposed Action on the CFPO

Direct Effects

Vehicle and Powerline Collisions

CFPO collisions with windows and fences have been documented in the Tucson area (USFWS 2002a), and observations of low flying CFPO across roadways indicate vehicle collisions are a realistic hazard (Abbate et al. 1999). While CFPO may be active during daylight, no CFPO have been detected within the action area, therefore, CFPO collisions with construction related vehicles are unlikely.

There is a small risk of a CFPO collision with power lines, however, raptors have lower rates of collision with power lines than passerine birds (McNeil et al. 1985). This reduced collision rate may be due to visual acuity, maneuverability, and non-flocking tendencies (Nobel 1995). To minimize the risk of powerline collisions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996" (APLIC 1996).

Electrocution
Because power structures and towers are attractive perching and nesting sites for some raptor species, significant raptor mortality from electrocution has been reported in North America (Harness and Wilson 2000). Electrocution occurs when a bird simultaneously touches two phase conductors or a conductor and a ground wire (Bevanger 1994). Most electrocutions occur on distribution lines (34-kV or less) rather than on transmission lines (69-kV or more), primarily because clearances between wires on distribution lines are less and distribution lines have an array of uninsulated, structure-mounted equipment (Marti 2002). To minimize the risk of raptor electrocutions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996" (APLIC 1996). Furthermore, on the structures to be used in the proposed action, the distance between the power lines is at least 18 ft (5.5 m). Because the average wingspan of an adult CFPO is 15 in (38 cm), there is no foreseeable risk of electrocution.

Construction Noise and Activity
Although no CFPO have been detected in the project area, short term noise disturbance and human activity associated with construction may discourage CFPO from using habitat within and adjacent to the proposed ROW. Human activity near nest sites at critical periods of the nesting cycle may cause CFPO to abandon their nests (USFWS 2002a). While CFPO may tolerate low level noise disturbances, such as those in low density residential areas (Cartron et al. 2000b), they will probably not tolerate noise levels associated with construction activities in close proximity to a nest. The greatest likelihood of noise disturbance will result from the use of helicopters during the installation of the transmission lines, but also could result from the presence of heavy machinery or large groups of construction personnel. If CFPO are not detected during the two consecutive years of protocol surveys, the potential for direct impacts to this species is minimal.

<u>Indirect Effects</u>
Habitat Modification and Fragmentation
The proposed action will result in the disturbance of areas that could provide potential nesting, foraging, and dispersal habitat for CFPO. Because many access roads will be closed and restored and all disturbed areas will be reseeded, this disturbance will be temporary. The proposed action could potentially result in temporary disturbance to habitat from access roads and structure installations in the following amounts: 34 acres (13.76 ha) in Sonoran desertscrub, 41.27 acres (16.70 ha) in desert riparian scrub, and 0.05 acres (0.02 ha) in deciduous riparian.

While all large saguaros within construction sites will be transplanted, construction could temporarily degrade CFPO habitat by removing vegetation that provides forage and shelter. Elimination of groundcover plant species, rodent burrows, and native soils, as well as loss of trees and shrubs, may impact local reptile and bird populations that are important to the pygmy-owl diet. Loss of complex vegetation structure increases energy demands on owls that must forage at greater distances and risk exposure to a variety of hazards (Abbate et al. 1999). Because of the linear nature of the proposed action, these impacts will be widely distributed and relatively minor in any single area.

Increased Legal and Unauthorized Access to CFPO Habitat
Although CFPO have not been detected in the project area, recreationists may access potential CFPO habitat using temporary construction roads associated with the proposed action. While hikers and other non-motorized recreationists will create minimal disturbance, noise from Off Highway Vehicle (OHV) users are much more likely to disturb CFPO, especially if the activity occurs over an extended period of time in or near a CFPO nesting territory. Increased access to CFPO habitat may subject the species to poaching or other harassment. While TEP will prevent unauthorized access to the ROW across private land, closure of the ROW on public land, particularly state land, is not feasible. Therefore, some increase in access to potential CFPO habitat is anticipated.

Accidental Wildfire
Increased road access may contribute to an increase in the frequency of human caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, CFPO will not likely be directly impacted by wildfires. However, wildfires may destroy columnar cacti and trees that provide nesting cavities as well as affect CFPO prey species through direct mortality from the fire or habitat destruction. Herbaceous plant species that serve as cover and forage for small mammals could be drastically reduced. Because of reduced groundcover, predation upon surviving small mammals by CFPO may actually increase in the short term. Furthermore, increased herbaceous production in the years following a fire may improve habitat for small mammals in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977).

The measures outlined in the Fire Prevention Plan will minimize the risk of wildfire associated with the proposed action.

Invasive Species
Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and

Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.1g Cumulative Effects
Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species crosses private, state, and federal lands, the habitat with the highest potential for occupancy by CFPO occurs on state and private lands in Pima County. Future federal actions on these lands will be subject to Section 7 consultation. These actions will not be considered cumulative.

Although the amount of future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). Because of the growth rate and the development pressures from nearby Tucson and Sahuarita, it is foreseeable that land adjacent to the proposed ROW will be developed. These developments will likely include increases in associated infrastructure such as roads, groundwater use, and commercial services, all resulting in the degradation of CFPO habitat.

An undetermined level of border crossings by undocumented immigrants occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase. Additionally, agriculture, recreation, OHV use, grazing, and other activities continue to occur on private and state land and adversely affect CFPO and their habitats.

2.1h Effects Determination and Incidental Take
While CFPO are not currently known to occupy the action area, the disturbance of potential habitat from construction activities and increased access may affect, and are likely to adversely affect, this species.

Take of CFPO is not anticipated because construction activities during breeding season will only occur following protocol surveys and the Conservation Measures outlined in SECTION 1.4 will minimize disturbance to potential habitat and prevent disturbance to nesting CFPO within the action area should any be detected in the future.

2.2 SOUTHWESTERN WILLOW FLYCATCHER (*Empidonax traillii extimus*) (Endangered)

2.2a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential migratory habitat for the SWFL includes those areas of Sopori Wash with riparian habitat similar to that described by Sogge et al. (1997). The action area for this species consists of the Sopori Wash both within the proposed ROW as well as the surrounding Sopori Wash watershed.

2.2b Natural History and Distribution

SWFL (Figure 13) are small passerine bird (Order Passeriformes; Family Tyrannidae) measuring approximately 5.75 in (14.6 cm) in length from the tip of the bill to the tip of the tail and weighing 0.4 ounces (11.34 grams). This species has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark and the lower is light yellow grading to black at the tip. SWFL are riparian obligate species, nesting along rivers, streams, and other wetlands where dense growths of willow, seepwillow (*Baccharis* sp.), buttonbush (*Cephalanthus* sp.), boxelder (*Acer negundo*), saltcedar (*Tamarix chinensis*), carrizo (*Phragmites australis*) or other plants are present, often with a scattered overstory of cottonwood and/or willow.

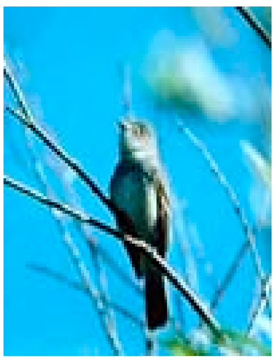


Figure 13. Southwestern willow flycatcher.

One of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993), SWFL are neotropical migratory species that breed in the southwestern U.S. from approximately 15 May to 1 September. This species migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical range of SWFL included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987).

SWFL breed in dense riparian habitats from sea level in California to just over 7,000 ft (2,134 m) in Arizona and southwestern Colorado. Historic egg/nest collections and species descriptions throughout SWFL range describe the widespread use of willow for nesting (Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987, San Diego Natural History Museum 1995). Currently, SWFL primarily use Geyer willow (*Salix geyeriana*), Goodding willow (*Salix gooddingii*), boxelder, saltcedar, Russian olive (*Elaeagnus angustifolio*), and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush, black twinberry (*Lonicera involucrata*), cottonwood, white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), carrizo, and stinging nettle (*Urtica* spp.). Nesting SWFL exhibit a strong preference for dense vegetation at the nest site, but high variation and density of vegetation at the patch scale (Hatten et al. 2000). Nesting sites are typically close to the edge of the vegetation patch and close to water (Allison et al. 2000). Based on the diversity of plant species composition and complexity of habitat structure, four basic nesting habitat types can be described for SWFL: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge et al.1997).

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of SWFL territories and nests; SWFL sometimes nest in areas where nesting substrates are in standing water (Maynard 1995, Sferra et al. 1995, 1997). Hydrological conditions at a particular site can vary remarkably in the arid southwest within a season and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June). However, the total absence of water or visibly saturated soil has been documented at several sites where the river channel has been modified (e.g. creation of pilot channels), where modification of subsurface flows has occurred (e.g. agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer et al. 1996). Throughout their range, SWFL arrive on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge et al. 1993, Sogge and Tibbitts 1994, Muiznieks et al. 1994, Maynard 1995, Sferra et al. 1995, 1997). Nesting begins in late May and early June, and young fledge from late June typically through mid August, but as late as early September.

SWFL are insectivores, foraging in dense shrub and tree vegetation along rivers, streams, and other wetlands. Flying insects are the most important SWFL prey item; however, they will also glean larvae of non-flying insects from vegetation (Drost et al. 1998). Drost et al. (1998) found that the major prey items of SWFL (in Arizona and Colorado), consisted of true flies (Diptera); ants, bees, and wasps (Hymenoptera), and true bugs (Hemiptera). Other insect prey taxa include leafhoppers (Homoptera: Cicadellidae), dragonflies and damselflies (Odonata); and caterpillars (Lepidoptera larvae). Non-insect prey include spiders (Araneae), sowbugs (Isopoda), and fragments of plant material.

2.2c Critical Habitat

Critical habitat for SWFL was originally designated on 22 July 1997 (USFWS 1997b), but on 11 May 2001, the 10th Circuit Court of Appeals set aside the critical habitat designation and instructed USFWS to issue a new designation in compliance with the court ruling. USFWS is currently soliciting information regarding areas important for the conservation of this species in order to re-propose critical habitat.

2.2d Current Status Statewide

The following status of SWFL in Arizona was summarized from Smith et al. (2002). In 2001, 177 sites covering approximately 139 mi (225 km) of riparian habitat were surveyed for SWFL in Arizona. Sites range from 98 ft (30 m) to 8,802 ft (2,683 m) in elevation and 98.5 ft (30 m) to 10 mi (16.1 km) in length. The mean site length was 1 mi (1.6 km). Fifty-two of the 177 sites were not surveyed according to protocol. This was due to time or funding limitations or because unsuitable SWFL habitat was found during the first survey. Of the 177 sites, 20 had not been previously surveyed. Most new survey sites were located along the Colorado River (n = 9) and Gila River (n = 4). Six hundred thirty-five resident SWFL were documented within 346 territories at 46 sites. AGFD personnel and statewide cooperators recorded 311 pairs.

SWFL were documented along 11 drainages. The greatest concentrations of SWFL were found at Roosevelt Lake (40 percent) and the Winkelman Study Area (35 percent). Resident SWFL were detected at five sites that had been surveyed at least once in previous years. Resident SWFL were documented in two drainages (Virgin River and Cienega Creek) for the first time since protocol surveys began. No historical occurrence record exists for SWFL along the Virgin River and SWFL have not been reported at Cienega Creek since 1964. These colonizations yield evidence of habitat restoration potential in these drainages that can aid in recovery of the SWFL.

2.2e Environmental Baseline

The section of Sopori Wash crossed by the proposed action supports a mixed riparian assemblage with mature but discontinuous Fremont cottonwood and netleaf hackberry along the banks and a midstory of large mesquite (HEG Field Notes, C. Hisler, AGFD, pers. comm., 18 July 2002) (Figure 14). Understory density is relatively low. Uplands surrounding Sopori Wash are characterized by semidesert grassland and are subject to grazing.

Figure 14. Riparian habitat in Sopori Wash

This reach of Sopori Wash is ephemeral, and water is probably present only for short periods of time following precipitation events. Because of the patchy habitat and lack of surface water, this area will likely be used only by migratory SWFL. The nearest recent (1999) reports of SWFL are from the Santa Cruz River between Tubac and Rio Rico, approximately 6 mi (10 km) to 12 mi (20 km) away (McCarthey et al. 1998, Paradzick et al. 1999, Paradzick et al. 2000). All of these reports were of migrant SWFL.

2.2f Effects of Proposed Action on the SWFL

Direct Effects

Because the proposed action does not impact suitable breeding habitat, no direct impacts to SWFL are anticipated.

Indirect Effects

Habitat Modification and Fragmentation

Some indirect impacts to SWFL may result from modifications to potential migratory habitat associated with the installation of structures within the Sopori Wash floodplain. Roads in this area will be limited to a width of 12 ft (4 m), resulting in the disturbance of 0.14 acres (0.06 ha) of deciduous riparian habitat. Because disturbed cottonwood and willow specimens will be mitigated at a 2:1 ratio, and riparian vegetation can recover quickly following minimal disturbance, any adverse effects to SWFL habitat will be temporary.

Increased Legal and Unauthorized Access to SWFL Habitat

Because this section of Sopori Wash is on a private ranch, unauthorized recreational access to this section of Sopori Wash via the temporary construction roads associated with the proposed action should not occur. Therefore, no disturbance of SWFL or habitat modification from increased access is anticipated.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). However, because new roads in this area will not be open to the public, increased risk of wildfire because of increased access will be negligible. The measures outlined in the Fire Prevention Plan will minimize the risk of wildfire associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.3g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Most land within the action area consists primarily of ASLD land with blocks of private parcels on either side of Arivaca Road. Federal actions will, on these lands, be subject to Section 7 consultation; these actions will not be considered cumulative.

Although the amount of future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Pima County grew by 26.5 percent and Santa Cruz County by 29.3 percent (U.S. Census Bureau 2000). Because of these growth rates and the trend of rural development to occur in areas with some existing infrastructure, it is foreseeable that the private ranches adjacent to Arivaca Road could be sold and subdivided for residential homes and ranchettes. Any substantial population increase in the area also could increase demands for access to recreational lands, increase groundwater pumping, and foster development of commercial services. These impacts to the watershed could degrade the value of habitat within Sopori Wash, thereby preventing its use by SWFL.

An undetermined level of border crossings by UDI occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.3h Effects Determination and Incidental Take

The disturbance of potential migratory habitat may affect the SWFL, but it is not likely to adversely affect the species, because the disturbance is temporary and relatively small in area.

Because the proposed action is not likely to adversely affect the species, no take of SWFL is anticipated.

2.4 LESSER LONG-NOSED BAT (*Leptonycteris curasoae yerbabuenae*) (Endangered)

2.4a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential roosting habitat occurs in the Tumacacori and Atascosa/Pajarito mountains, and foraging habitat occurs through those portions of the proposed ROW that contain agave and saguaro cacti. Because LLNB have been documented foraging up to 40 mi (64 km) from roost sites, the action area for the LLNB consists of all potential foraging and roosting habitat within a 40 mi (64 km) buffer surrounding the proposed action.

2.4b Natural History and Distribution

The LLNB (formerly Sanborn's long-nosed bat) is one of three members of American leaf-nosed bats (Family Phyllostomidae) in Arizona (Hoffmeister 1986). The LLNB (Figure 15) is one of the larger Arizona bats, and gray to reddish-brown in color. This bat has an erect triangular flap of skin (nose leaf) at the end of a long slender nose. The LLNB can be distinguished from *Macrotus* by its much longer nose, greatly reduced tail membrane, and smaller ears; and from *Choeronycteris,* which has a shorter tail, larger tail membrane, and longer, narrower nose.

Figure 15. Lesser long-nosed bat.

LLNB occur from the southern United States to northern South America, including several islands and the adjacent mainland of Venezuela and Colombia. LLNB occurs between 4 degrees to 32 degrees N latitude, typically in semiarid to arid regions (Nowak 1994). This bat is typically associated with their primary food source, flower nectar and fruit of columnar cacti and certain agave species. Because of the seasonal nature of the food source, LLNB migrate to follow flowering and fruiting plants. In addition to food availability, there must be suitable roosting within commuting distance of the food source. Currently, the longest known commute distance is about 30 mi (48 km).

The primary range of this bat lies in Mexico and Central America. Occurrences in Arizona probably represent range expansion. Prior to the 1930s, there are no records of LLNB in Arizona (Cockrum 1991). Colossal Cave and the Old Mammon Mine are the most northern sites known to house colonies of these bats. However, these sites support colonies of about 5,000 individuals, versus sites in Mexico, which are as large as 150,000 individuals.

LLNB have a bi-seasonal occurrence in Arizona. The maternity season, when bats migrate to southwestern Arizona, represents a United States population of about 30,000 individuals. The fall agave flowering season, located in southeastern Arizona, which attracts about 70,000 bats. Each of these areas contains three known primary roosts and some number of secondary/transient or night roosts (sheltering tens to a few hundred individuals/site).

With the exception of a small bachelor roost located in the Chiricahua Mountains, all remaining records represent very small numbers (usually single individuals) at hummingbird feeders, caught in mist nets, or chance findings in residential areas. Constantine (1966) reported two immature females from Maricopa County, one in Phoenix on 30 August 1963 and the other in Glendale on 16 September 1963. The Glendale specimen was found dead. The other was hanging on a screen door (not a normal place) indicating something was likely wrong with that bat. He also reported two males from southern California: one was taken alive on 3 October 1993 outside a home in Yucaipa, the other was taken on 18 October 1996 from the outside of a building in Oceanside (Constantine 1998). LLNB also have been reported from the Aravaipa Canyon area (Cockrum 1991). Hoffmeister (1986) has a record in the Santa Catalina Mountains, but Cockrum (1991) states it was probably a transcription error because the nectar-feeding bats found there belong to the genus *Choeronycteris*. However, Cockrum (1991) does report LLNB from the Santa Catalina Mountains but only once in a mist net set in Sabino Canyon (a female in June).

The diet of LLNB in Arizona consists primarily of the nectar, pollen, and ripe fruit of columnar cacti (particularly saguaro) and agave (e.g., *Agave chrysantha*, *A. deserti*, *A. palmeri*, and *A. parryi*). The LLNB has been demonstrated to be a significant pollinator of saguaros, organpipe cacti (*Stenocereus thurberi*), and agaves (Howell and Roth 1981, Alcorn et al. 1962, and McGregor et al. 1962). Generally, LLNB in Arizona forage after dusk to nearly dawn during the months of May through September. In a single night, LLNB will forage well away from daytime roost sites. In Sonora, Mexico, bats feed on the mainland by night at Bahia Kino and roost by day on Isla Tiburon, 15 mi (24 km) to 20 mi (32 km) away. The closest sizable densities of columnar cacti to LLNB roosts in the Sierra Pinacate, Sonora, Mexico, are found in Organpipe Cactus National Monument in Arizona, about 25 mi (40 km) to 30 mi (48 km) away (Fleming 1991).

In Arizona, females arrive in late March and early April, then migrate northward through Mexico along a “nectar corridor” provided by columnar cacti such as saguaro and organpipe (Fleming 1991). Female LLNB usually arrive in Arizona pregnant and congregate in traditional maternity roosts at lower elevations, feeding primarily on saguaro nectar (Cockrum 1991). Later in the summer the adult males arrive and along with dispersing members of the maternity roosts, roost at higher elevations, especially within proximity to significant stands of flowering agave.

LLNB are gregarious and form large maternity colonies that number in the thousands (Hayward and Cockrum 1971, Hoffmeister 1986). All four of the verified maternity roosts of LLNB in the United States are found in Arizona (Cockrum 1991). The largest and most important of the four is found in a mine located in Organpipe Cactus National

Monument. About 15,000 LLNB use this mine as a maternity roost. Young are typically born between mid-May and early June (Cockrum 1991, Hayward and Cockrum 1971).

While in the roost during the day, LLNB engage in various activities such as flying, suckling of young, grooming, resting, and interacting with neighbors. LLNB are particularly active during the day and any disturbance, such as aircraft fly-overs or other human activities, may cause an expenditure of extra energy (Dalton and Dalton 1993, Dalton et al. 1994). Female LLNB gathered in large maternity colonies are particularly vulnerable to disturbances. Maternity colonies are more sensitive because of the vulnerability of nonvolant young, whose recruitment into the population is essential to maintain a viable population.

2.4c Critical Habitat
No critical habitat has been designated for this species.

2.4d Current Status Statewide
USFWS listed this species as endangered throughout its range in the southwestern United States and Mexico on 30 September 1988 (USFWS 1988). Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current endangered status of the species. All available information on the species through 1994 was summarized in the Lesser Long-nosed Bat Recovery Plan approved in 1997 (Fleming 1994). The Plan indicates that the species is not in danger of extinction in Arizona or Mexico. The species still warrants some protection, as it is vulnerable to human disturbance at roost sites. There also is particular concern for the protection of forage plants from disturbance or destruction, particularly near roost sites.

Primary threats to LLNB populations are agave harvesting and human disturbance of roosting and maternity colonies. Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial for the LLNB (Fleming 1995). The USFWS determined that the LLNB was endangered because of the following factors (USFWS 1988):

- A long-term decline in population
- Reports of absence from previously occupied sites
- Decline in the pollination of certain agaves

In Arizona and Mexico, there are 16 large known roosts (Fleming 1995). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known from Arizona and Mexico. Disturbance of these roosts or removal of the food plants associated with them could lead to the loss of the roosts. Limited numbers of maternity roosts may be the critical factor in the survival of this species.

2.4e Environmental Baseline

No LLNB roosts are known from the proposed corridor, but field surveys did locate small caves and crevices nearby that could serve as LLNB day roosts (HEG 2002, unpublished data). Furthermore, unsurveyed caves, mineshafts, and adits, which may provide suitable roost sites, occur within the Tumacacori-Atascosa mountains. The two closest known LLNB roost sites are the Cave of the Bells in the Santa Rita Mountains, approximately 20 mi (32 km) to the west, and a cave in the Patagonia Mountains, approximately 35 mi (56 km) to the west. Both of these roost sites are within the known flight distance to the proposed action and LLNB may utilize the proposed corridor for foraging.

Saguaro cacti occur within proposed corridor north of Duval Mine Road, and agaves are present in varying densities south of Arivaca Road. While the exact densities of agaves and saguaro cacti were not determined for this BA, CNF estimates that Palmer's agave is widely scattered over 1 million acres (400,000 ha) at densities of 10 to 200 per acre, generally between the elevations of 3,000 ft (914 m) and 6,000 ft (1,829 m) (USFWS 2002b). Parry's agave is found between 5,000 ft (1,524 m) and 8,200 ft (2,500 m) and begins blooming in mid-spring.

The northern portion of the proposed action is primarily undeveloped but contains some existing electrical distribution lines as well as low-density housing developments near Sahuarita Road. The Mission Mine Complex also is located within this section of the project area. The proposed action passes through the Tumacacori EMA of the CNF. Range condition in areas crossed by the proposed action is moderately high with a stable or unknown trend. While agaves have persisted in areas grazed for more that 100 years, mortality through direct herbivory and trampling is known to occur. There is a forest-wide study to determine the effects of livestock grazing on agaves currently underway (USFWS 2001b). Livestock stocking rates for the allotments within the Tumacacori EMA range from 1,320 AUMs in the Peña Blanca Allotment to 2,400 AUMs in the Bear Valley Allotment. Allotment Management Plans for Bear Valley and Sardinia Allotments are currently being revised.

2.4f Effects of Proposed Action on the LLNB

<u>Direct Effects</u>

Construction Noise and Activity

Although no LLNB roosts have been detected within the proposed corridor, short-term noise disturbance and human activity associated with construction activities may disturb LLNB if they are present in undetected roosts adjacent to the proposed corridor. The greatest likelihood of noise disturbance will result from the use of helicopters during the installation of the transmission lines, but could also result from the presence of heavy machinery or large groups of construction personnel in close proximity to an undetected roost. The consequences of disturbance to small numbers of LLNB in day roost will be less serious than disturbance of large aggregations of bats at one location.

Indirect Effects

Habitat Modification

Indirect effects to LLNB may result from the potential reduction in forage resources (agave and saguaro) during construction of temporary access roads or the installation of transmission structures. Because agave and saguaro are unevenly distributed and the nectar they provide is seasonally and geographically separated, the loss of significant numbers of either species may alter LLNB foraging patterns and roost selection within the action area. Even if the loss of a high-density patch of flowering agaves does not cause the abandonment of a roost, bat survivorship may be reduced through increased foraging flight distances and related energy expenditures, and increased exposure to predators. Because of the linear nature of the proposed action, however, these impacts will be widely distributed and relatively minor in any single area.

Although all agave and saguaro cacti disturbed as a result of the proposed action will be transplanted immediately outside of the construction zone, the long-term survival and future flowering of these specimens is uncertain. Agaves are typically easy to cultivate in warm climates with well-drained soils (Gentry 1982), but no long-term studies of agave transplant survival have been conducted. Transplantation of saguaro cacti is a common practice within Pima County, but preliminary results from a 10-year study of saguaro indicate that smaller saguaros (< 16 ft [5 m] tall) are more successfully transplanted than larger saguaros (HEG, unpublished data). It may take several years for saguaro cacti to die from a mortal injury, and so it is necessary to monitor transplants for many years in order to evaluate success.

Even in areas where no agaves or saguaro cacti presently exist, dormant seeds may be present in the soil. Construction activities associated with the proposed action may compact soil and alter water infiltration, which may prohibit seeds germination.

Increased Legal and Unauthorized Access to LLNB Habitat

Because LLNB are sensitive to human disturbance (to the point of temporarily abandoning a day roost after a single human intrusion) increased human access to roost sites could negatively impact LLNB. New roads on state land will not likely result in disturbance to undetected roosts because few areas in this area the support rock outcroppings, caves, and mine shafts necessary for LLNB roosts. The greatest potential for undetected roosts occurs on CNF land. The road closures on CNF land outlined in SECTION 1.4 and in the RA (URS 2003) will minimize the probability of increased human access and disturbance of LLNB in undetected roosts in these areas.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Agave in desert grasslands have evolved with fire, but unnaturally high fire frequency and intensity can lead to decline or elimination of agave populations. Furthermore, agave mortality from fire may affect the abundance and distribution of blooming agaves for a number of years, especially if there is high mortality within certain age and size classes.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action.

Invasive Species
Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.4g Cumulative Effects
Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. The action area for this species crosses private, state, and federal lands. Future federal actions on USFS land will be subject to Section 7 consultation but these actions will not be considered cumulative. Because the action area for this species includes a 40 mi (64 km) buffer, some of the future planned actions on private and state lands in southern Pima County and much of Santa Cruz County may be considered cumulative.

Although the amount of this future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). In the same time period, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000).

An undetermined level of border crossings by UDI occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase into the foreseeable future. Additionally, agricultural, recreation, OHV use, grazing, and other activities continue to occur on private and state land and adversely affect LLNB and their habitats.

2.4h Effects Determination and Incidental Take

The potential disturbance of LLNB in undetected roosts from construction noise and potential mortality of transplanted forage species may affect, and is likely to adversely affect, this species.

No take of LLNB is anticipated as a result of the proposed action. First, noise disturbance will likely impact small numbers of individuals and will be short term in duration. Secondly, changes in agave and saguaro cacti distribution will be not be significant in any single location.

2.5 CHIRICAHUA LEOPARD FROG (*Rana chiricahuensis*) (Threatened)

2.5a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. The action area for the CLF consists of all cienegas, pools, livestock tanks, and streams at elevations above 3,200 ft (975 m) in the Tumacacori and Atascosa/Pajarito mountains. The action area also includes the entire watersheds of these aquatic systems and lies almost entirely on CNF land. That portion of the action area not on CNF land is a considerable distance downstream of the proposed action.

2.5b Natural History and Distribution

CLF (Figure 16) are distinguished from other members of the leopard frog (*Rana pipiens*) complex by a combination of characters, including a distinctive pattern on the rear of the thigh consisting of small, raised, cream-colored spots or tubercles on a dark background, dorsolateral folds that were interrupted and deflected medially, stocky body proportions, relatively rough skin on the back and sides, and often green coloration on the head and back (Platz and Mecham 1979). The species also has a distinctive call consisting of a relatively long snore of one to two seconds in duration (Davidson 1996, Platz and Mecham 1979).

Figure 16. Chiricahua leopard frog.

CLF are riparian habitat generalists, occupying springs, cienegas, canals, small creeks, mainstem rivers, lakes and livestock tanks at elevations of 3,281 ft (1,000 m) to 8,890 ft (2,710 m) in central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northern Sonora, and the Sierra Madre Occidental of Chihuahua, northern Durango and northern Sinaloa (Platz and Mecham 1984, Degenhardt et al. 1996, Sredl et al. 1997). Adult CLF are the most aquatic of all Arizona leopard frogs, requiring aquatic habitats for larval forms and semi-aquatic habitats for adult forms. CLF may breed anytime, but breeding in late spring and early summer is most common. Eggs are oviposited in shallow water attached to vegetation, or on bottom substrate. Tadpoles can metamorphose in as few as three months, but may overwinter and metamorphose the following spring. Because time from hatching to metamorphosis is shorter in warm water than cold water, water permanency is probably more important at higher elevations.

Heterogeneous habitat is important for leopard frog populations; shallow water with emergent vegetation is important for breeding and deeper water provides escape cover for adults. In Arizona, slightly more than half of known historic localities are natural lotic systems, a little less than half are stock tanks, and the remainder are lakes and reservoirs (Sredl et al. 1997). Sixty-three percent of extant populations in Arizona occupy stock tanks (Sredl and Saylor 1998). Although stock tanks provide refugia for frog populations and are important for this species in many areas, such tanks support only small populations and these habitats are very dynamic. Tanks often dry out during drought, and flooding may destroy downstream impoundments or cause siltation, either of which may result in loss of aquatic communities and extirpation of frog populations. Periodic maintenance to remove silt from tanks also may cause a temporary loss of habitat and mortality of frogs.

CLF are rarely found in aquatic sites inhabited by non-native fish, bullfrogs (*Rana catesbiana*), and/or crayfish (*Oronectes virilis*). However, in complex systems or large aquatic sites, CLF may coexist with low densities of non-native predators (Bloomquist et al. 2002).

Where the species is extant, sometimes several small populations are found in close proximity, suggesting metapopulations are important for preventing regional extirpation (Sredl et al. 1997). Disruption of metapopulation dynamics is likely an important factor in regional loss of populations (Sredl et al. 1997, Sredl and Howland 1994). CLF populations are often small and their habitats are dynamic, resulting in a relatively low probability of long-term population persistence. However, if populations are relatively close together and numerous, extirpated sites can be recolonized.

The range of the species is divided into two parts, including: (1) a southern group of populations (the majority of the range) located in mountains and valleys south of the Gila River in southeastern Arizona, extreme southwestern New Mexico, and Mexico; and (2) northern montane populations in west central New Mexico and along the Mogollon Rim in central and eastern Arizona (Platz and Mecham 1979). Historical records exist for Pima, Santa Cruz, Cochise, Graham, Apache, Greenlee, Gila, Coconino, Navajo, and Yavapai counties in Arizona, and Catron, Grant, Hidalgo, Luna, Soccoro, and Sierra counties in New Mexico (Sredl et al. 1997, Degenhardt et al. 1996). The distribution of the CLF in Mexico is unclear. The species has been reported from northern Sonora, Chihuahua, and Durango (Hillis et al. 1983, Platz and Mecham 1979, 1984) and, more recently, from Aguascalientes. However, Webb and Baker (1984) concluded that frogs from southern Chihuahua were not CLF. The taxonomic status of *chiricahuensis*-like frogs in Mexico from southern Chihuahua to Aguascalientes is unclear and in this region another leopard frog, *Rana montezumae,* may be mistaken for the CLF.

Recent evidence suggests a chytridiomycete skin fungi is responsible for observed declines of frogs, toads, and salamanders in portions of Central America (Panama and Costa Rica), South America (Atlantic coast of Brazil, Ecuador, and Uruguay), Australia (eastern and western states), New Zealand (South Island), Europe (Spain and Germany), Africa (South Africa, “western Africa”, and Kenya), Mexico (Sonora), and the United States (8 states) (Speare and Berger 2000, Longcore et al. 1999, Berger et al. 1998). Ninety-four species of amphibians have been diagnosed as infected with the chytrid *Batrachochytrium dendrobatidis*. In Arizona, chytrid infections have been reported from four populations of CLF, as well as populations of Rio Grande leopard frog (*Rana berlandieri*), Plains leopard frog (*Rana blairi*), lowland leopard frog (*Rana yavapaiensis*), Tarahumara frog (*Rana tarahumarae*), canyon treefrog (*Hyla arenicolor*), and Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) (Davidson et al. 2000, Sredl and Caldwell 2000, Morell 1999). The disease was recently reported from a metapopulation of CLF from New Mexico; that metapopulation may have been extirpated.

The role of the fungi in the population dynamics of the CLF is undefined; however, it may well prove to be an important contributing factor in observed population decline. Rapid death of recently metamorphosed frogs in stock tank populations of CLF in New Mexico was attributed to post-metamorphic death syndrome (Declining Amphibian Populations Task Force 1993). Hale and May (1983) and Hale and Jarchow (1988) believed toxic airborne emissions from copper smelters killed Tarahumara frogs and CLF in Arizona and Sonora. However, in both cases, symptoms of moribund frogs matched those of chytridiomycosis. Chytrids were recently found in a specimen of Tarahumara frog collected during a die off in 1974 in Arizona. This earliest record for chytridiomycosis corresponds to the first observed mass die-offs of ranid frogs in Arizona (USFWS 2002c).

2.5c Critical Habitat
No critical habitat has been designated for this species.

2.5d Current Status Statewide
USFWS listed this species as threatened throughout its range in the southwestern United States and in Mexico on 13 June 2002 (USFWS 2002c). Potential threats to the species include disease, predation and possibly competition by non-native organisms, including fishes in the family Centrarchidae (*Micropterus* spp., *Lepomis* spp.), bullfrogs, tiger salamanders (*Ambystoma tigrinum stebbinsi*), crayfish, and several other species of fishes, including, in particular, catfishes (*Ictalurus* spp. and *Pylodictus oliveris*) and trout (*Oncorhynchus* spp. (=*Salmo*) and *Salvelinus* spp.) (USFWS 2002c). For instance, in the Chiricahua region of southeastern Arizona, Rosen et al. (1996a) found that almost all perennial waters investigated that lacked introduced predatory vertebrates supported CLF. All waters, except three that supported introduced vertebrate predators, lacked CLF.

Human factors affecting the species include modification or destruction of habitat through water dams, water diversions, groundwater pumping, introduction of non-native organisms, woodcutting, mining, contaminants, urban and agricultural development, road construction, overgrazing and altered fire regimes. Additional human factors include over-collection for commercial and scientific purposes.

In Arizona, the species is extant in seven of eight major drainages of historical occurrence (Salt, Verde, Gila, San Pedro, Santa Cruz, Yaqui/Bavispe, and Magdalena river drainages), but appears to be extirpated from the Little Colorado River drainage on the northern edge of the range. Within the extant drainages, the species was not found recently in some major tributaries and/or from river mainstems. For instance, the species was not reported from 1995 to the present from the following drainages or river mainstems where it historically occurred: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek.

USFWS reports that CLF were observed at 87 sites in Arizona from 1994 to 2001, including 21 northern sites and 66 southern sites (USFWS 2002c). Many of these sites have not been revisited in recent years; however, evidence suggests some populations have been extirpated in the Galiuro and Chiricahua mountains. In 2000, the species was also documented for the first time in the Baboquivari Mountains, Pima County, Arizona (USFWS 2002c).

Intensive and extensive surveys were conducted by AGFD in Arizona from 1990 to 1997 (Sredl et al. 1997). Included were 656 surveys for ranid frogs within the range of the CLF in southeastern Arizona. Rosen et al. (1994, 1996a, 1996b), Hale (1992), Wood (1991), Clarkson and Rorabaugh (1989), and others have also extensively surveyed wetlands in southeastern Arizona. It is unlikely that many additional populations will be found there. A greater potential exists for locating frogs at additional sites in the northern region of Arizona, as several new populations have been discovered on the Coconino National Forest in 2000 and 2001 (USFWS 2002c).

The latest information for Arizona (USFWS 2002c) indicates the species is extant in all major drainages in Arizona and New Mexico where it occurred historically. However, it has not been found recently in many rivers, valleys, and mountains ranges, including the following in Arizona: White River, East Clear Creek, West Clear Creek, Silver Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, Sonoita Creek, Pinaleno Mountains, Peloncillo Mountains, Sulphur Springs Valley, and Huachuca Mountains. In many of these regions CLF were not found for a decade or more despite repeated surveys.

2.5e Environmental Baseline

The action area for this species lies within the Tumacacori EMA of the CNF. Within this EMA, CLF are present in Sycamore Canyon, Peña Blanca Spring, Hank & Yank Tank, and Bear Valley Tank (J. Rorabaugh, USFWS, pers. comm., 1 October 2002). Of these, Peña Blanca Spring and portions of Sycamore Canyon are downstream or near construction areas of the proposed action. Watershed condition is a function of percent groundcover present to dissipate rain and prevent excess erosion. Along the proposed ROW, watershed condition is satisfactory on the Sycamore Canyon watershed and the watershed immediately to the east, but unsatisfactory on the Peck Canyon watershed and the watershed on the northern boundary of the Tumacacori EMA. Peña Blanca Spring is not within a grazing allotment but is adjacent to Ruby Road. The spring is downstream of the Walker fire, a 16,369 acre (6,624 ha) human-caused fire along the international border. Portions of the Walker fire were very hot (especially near the international border and the upper slopes of ridges) while other areas (like Walker Canyon) burned relatively cool (T. Newman, CNF, pers. comm., 26 November 2002). While vegetation has begun to recover in some areas, other areas are highly susceptible to erosion due to lost groundcover (Figure 11).

The population in Sycamore Canyon is probably a source of immigrants to other suitable areas within the EMA (USFWS 2001b). Sycamore Canyon also is the only aquatic habitat within the EMA confirmed to contain the chytrid fungus (J. Rorabaugh, USFWS, pers. comm., 1 October 2002). While there are 17 historical records of CLF in the Atascosa and Pajarito mountains (USFWS 2001b), there are currently no plans for reintroducing CLF into any aquatic habitats in CNF (J. Rorabaugh, USFWS, pers. comm., 1 October 2002).

2.5f Effects of Proposed Action on the CLF

Direct Effects

Vehicle Collisions

No construction activities will occur within stock tanks, or other aquatic habitats; however, CLF may be present on land some distance away from these areas and construction traffic could result in vehicle collisions with individual CLF.

Indirect Effects

Habitat Modification

Some indirect impacts to CLF may result from modifications to its habitat caused by the construction of temporary access roads. The removal of vegetative cover for these roads will increase surface runoff and sediment transport and decrease infiltration of precipitation (Gifford and Hawkins 1978, Busby and Gifford 1981, Blackburn 1984, DeBano and Schmidt 1989, Belnap 1992, Belsky and Blumenthal 1997). The use of both existing and new roads by heavy equipment makes them less permeable because of compaction and crusting (Rostagno 1989). Compaction leads to reduced infiltration and an increase in the force of overland flow, which in turn leads to increased erosion. Increased erosion can accelerate sedimentation of deep pools used by CLF (Gunderson 1968). Sediment can alter primary productivity and fill interstitial spaces in streambed materials with fine particulates that impede water flow, reduce oxygen levels, and restrict waste removal (Chapman 1988). Because alignment of the structures is approximately 1 mi (1.6 km) from Sycamore Canyon, impacts from road erosion are expected to be insignificant in that area, and BMPs will minimize erosion into other aquatic systems closer to the proposed alignment. However, unusually large precipitation events may temporarily overwhelm BMPs and result in some increase in sediment transport.

Transport of Disease Agents

The construction of temporary roads will provide construction vehicles and personnel access to remote areas and potential CLF habitats not currently accessible by vehicles. Because these same construction vehicles and personnel will be used along the entire proposed ROW, there may be an increased possibility for the introduction of the chytrid fungus into aquatic habitats that do not presently contain the fungus. Chytrid fungus could be carried inadvertently in mud clinging to wheels, boots, or other equipment. The use of a diluted-bleach wash station when equipment and personnel move between wet zones will significantly reduce the potential for unintentional introduction of the disease to new aquatic habitats.

Increased Legal and Unauthorized Access to CLF Habitat
Recreationists may access CLF habitat, using roads constructed for the proposed action, even after the roads have been closed and revegetated. Unmanaged OHVs can damage riparian vegetation, increase siltation in pools, compact soils, disturb the water in stream channels, and crush CLF. Increased human access to these aquatic habitats also may lead to the introduction of non-native predators to streams and stock tanks or illegal killing or collection of CLF. Long-term monitoring and maintenance of road closures will minimize the probability of unauthorized access and thereby minimize any adverse effects associated with such access.

Accidental Wildfire
Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Roads constructed for the proposed action may allow the establishment or increased density of non-native grasses, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Wildfires could remove groundcover that is important in dissipating rainfall energy and reducing erosion.

However, new roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action.

Invasive Species
Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.5g Cumulative Effects
Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. The action area for

this species crosses private, state, and federal lands. Future federal actions on USFS lands will be subject to Section 7 consultation but these actions will not be considered cumulative. Because the action area for this species includes the entire watersheds of the aquatic habitats on the CNF, some of the future planned actions on private and state lands in Santa Cruz County may be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew 29.3 percent (U.S. Census Bureau 2000). Despite being downstream of occupied and potential CLF habitat, an increase in regional population translates into an increased demand for recreational use of USFS lands.

An undetermined level of border crossings by UDI occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.5h Effects Determination and Incidental Take

Potential vehicle impacts to dispersing CLF and increased transport of sediments into aquatic habitats may affect, and will likely adversely affect, this species.

No take of CLF is anticipated for the following reasons: (1) no construction activities will occur within occupied streams, stock tanks, or other CLF habitat; (2) implementation of BMPs will minimize erosion.

2.6 PIMA PINEAPPLE CACTUS (*Coryphantha scheeri* var. *robustispina*) (Endangered)

2.6a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential habitat for the PPC includes those areas of the proposed ROW from the TEP South Substation to an elevation of 4,600 ft (1,402 m) in the foothills of the Tumacacori Mountains.

2.6b Natural History and Distribution

The PPC (Figure 17) is small and round with finger-like projections. Adult cactus range in size from 1.8 in (4.6 cm) to 18 in (46 cm) in height. At the tip of each projection or tubercle is a rosette of 10–15 straw-colored spines with one central hooked spine. Plants can be single or multi-stemmed and produce bright yellow flowers after summer rains (Roller 1996).

Figure 17. Pima pineapple cactus.

Populations of PPC are known to occur south of Tucson, in Pima and Santa Cruz counties, Arizona and adjacent northern Sonora, Mexico. It is distributed at low densities within the Altar and Santa Cruz Valleys, as well as in low-lying areas connecting these valleys.

PPC populations are generally found in open patches within semidesert grassland and Sonoran desertscrub plant communities (Brown 1994). They are typically found on flat alluvial bajadas that are comprised of granitic material and are most abundant within the ecotone between the grassland and desertscrub biomes (Roller 1996). This plant is found at elevations between 2,362 ft (720 m) and 4,593 ft (1,400 m). PPC are not typically found in washes or riparian areas.

2.6c Critical Habitat

No critical habitat has been designated for this species.

2.6d Current Status Statewide

USFWS listed PPC as endangered throughout its range on 25 October 1993 (58 FR 49875). Habitat loss and degradation, habitat modification and fragmentation, limited geographic distribution, plant species rareness, illegal collection and difficulties in protecting areas large enough to maintain functioning populations are factors that contributed to the current endangered status of this species. PPC densities vary throughout its range with the highest densities occurring south of Tucson through the Santa Cruz Valley (to the town of Amado and surrounding developed parts of Green Valley and Sahuarita, and parts of the San Xavier District of the Tohono O'odham

Nation). Continued urbanization, farm and crop development, mine expansion, and invasion of non-native species are primary threats to PPC populations. Overgrazing by livestock, illegal plant collection, and fire-related interactions involving non-native Lehmann's lovegrass may also have negative impacts on PPC (USFWS 1993b).

2.6e Environmental Baseline

The environmental baseline for PPC evaluates the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area. Due to the limited information on PPC population distributions under current habitat conditions, it is difficult to determine the current status of the plant statewide. USFWS has insufficient data to determine if the majority of populations of PPC can be sustained under current reduced and fragmented conditions.

Based on monitoring results, the range-wide status of PPC appears to have been recently affected by threats that completely alter or considerably modify more than a third of the surveyed habitat and have caused the elimination of nearly 60 percent of documented locations (USFWS 2001c). Dispersed, patchy clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to detrimentally impact PPC habitat.

The proposed project area is primarily undeveloped, contains existing electrical distribution lines and associated roads (Figure 14) and is in close proximity to low-density housing developments and the Mission Mine Complex.

Surveys for PPC were conducted using an approved survey protocol (Roller 1996) that established a belt transect across identified potential habitat with each surveyor covering a 16 ft (5 m) to 23 ft (7-m) swath. One survey pass of the entire corridor was conducted, with intensive searches at identified PPC individuals. Surveys on state, private, and BLM land covered a 200 ft (61 m) wide area centered on the proposed structure alignment. On the CNF, the coverage was expanded to 750 ft (229 m) wide. All detected PPC locations were recorded using a Global Positioning System (GPS) unit. To determine the extent of proposed disturbance to PPC habitat, recent aerial photography was used to eliminate areas not suitable for PPC, including slopes over 15 percent, high clay or bedrock soils, washes, and previously disturbed areas such as roads, buildings, mining disturbance, etc. During surveys conducted between July 2002 and March 2003, 70 PPC were detected within the 125 ft (38.1 m) ROW between the TEP South Substation and the CNF boundary (HEG 2003, unpublished data). Based the acreage surveyed, the density of PPC within this area is approximately 0.14 PPC/ acre (0.34 PPC/ha).

2.6f Effects of Proposed Action on the PPC

<u>Direct Effects</u>

Because the precise locations of structures and access roads can be modified to avoid sensitive resources, the proposed action will not result in the loss of any individual PPC. All known individuals of PPC near construction areas and along main access routes will be clearly marked and protected to avoid impacts.

Indirect Effects

Modification of Habitat

The construction of new access roads and the installation of structures will alter PPC seed sources in unoccupied, but potential, PPC habitat. Construction vehicles will compact soil, changing water infiltration rates, and road construction will dramatically alter soil structure and seed source depth. Disturbance of structure installation sites and many access roads will be temporary and will regenerate as potential PPC habitat in the future. Some recent observations indicate that PPC may readily establish in recently disturbed habitats (USFWS 2002d), but these areas must be allowed to recover for many years, even decades.

Detailed analysis of impacts to habitat for this species is ongoing. To mitigate for the potential loss of PPC habitat, TEP will purchase credits in a USFWS-approved conservation bank for PPC at a ratio determined in consultation with USFWS.

Increased Legal and Unauthorized Access to PPC Habitat

Much of the proposed corridor through PPC habitat parallels existing electrical distribution lines with existing utility access roads; however, new access roads will be constructed, potentially resulting in unintended access into previously undisturbed PPC habitat, especially by OHV users. Off-road travel could directly impact additional PPC or impede seedling establishment through changes in soil characteristics.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). It is widely regarded that most succulent species are negatively impacted by fire and are not fire-adapted (Rogers and Steele 1980, McLaughlin and Bowers 1982). Plants die by direct heating of the fire, or later through indirect fire effects such as grazing of spineless plants, post-fire increase in plant tissue temperature, or the introduction of disease or infestation into weakened plants (Thomas 1991). The sparse distribution of this species across the landscape, however, can mean that loss of a few individuals to fire can greatly affect the range and density of local PPC populations.

However, new roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977).

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.6g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Under Section 9 of the ESA, the taking of listed animals is specifically prohibited, regardless of land ownership status. For listed plants, these prohibitions and the protection they afford do not apply. Listed plant species are protected only from deliberate removal from federal lands. There is no protection against removal from, or destruction of, plants on private land under the ESA by a landowner.

Although the amount of future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). Because of growth rates and the development pressures of nearby Tucson and Sahuarita, Arizona, it is foreseeable that some lands adjacent to the proposed ROW will be developed. These developments will likely include increases in associated infrastructure such as roads, groundwater use, and commercial services, all resulting in the degradation of PPC habitat.

An undetermined level of border crossings by UDI occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase. Additionally, agricultural, recreation, OHV use, grazing, and other activities continue to occur on private and state lands and adversely affect PPC and its habitat.

2.6h Effects Determination

The disturbance of potential PPC habitat may affect, and is likely to adversely affect the species through hindering seedling establishment. The adverse affects to the species will be mitigated through the purchase of mitigation bank credits.

2.7 **SONORA CHUB** (*Gila ditaenia*) (Threatened)

2.7a Action Area

The action area means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. In streams, the action area is often much larger than the area of the proposed action because impacts in the watershed may be concentrated in the stream and actions within the stream may be carried downstream well outside of the immediate project area. The action area for the Sonora chub is the entire Sycamore Canyon watershed.

2.7b Natural History and Distribution

The Sonora chub (Figure 18) is a stream-dwelling member of the minnow family (Cyprinidae) and can achieve total lengths of 7.8 in (200 mm) (Hendrickson and Juarez-Romero 1990). In the United States, it typically does not exceed 5 in (125 mm) (Minckley 1973), although specimens up to 6 in (150 mm) have been measured. The Sonora chub has 63 to 75 scales in the lateral line, and the scales bear radii in all fields. The mouth is inferior and almost horizontal. There typically are eight rays in the dorsal, anal, and pelvic fins, although the dorsal fin can have nine (Miller 1945), and the anal and pelvic fins seven (Rinne 1976). The body is moderately chubby and dark-colored, with two prominent black bands above the lateral line and a dark, oval basicaudal spot. Breeding individuals are brilliantly colored (Miller 1945).

Figure 18. Sonora chub.

Sonora chub spawn at multiple times from spring through summer, most likely in response to flooding during the spring and summer rains (Henderickson and Juarez-Romero 1990). Although Sonora chub is regularly confined to pools during arid periods, it prefers riverine habitats. In lotic waters in Mexico, Henderickson and Juarez-Romero (1990) commonly found Sonora chub in pools less than 2 ft (0.61 m) deep, adjacent to or near areas with a fairly swift current, and over sand and gravel substrates. It was less common in reaches that were predominately pools with low velocities and organic sediments. Sonora chub are adept in exploiting small marginal habitats and can survive under severe environmental conditions. They can maneuver upstream past small waterfalls and other obstructions to colonize newly-formed habitats (Carpenter and Maughan 1993).

Based on collection dates of young-of-the-year (YOY), spawning occurs in early spring (Minckley 1973). Larval and juvenile Sonora chub were found in Sycamore Creek and in a tributary to Rio Altar in November, which indicated breeding was apparently not limited by season. Adults with breeding coloration were also taken during these periods (Hendrickson and Juarez-Romero 1990). In Sycamore Creek, adults with breeding colors were seen from April through September in 1990 and 1991. Larvae and juveniles 0.6 in (15mm) to 0.7 in (18 mm) were seen in April, May, and September (Carpenter 1992), suggesting that spawning occurred after the spring and summer rains. Bell (1984) also noted young after heavy flooding and suggested that post-flood spawning is a survival mechanis. During spawning, Sonora chub broadcast eggs onto fine gravel substrates in slowly flowing water for hatching and development. There are no nests built, and no parental care given. Larvae use shallow habitats at pool margins where they feed on microscopic organisms and algae. As adults they can exploit shallow to deep pools, runs, and riffles as available. In 2000, multiple spawning in California Gulch was documented (USFS 2000).

Sonora chub respond to wet and dry cycles by expanding into riffles, runs, and pools during wet periods, and then shrinking back to deep pools as the stream dries. A substantial number of Sonora chub die when they become trapped in habitats that do not sustain perennial water during arid periods (Carpenter and Maughan 1993). Recolonization is dependent on individuals that survived the dry period. The species has an amazing capacity for reproduction and recruitment as its habitat expands. It can explode from a small number of individuals occupying a few pools to a population numbering in the thousands and occupying newly-wetted habitats in just a few weeks or months. The capability of the population to increase by several orders of magnitude within a few months is most likely an adaptation to the harsh climate and intermittent nature of southwestern riparian systems, which has allowed the Sonora chub to survive until present (Bell 1984).

2.7c Critical Habitat

Critical habitat was designated at the time of federal listing to include Sycamore Creek, extending downstream from and including Hank and Yank Spring, to the United Staes-Mexico border (Figure 3, Ruby Quadrangle). Also designated was the lower 1.2 mi (2 km) of Peñasco Creek, and the lower 0.25 mi (0.4 km) of an unnamed stream entering Sycamore Creek from the west, about 1.5 mi (2.4 km) downstream from Hank and Yank Spring. In addition to the aquatic environment, critical habitat includes a 39.3 ft (12 m) wide riparian area along each side of Sycamore and Peñasco creeks. This riparian zone is essential to maintain the creek ecosystem and stream channels and the conservation of the species (USFWS 1986). The proposed action does not pass through designated Sonora chub critical habitat but is located approximately 1 mi (1.6 km) upstream of critical habitat.

2.7d Current Status Statewide

The Sonora chub was listed in the United States as threatened on 30 April 1986 (51 FR 16042) with critical habitat. The species is also listed by Arizona as a "species of special concern" (AGFD 1996), as a threatened species by the Republic of Mexico (Secretaria de Desarrollo Social 1994), and included on the Regional Forester's list of sensitive species (USFS 1999).

Sonora chub is locally abundant in Sycamore Canyon and has been found as far north in the canyon as Casita Spring (T. Newman, CNF, pers. comm. 13 May 2002), although the habitat is limited in extent (Minckley and Deacon 1968). In Mexico, it is found in the Magdalena and Altar rivers, where it is considered relatively secure (Henderickson and Juarez-Romero 1990). In 1995, Sonora chub were found in California Gulch (AGFD

1995a). The overall estimated current chub habitat is 10 mi (16.1 km) length of Sycamore Creek and California Gulch, including a 39 ft (12 m) wide riparian area along each side of Sycamore and Peñasco creeks. A recovery plan was written in October 1992 (USFWS 1992).

Potential threats to Sonora chub are related to additional watershed developments, such as grazing, mining, road construction, and agricultural development, as well as predation by non-native vertebrates such as green sunfish (Minckley 1973) and bullfrogs (AGFD 1988). The green sunfish was the last non-native fish recorded in Sycamore Creek prior to 1989 (USFWS 1999b)

2.7e Environmental Baseline

The action area for this species lies within the Tumacacori EMA of the CNF. There is no authorized livestock grazing immediately adjacent to Sycamore Creek from the United Satates - Mexico border to the corrals north of Ruby Road. A livestock exclosure encompassing approximately 2,175 acres (880 ha) was completed around this area in 1998. Furthermore, roadways in Sycamore Canyon south of Ruby Road are closed to all vehicles, and Casita Spring, north of the corrals, is also fenced to exclude livestock. Both exclosures are periodically checked and maintained by CNF personnel. Violations of the road closure were recorded in 1999 and 2000 (CNF 2000).

The Sycamore Creek Watershed consists of 16,645 acres (6,737 ha) within the Tumacacori EMA and is in satisfactory condition. The Sycamore Canyon watershed lies within the Bear Valley allotment. This allotment is permitted for 350 cattle, but use of the area in 2002 was projected to be only 200 cattle. The range condition on the Bear Valley allotment is moderately high, but with an unknown trend.

CNF personnel have conducted 6 years of pool surveys in Sycamore Canyon to document trends that may indicate whether habitat for the Sonora chub is increasing, decreasing, or remaining static. These surveys record pool area index (surface area of pools per run) and presence/absence of Sonora chub within runs. In 2002 the pool index showed a 50 percent decrease from the previous five year average. The pool area index in 2001 was more than double the previous five year average.

Between 1997-2001, Sonora chub occupied most of the available pools. In 2002, the number of occupied pools was the lowest recorded during the six year period. This reduced occupancy may be because of smaller, shallower pools being available in 2002, and, thus, Sonora chub may have been killed by predation or some other factor, such as low oxygen levels, prior to the survey (T. Newman, CNF, pers. comm., 9 August 2002). Newman believes there are sufficient numbers of Sonora chub surviving in available pools to fill the available habitat once rains occur. Once pools are connected, Sonora chub move into the newly available habitat. The effect of movement can be most easily seen in the information on the Ruby Road upstream segment. Even though this is a short stream segment and only has a few pools, it has been occupied four of the six years covered by these surveys. Despite having no occupied pools for two years (1999 and 2000), when conditions improved in 2001, the majority of the pools were occupied.

2.7f Effects of Proposed Action on the Sonora Chub and Critical Habitat

Direct Effects

No direct effects to the Sonora chub are anticipated as a result of the proposed action because construction activities will not occur within occupied or potential Sonora chub habitat.

Indirect Effects

Modification of habitat

Indirect impacts to Sonora chub may result from modifications to habitat from the construction of access roads and installation of structures. The removal of vegetation for roads and structures will increase surface runoff and sediment transport, and decrease infiltration of precipitation (Gifford and Hawkins 1978, Busby and Gifford 1981, Blackburn 1984, DeBano and Schmidt 1989, Belnap 1992, Belsky and Blumenthal 1997). The use of roads by heavy equipment makes them less permeable because of compaction and crusting (Rostagno 1989). Compaction leads to reduced infiltration and an increase in the force of overland flow, which in turn leads to increased erosion.

Increased erosion could accelerate sedimentation of deep pools. As pools become shallower, water temperature rises. Warmer water temperatures may increase the impact of parasites or diseases within the chub population (USFWS 2001b). Sediment can alter primary productivity and fill interstitial spaces in streambed materials with fine particulates that impede water flow, reduce oxygen levels, and restrict waste removal (Chapman 1988). High-energy overland water flow increases erosion and downcutting of streams, and can create damaging debris flows. While BMPs will minimize impacts, some increase in erosion into Casita Spring may occur during unusually large precipitation events because of the spring's proximity to construction areas.

Increased Legal and Unauthorized Access to Sonora Chub Habitat

No new roads are proposed within the Sycamore Canyon exclosure; however, new roads are proposed near potential Sonora chub habitat upstream of Ruby Road, including a road proposed 656 ft (200 m) north of Casita Spring. Future unauthorized access to closed roads in this area could damage riparian vegetation, compact soils, and increase siltation in pools and stream channels. Increased human access to these aquatic habitats also may lead to the introduction of non-native predators to streams and stock tanks or illegal killing or collection of Sonora chub. The monitoring and maintenance of road closures will minimize the probability of unauthorized access and thereby minimize any adverse effects associated with such access.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Roads constructed for the proposed action also may allow the establishment or increased density of non-native grasses, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995).

Wildfires could remove groundcover that is important in dissipating rainfall energy and reducing erosion.

However, new roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action.

Invasive Species
Roads may be the first point of entry for invasive species into a new landscape, and may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.7g Cumulative Effects
Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Because the action area for this species is entirely on USFS land, all activities are subject to the consultation requirements established under Section 7 of the ESA, and, therefore, are not considered cumulative to the proposed action.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite being outside of occupied and potential chub habitat, an increase in regional population translates into an increased demand for recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.7h Effects Determination and Incidental Take
<u>Effects to Species</u>
The transport of sediments into Casita Spring and upper Sycamore Canyon may affect the Sonora Chub, and is likely to adversely affect the species.

No take of Sonora chub is anticipated for the following reasons: (1) no construction activities will occur within occupied streams, and (2) BMP erosion control measures will minimize sediment transport.

Effects to Critical Habitat

No adverse modification or destruction of Sonora chub critical habitat is anticipated because BMPs will be in place to minimize erosion and because alignment of the structures is approximately 1 mi (1.6 km) from Sycamore Creek and Hank and Yank Spring.

2.8 JAGUAR (*Panthera onca*) (Endangered)

2.8a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Because of the large movements possible by the jaguar and historical records for the species in a variety of habitats, the action area for the jaguar considered for the proposed action includes most of western Santa Cruz and southern Pima counties.

2.8b Natural History and Distribution

Jaguars (Figure 19) are the largest species of cat now native to the Western Hemisphere. Jaguars are large muscular cats with relatively short massive limbs, a deep-chested body, and cinnamon-buff in color with many black spots. Its range in North America includes Mexico and portions of the southwestern United States (Hall 1981). A number of jaguar records are known for Arizona, New Mexico, and Texas. Additional reports exist for California and Louisiana. Records of the jaguar in Arizona and New Mexico have been attributed to the subspecies *Panthera onca arizonensis*. The type specimen of this subspecies was collected in Navajo County, Arizona, in 1924 (Goldman 1932). Nelson and Goldman (1933) described the distribution of this subspecies as the mountainous parts of eastern Arizona north to the Grand Canyon, the southern half of western New Mexico, northeastern Sonora, and, formerly, southeastern California. The records for Texas have been attributed to another subspecies *P. o. veraecrucis*. Distribution of this subspecies was described by Nelson and Goldman (1933) as the Gulf slope of eastern and southeastern Mexico from the coast region of Tabasco, north through Vera Cruz and Tamaulipas, to central Texas. Swank and Teer (1989) indicated the historical range of the jaguar included portions of Arizona, New Mexico, and Texas. These authors consider the current range to be central Mexico through Central America and into South America as far as northern Argentina.

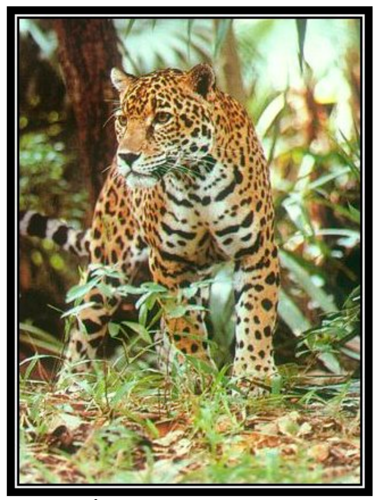


Figure 19. Jaguar.

Swank and Teer (1989) stated the United States no longer contains established breeding populations of jaguar, which probably disappeared from the United States in the 1960s. According to these authors, the jaguar prefers a warm tropical climate and is usually associated with water, and rarely found in extensive arid areas. Goldman (1932) believed the jaguar was a regular, but not abundant, resident in southeastern Arizona. Hoffmeister (1986) considered the jaguar an uncommon resident species in Arizona. He concluded that the reports of jaguars between 1885 and 1965 indicated a small but resident population once occurred in southeastern Arizona. Brown (1983a) suggested the jaguar in Arizona ranged widely throughout a variety of habitats from Sonoran desert scrub through subalpine conifer forest. Most of the records were from Madrean evergreen-woodland, shrub-invaded semidesert grassland, and along rivers.

Brown (1983a) presented an analysis suggesting there was a resident breeding population of jaguars in the southwestern United States at least into the 20th century. USFWS (1990) recognized that the jaguar continues to occur in the American southwest as an occasional wanderer from Mexico. Currently, breeding population of jaguar are unknown in the United States.

In Arizona, the gradual decline of the jaguar appeared to be concurrent with predator control associated with land settlement and the development of the cattle industry (Brown 1983a, USFWS 1990). Lange (1960) summarized the jaguar records from Arizona, and between 1885 and 1959 the reports consisted of 45 jaguars killed, six sighted, and two recorded by sign. Brown (1991) related that the accumulation of all known records indicated a minimum of 64 jaguars were killed in Arizona after 1900.

2.8c Critical Habitat
No critical habitat has been designated for this species.

2.8d Current Status Statewide
The jaguar was initially listed as endangered from the United States. - Mexico border southward to include Mexico and Central and South America (37 FR 6476, 1972; 50 CFR 17.11, August 1994). As a result of a petition, the jaguar was proposed as endangered in the United States (59 FR 35674; July 13, 1994). In a Federal Register notice dated 22 July 1997, the jaguar was listed as an endangered species in the United States (62 FR 39147).

The most recent records of jaguars in the United States are from Arizona. In 1971, a jaguar was taken east of Nogales and in 1986 one was taken from the Dos Cabezas Mountains. The latter reportedly had been in the area for about a year before it was killed. AGFD (1988) cited two recent reports of jaguars in Arizona. The individuals were considered to be transients from Mexico. One report (1987) was from an undisclosed location. The other report was from 1988, when tracks were observed for several days prior to the treeing of a jaguar by hounds in the Altar Valley, Pima County. An unconfirmed report of a jaguar at the Coronado National Memorial was made in 1991. In 1993, an unconfirmed sighting of a jaguar was reported for Buenos Aires National Wildlife Refuge. In March 1996, the presence of a jaguar was confirmed through photographs made in the Peloncillo Mountains of Arizona and New Mexico (Glenn 1996). AGFD reported a jaguar sighting in the Baboquívari Mountains in 1996, and in the fall of 1997, one was reported from the Cerro Colorado Mountains of southern Arizona. A jaguar was recently documented (December 2001) in the Atascosa Mountains within about 2 mi (3 km) of the proposed action.

2.8e Environmental Baseline
The Tumacacori EMA is the location of recent reports of jaguars in the United States. This area continues to include the most likely habitat that will support the existence of jaguars in the United States. Many of the larger canyon bottoms in the Tumacacori EMA contain substantial cover and could act as travel corridors for dispersing jaguars. It is believed that all recent sightings of jaguars in Arizona are males dispersing north from

the northern most breeding population in Mexico in an effort to find unoccupied habitat (B. VanPelt, AGFD, pers. comm., 3 October 2002). Because no breeding pairs are thought to exist north of the United Sates-Mexico border, conservation of the Mexican population is vital to the future presence of jaguars in Arizona.

Under the leadership of AGFD and New Mexico Department of Game and Fish, a conservation agreement and strategy has been prepared to address the conservation of the jaguar in Arizona and New Mexico. This agreement established an interstate/intergovernmental Jaguar Conservation Team under a Memorandum of Agreement (MOA). This MOA has been signed by various state and federal cooperators and local and tribal governments with land and wildlife management responsibilities in the geographic area of concern. The Jaguar Conservation Agreement and Strategy serves as a mechanism for implementation of actions for the protection and conservation of the jaguar, while providing a template for the recovery of the species until a recovery plan is prepared and adopted.

The Conservation Agreement established procedures for reporting and evaluating jaguar sightings and compiling distribution and occurrence information, investigation of livestock depredation, evaluation of habitat suitability, development of education materials, and other activities. The Jaguar Conservation Agreement also provides for participation by interested private citizens and organizations. CNF grazing allotment permitees are participating in this process.

The December 2001 sighting mentioned earlier came from a remote camera operated under the direction of the Jaguar Conservation Team (S. Schwartz, AGFD, pers. comm., 17 September 2002). Currently, 14 remote cameras are positioned along the United States-Mexico border in an attempt to document movement of jaguars in and out of Arizona (J. Childs, Jaguar Conservation Team, pers. comm., 3 October 2002).

2.8f Effects of Proposed Action on the Jaguar

Direct Effects

Construction Noise and Activity

Because jaguars are primarily nocturnal, disturbance from construction activities, even in suitable dispersal habitat, is unlikely. The greatest likelihood of noise disturbance will result from the use of helicopters during early morning or late evening hours. However, because of the linear nature of the proposed action, any noise disturbance will be widely distributed and relatively short term in any location. Any jaguar within the action area will likely avoid construction sites. The use of additional remote cameras to monitor the United States-Mexico border south of the proposed action also will minimize the possibility of construction activities affecting breeding jaguars.

Indirect Effects

Habitat Modification and Fragmentation

Roads can reduce habitat value because of habitat fragmentation and edge effects. Some studies have shown that a few large areas of low road density, even in a landscape of high average road density, may be the best indicator of suitable habitat for large vertebrates (Rudis 1995). Because construction activities within riparian corridors or other major canyons will be minimal and widely distributed, no adverse impacts to the composition or structure of jaguar movement corridors or fragmentation of habitat is anticipated. Furthermore, access and construction roads for the proposed action commonly are spurs off existing roads and range between 500 ft (152 m) and 1,000 ft (305 m) in length, which do not isolate or separate habitat patches.

While access roads and structure site construction could degrade the habitats of jaguar prey species, effects on the prey base are difficult to quantify. The primary jaguar prey species in Arizona is deer (*Odocoileus* spp.), which have relatively large home ranges. Road-avoidance behavior (up to distances of 300 ft [90 m] to 600 ft [180 m]) is common in large mammals (Lyon 1983), including those species that may serve as prey for jaguars. Because of the linear nature of the proposed action, impacts to deer habitat will be widely distributed and relatively minor in any single area.

Increased Legal and Unauthorized Access to Jaguar Habitat

Jaguars appear to be relatively tolerant of some level of human activity (B. VanPelt, AGFD, pers. comm., 3 October 2002) and have been documented using areas that have recreational and agricultural activities occurring on a regular basis. However, increased human access to potential jaguar habitat through the use of temporary proposed construction roads could reduce the quality of the habitat. The road closure techniques outlined in the SECTION 1.4 and the RA (URS 2003) will minimize unintended uses of these roads.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, jaguars will not likely be directly impacted by wildfires; however, these wildfires could potentially alter or destroy portions of prey species habitat. While the short-term effects of wildfires may affect prey species through loss of forage from the fire, increased herbaceous production in the years following a fire may improve habitat in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape. The fire prevention measures being developed for the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.8g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal lands, the habitat with the highest potential for occupancy by jaguars occurs on USFS land in Santa Cruz County. Future federal actions on these lands will be subject to Section 7 consultation; these actions will not be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.8h Effects Determination and Incidental Take

Construction noise and activity associated with the proposed action may affect the jaguar, but it is not likely to adversely affect the species because any disturbance will be widely distributed and short term in duration.

Because the proposed action is not likely to adversely affect the jaguar, no take is anticipated.

2.9 GILA TOPMINNOW (*Poeciliopsis occidentalis occidentalis*) (Endangered)

2.9a Action Area

The action area includes all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. In streams, the action area is often much larger than the area of the proposed action because impacts in the watershed may be concentrated in the stream and actions within the stream may be carried downstream well outside of the immediate project area. The action area for the Gila topminnow is the entire Santa Cruz River watershed.

2.9b Natural History and Distribution

The Gila topminnow (Figure 20) was originally described by Baird and Girard (1853) as *Heterandria occidentalis* from a specimen collected in 1851 from the Santa Cruz River near Tucson. It was redescribed by Hubbs and Miller (1941) as *Poeciliopsis occidentalis*. As with all species in the family Poeciliidae, the Gila topminnow exhibits sexual dimorphism. Both males and females are tan to olive-bodied and usually white on the belly. Scales of the dorsum are darkly outlined and the fin rays contain melanophores, although lacking in dark spots. Dominant sexually mature males are often blackened, with some gold on the pre-dorsal midline, orange at the base of the gonopodium, and exhibits bright yellow pelvic, pectoral, and caudal fins (Minckley 1973). Females remain drab in coloration upon reaching maturity and throughout their life. All male poeciliids have a modified anal fin (gonopodium) used to fertilize the female internally.

Figure 20. Gila topminnow

Habitat requirements of *P. o. occidentalis* are broad. The species prefers shallow, warm, fairly quiet water; however, they can become acclimated to a much wider range of conditions. Both lentic habitats and lotic habitats with moderate current are easily tolerated. Temperatures from near freezing under ice to 98.6 degrees F (37 degrees C) have been reported, with a maximum tolerance of 109.4 degrees F (43 degrees C) for brief periods (Heath 1962). Gila topminnows can live in a wide range of water chemistries, with recorded pH values from 6.6 to 8.9, dissolved oxygen readings from 2.2 to 11 milligrams/liter (Meffe et al. 1983), and salinities from very dilute to sea water (Schoenherr 1974). The widespread historic distribution of Gila topminnows throughout rivers, streams, marshes, and springs of the Gila River Basin is evidence for their tolerance of these environmental extremes. One reestablished population (Mud Springs) survived for 16 years in a simple cement-watering trough before being moved.

Meffe et al. (1983) reported that topminnows can tolerate almost total loss of water by burrowing into the mud for 1-2 days. Preferred habitats contain dense mats of algae and debris, usually along stream margins or below riffles, with sandy substrates sometimes covered with organic mud and debris (Minckley 1973). Topminnows are usually found in the upper third of the water column and young show a preference for the warmest and shallowest areas (Forrest 1992). Simms and Simms (1992) found topminnows occupying pools, glides, and backwaters more frequently than marshes or areas of fast flow.

According to Schoenherr (1974), the spring-heads presently occupied by Gila topminnows are questionable as preferred habitat. Destruction of historically occupied habitats such as the marshes, sloughs, backwaters, and edgewaters of larger rivers and presence of non-native fish in such habitats that remain has undoubtedly forced Gila topminnow out of their preferred historic habitats and into the spring-heads and smaller erosive creeks we see them in today. Their tolerance of conditions in these habitats has allowed them to maintain populations with less impact from non-native fishes.

Gila topminnows are viviparous fish, meaning embryos grow and mature within the female and are born living. Eggs are fertilized internally through deposition of spermatophores (packets of sperm) into the female genital pore by the male gonopodium. Female Gila topminnow can store spermatozoa for several months, and may produce up to 10 broods after being isolated from males (Schultz 1961). Female Gila topminnows also exhibit superfetation in which 2 or more groups of embryos at different stages develop simultaneously. Females of the genus *Poeciliopsis* generally carry only 2 stages, although some *P. o. occidentalis* females have been shown to carry 3 stages for a few days when population densities are low. The mean interval between broods is 21.5 days (Schoenherr 1974). Brood size ranges from 1-31 dependent upon female standard length (SL) (Constantz 1974; Schoenherr 1974, 1977). Under optimum laboratory conditions, *Poeciliopsis* can produce 10 broods per year at intervals of 7 to 14 days (Schultz 1961). Sexual maturity can be attained as early as 2 months or as late as 11 months following birth, dependent upon the season of birth (Schultz 1961; Constantz 1976, 1979; Schoenherr 1974).

Breeding occurs primarily during January through August, but in thermally constant springs, young may be produced throughout the year (Heath 1962; Minckley 1973; Schoenherr 1974). During the peak of the breeding season up to 98 percent of mature females are pregnant (Minckley 1973). Dominant males turn black, defend territories, and court females. Smaller subordinate males do not turn black or defend territories. Instead, they take on a "sneaking" mating strategy where they attempt to mate with uncooperative females while the dominant male is busy elsewhere. Subordinate males have a longer gonopodium, which may have an adaptive benefit for this type of mating strategy (Constantz 1989). However, if the larger territorial males are removed, smaller males will become dominant, take on breeding coloration, and defend territories (Constantz 1975; Schoenherr 1977). Brood size and the onset of breeding in topminnows can be influenced by several factors including food abundance, photoperiod, temperature, predation upon the population, and female size. Increased food supply and larger female size are believed to contribute to the greater fecundity seen in topminnows from Monkey Spring canal compared with topminnows from Monkey Spring headspring (Constantz 1974, 1979; Schoenherr 1974, 1977). Sex ratios in stabilized populations nearly always favor females, varying from 1.5 to 6.3 per male (Schoenherr 1974).

Gila topminnows are opportunistic omnivorous feeders, having a gut length 1.5 to 2 times SL of the individual (Schoenherr 1974). They have weakly spatulate dentition characteristic of an omnivorous diet. Primary food items include detritus, vegetation, amphipods, ostracods, insect larvae, and rarely, other fish (Schoenherr 1974; Gerking and Plantz 1980; Meffe et al. 1983; Meffe 1984).

Gerking and Plantz (1980) noted that Gila topminnows prefer to eat large prey, but prey sizes are limited by mouth size. Schoenherr (1974) observed that individual fishes in complex habitats with several food resources present will select and focus on different items. He suggested that variation in feeding among individuals prevents over-utilization of a single resource, thus enhancing survival potential of the species.

In the United States, this species currently occurs in the Gila River drainage, Arizona, particularly in the upper Santa Cruz River, Sonoita and Cienega creeks, and the middle Gila River. The Gila topminnow is restricted to 14 natural localities in Arizona. In Mexico, the species occurs in the Río Sonora, Río de la Concepción, and Santa Cruz River but are not listed under the ESA. Gila topminnows occupy a variety of habitats, including: springs, cienegas, permanent and interrupted streams, and margins of large rivers. Habitat alteration and destruction, and introduction of predatory non-native fish, (principally western mosquitofish [*Gambusia affini*]) is the main reason for decline of the Gila topminnow.

2.9c Critical Habitat
No critical habitat has been designated for this species.

2.9d Current Status Statewide
The United States population of the Gila topminnow was federally listed as an endangered species in 1967 (USDOI 1967). The original recovery plan for Gila topminnow listed 10 extant natural populations: Monkey Spring, Cottonwood Spring, Sheehy Spring, Sharp Spring, Santa Cruz River near Lochiel, Redrock Canyon, Cienega Creek, Sonoita Creek (presumably including localities above and below Patagonia Lake), Salt Creek, and Bylas Springs (USFWS 1984). Gila topminnows were also known from Middle Spring (also known as SII or Second Spring) on the San Carlos Apache Indian Reservation (Meffe et al. 1983). Middle Spring was considered part of the Bylas Springs complex in the earlier recovery plan.

Since 1984, Gila topminnows have been discovered or rediscovered at 4 additional locations: North Fork of Ash Creek in 1985 (Jennings 1987), Fresno Canyon in 1992, Santa Cruz River north of Nogales in 1994, and Coal Mine Canyon in 1996 (Weedman and Young 1997). However, Gila topminnow were last collected from the North Fork of Ash Creek in 1985 and from Sheehy Spring in 1987. They have also been very rare or absent during recent surveys (last 5 years) of Sonoita Creek above Patagonia Lake and Santa Cruz River near Lochiel. Mosquitofish are quite common in both areas. Topminnows were extirpated from 1 of the original 10 localities, Salt Creek, by mosquitofish (Marsh and Minckley 1990), but the stream was renovated and restocked with Gila topminnows from Middle Spring. Subsequently, mosquitofish were found in the stream and it was again renovated and restocked with topminnows from Bylas Spring. Thus, there are 14 naturally occurring localities (considering Sonoita Creek above and below Patagonia Lake as 2 separate localities) currently known to support Gila topminnows in the United States.

Eleven of the naturally occurring locations currently supporting Gila topminnows are in the Santa Cruz River system: Redrock Canyon, Cottonwood Spring, Monkey Spring, upper Sonoita Creek, Fresno Canyon, Coal Mine Canyon, lower Sonoita Creek, Santa Cruz River north of Nogales, Cienega Creek, Sharp Spring, and the upper Santa Cruz River. The 2 remaining localities (Bylas Springs and Middle Spring) and Salt Creek are next to the Gila River on the San Carlos Apache Indian Reservation. Bylas Springs has been unsuccessfully poisoned twice to remove mosquitofish (Meffe et al. 1983; Brooks 1985; Marsh and Minckley 1990). Another attempt at renovation of Bylas Springs was done by USFWS Arizona Fishery Resource Office and has so far been successful. The population at Middle Spring was eliminated by lack of water during the summer of 1989, but was recently reestablished (following construction of additional pool habitat) with Gila topminnows from the original Middle Spring population held at Roper Lake State Park. Salt Creek has also been renovated and restocked with topminnows originally from Bylas Spring.

As part of past recovery actions, more than 200 Gila topminnow reintroductions or natural dispersals from reintroductions have occurred at 175 wild locations. For this count, a wild location refers to an area that does not have a mailing address, in contrast with a captive population that does (following Simons 1987). Eighteen wild populations remained in 1997, 17 of which are in historic range (Weedman and Young 1997). Seven of these populations are secure enough that they should persist into the foreseeable future. Minckley and Brooks (1985), Brooks (1985, 1986), Simons (1987), Bagley et al. (1991), Brown and Abarca (1992), and Weedman and Young (1997) describe the plight of re-established and captive populations of Gila topminnows.

Gila topminnows also have been stocked into many captive locations for propagation or conservation. Twelve captive populations were known to persist in 1997. The following publicly maintained populations are large enough to provide individuals for reintroductions, although one is known to be mixed with topminnows from more than one natural population (Arizona-Sonora Desert Museum, Boyce-Thompson Arboretum (mixed), Dexter National Fish Hatchery and Technology Center, Roper Lake State Park, Arizona State University, and Hassayampa River Preserve).

2.9e Environmental Baseline

Gila topminnow currently occupy the Santa Cruz River in its perennial reaches, as far north as Chavez Siding Road. This reach of the river was also occupied by longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus clarki*), Sonora sucker (*Catostomus insignis*), green sunfish (*Lepomis cyanellus*), and mosquitofish as recently as 1997 (USFWS 2001d). No Gila topminnows occur on the Tumacacori EMA and there are currently no plans for reintroductions in any locations (CNF 2000; D. Duncan, USFWS, pers. comm., 1 October 2002).

2.9f Effects of Proposed Action on the Gila topminnow

<u>Direct Effects</u>
The effects of the proposed action on this species are not anticipated to include direct effects to individual Gila topminnow because no construction will occur within occupied habitat.

<u>Indirect Effects</u>
Habitat Modification
Some indirect impacts to Gila topminnow habitat from erosion are possible from the construction of the proposed action. While the removal of vegetation for construction of access roads will increase surface runoff and sediment transport, and decrease infiltration of precipitation (Gifford and Hawkins 1978, Busby and Gifford 1981, Blackburn 1984, DeBano and Schmidt 1989, Belnap 1992, Belsky and Blumenthal 1997), the implementation of BMPs will help control erosion. However, unusually large precipitation events may temporarily overwhelm BMPs and result in some increase in sediment transport. Nevertheless, the distance of the proposed action from the Santa Cruz River will minimize the amount of sediments reaching Gila topminnow habitat.

Accidental Wildfire
Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Roads constructed for the proposed action also may allow the establishment or increased density of non-native grasses, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Wildfires could remove groundcover that is important in dissipating rainfall energy and reducing erosion.

However, new roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action. Measures outlined in the Invasive Species Management Plan also will minimize the introduction or spread of invasive species that may facilitate fires.

2.9g Cumulative Effects
Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal land, the habitat with the

highest potential for occupancy by Gila topminnow occurs on private land in Santa Cruz County. Most future actions on private land will not be subject to Section 7 consultation.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand for recreational use of USFS lands.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.9h Effects Determination and Incidental Take

The transport of sediments into the Santa Cruz River may affect the Gila topminnow; however, any increase in sediments will be relatively small because of the distance of the proposed action from occupied habitat. Therefore, it is not likely to adversely affect the species.

Because the proposed action is not likely to adversely affect the species, no take of Gila topminnow is anticipated.

2.10 MEXICAN GRAY WOLF (*Canis lupus baileyi*) (Endangered)

2.10a. Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential habitat for Mexican gray wolf is found within portions of Santa Cruz County containing oak and pine/juniper savannas above 4,000 ft (1,200 m). Wolves may travel long distances during hunting expeditions, typically in an irregular circle 20 mi (34 km) to 60 mi (68 km) in diameter. The action area for the Mexican gray wolf considered for the proposed action includes all potential habitat and travel corridors in western Santa Cruz and southern Pima County.

2.10b. Natural History and Distribution

Mexican gray wolves (Figure 21) are the smallest and southernmost of the 5 subspecies of gray wolf in North America. The Mexican gray wolf is a large dog-like carnivore with a mixed brown, rust, black, gray, and white. This species has a distinct white lip line, chin, and throat. Adults weigh between 50-90 lbs (23-41 kg) (Hoffmeister 1986). The historic range was from southeastern Arizona, southwestern New Mexico, southwestern Texas, and south through the Sierra Madre of Mexico. The Mexican gray wolf is the southernmost occurring and most endangered subspecies in North America. This wolf is the last subspecies of gray wolf known to occur in the Arizona-New Mexico area. The last known naturally occurring specimen in the United States was found in New Mexico in 1970 (USFWS 2001d).

Figure 21. Mexican gray wolf.

Historically, Mexican gray wolf habitat was montane woodlands, presumably because of the favorable combination of cover, water, and prey availability. Most wolf collections came from pine, oak, and pinyon-juniper woodlands, and intervening or adjacent grasslands above 1,372 m (4,500 ft) (Brown 1983b). Wolves avoided desertscrub and semidesert grasslands, but wooded riparian corridors were probably used for travelling and hunting (Parsons 1996).

These are social animals in the dog family that live and travel in packs of 7 to 30 animals depending upon prey size and availability. Mexican gray wolves prey upon a variety of animals from mice and squirrels to deer and elk. Territory size can range from 30 (78 km^2) to 500 mi^2 (1,295 km^2) or more. Packs are led by a pair of dominant animals that control most of the breeding. Breeding season lasts from late winter to early spring, and the dominant female produces up to 6 pups for the pack. The wolves care for the pups communally.

During the late 1800s through the mid 1900s, extensive hunting, trapping, and poisoning efforts at local, state, and federal levels resulted in the extirpation of this species from the United States portion of its range. Reintroduction efforts of captive bred wolves are under way in the Blue Range Recovery Area of eastern Arizona and New Mexico. Fourteen packs have been released to date.

2.10c Critical Habitat
No critical habitat has been designated for this species.

2.10d Current Status Statewide
Mexican gray wolves were listed as endangered by the USFWS in 1976 (41 FR 17736) without critical habitat. In 1998, an experimental, non-essential population was designated for the southwest (63 FR 1763) and a reintroduction program was initiated. Eleven wolves from captive breed stock were reintroduced into the Apache National Forest in southeastern Arizona under the experimental, non-essential designation in an effort to re-establish the subspecies to a portion of its historic range. A Recovery Plan for this subspecies was completed in 1982 and revisions are currently in progress (USFWS 2001d).

Mexican gray wolf populations steadily declined in Arizona because of predator control programs and conflicts with livestock interests. Pressure to control wolves became a priority beginning in the 1920s when this subspecies was nearly eliminated from the state and prevention of wolves from entering from Mexico was undertaken. In 1921 and 1922, a reported 58 wolves were taken by trapping or poisoning in Arizona. By 1924, reported takings dropped to 29 and by 1936, to 5. After 1952, only 2 wolves were reported taken in Arizona, 1 in 1958 and another in 1960 (Hoffmeister 1986). Reports of Mexican gray wolves living in the wild in Arizona continued into the early 1970s (USFWS 1982).

Similar predator control programs in Mexico reduced populations and may have eliminated the wolf by the 1980s. Surveys conducted in Mexico in the early 1990s did not confirm Mexican gray wolf populations in the wild (Parsons 1996).

2.10e Environmental Baseline
The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consideration.

The Tumacacori EMA contains some areas of montane and riparian woodlands that may serve as dispersal corridors for Mexican gray wolves. If wolf populations exist in the mountains of Sonora, these corridors may be used as hunting and dispersal corridors. There are currently no plans to reintroduce the Mexican gray wolf into southern Arizona and, because of the distance and fragmentation of intervening habitat, it is unlikely that current experimental populations in northern Arizona could disperse into Santa Cruz County.

2.10f Effects of Proposed Action on the Mexican Gray Wolf

Direct Effects

Construction Noise and Activity

Because the only wild populations of Mexican gray wolves in Arizona occur in the Apache National Forest, disturbance from construction of the proposed action, even in suitable dispersal habitat, is highly unlikely. In the event that populations of wolves exist in Mexico and could disperse into southern Arizona, the greatest likelihood of disturbance will result from the use of helicopters during early morning or late evening hours. However, because of the linear nature of the proposed action, any noise or construction disturbance will be widely distributed and relatively minor in any single area.

Indirect Effects

Habitat Modification and Fragmentation

Roads can reduce habitat value because of habitat fragmentation and edge effects. Gray wolves (*Canis lupus*) in Wisconsin are limited to places with pack-area mean road densities of 0.7 mi/1 mi^2 (1.1 km/1 km^2) or less (Mladenoff et al. 1995). Some studies have shown that a few large areas of low road density, even in a landscape of high average road density, may be the best indicator of suitable habitat for large vertebrates (Rudis 1995). Access and construction roads for the proposed action commonly are spurs from existing roads and range between 500 ft (152 m) and 1,000 ft (305 m) in length, which do not isolate or separate habitat patches. Furthermore, construction activities within montane woodlands, riparian corridors or major canyons will be minimal and widely distributed, resulting in negligible impacts to the composition or structure of Mexican gray wolf habitat.

Increased Legal and Unauthorized Access to Mexican Gray Wolf Habitat

Gray wolves experience negative interactions with humans and roads are a key facilitator (Thiel 1985). Increased human access to potential wolf habitat through the use of temporary proposed construction roads could reduce the quality of the habitat and human interactions may increase mortality (Mech 1973). The road closure techniques outlined in the SECTION 1.4 and the RA (URS 2003) will minimize unintended uses of these roads.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, wolves will not likely be directly impacted by wildfires; however, these wildfires could potentially alter or destroy portions of prey species habitat. While the short-term effects of wildfires may affect prey species through loss of forage from the fire, increased herbaceous production in the years following a fire may improve habitat in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape. Fire prevention measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.10g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal lands, the habitat with the highest potential for occupancy by Mexican gray wolf occurs on USFS land in Santa Cruz County. Future federal actions will be subject to Section 7 consultation and will not be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand for recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area and results in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.10h Effects Determination and Incidental Take

Construction noise and activity associated with the proposed action may affect the Mexican gray wolf, but it is not likely to adversely affect the species because any disturbance will be widely distributed and short term in duration.

Because the proposed action is not likely to adversely affect the Mexican gray wolf, no take is anticipated.

3.0 USFS SENSITIVE SPECIES

USFS special status species are plant and wildlife species that are of concern because their populations are declining in size. In a letter dated 25 April 2002, AGFD listed 40 USFS Sensitive species that are known to occur in the vicinity of the proposed corridor or may be expected to occur along the corridor if suitable habitat exists. The information listed in the letter was based on AGFD Heritage Data Management System. AGFD species abstracts and other literature also were reviewed for species' historical ranges and habitat preferences. While field reconnaissance surveys were conducted along the entire corridor, species-specific surveys were impractical because of ongoing drought conditions in the project area, therefore the potential presence of sensitive species was assumed in all areas containing potential habitat. The 40 USFS Sensitive species that may occur on or near the proposed Western Corridor are listed in Table 3.

TABLE 3. SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Alamos Deer Vetch *Lotus alamosanus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arid Throne Fleabane *Erigeron arisolis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arizona Giant Sedge *Carex ultra*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arizona Metalmark *Calephelis rawsoni arizonensis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona. • Mitigation plantings of host species will reduce impacts.
American Peregrine Falcon *Falco peregrinus anatum*	No Impacts	• Seasonal restriction will prevent disturbance to species within project area.
Bartram's Stonecrop *Graptopetalum bartramii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Beardless Chinch Weed *Pectis imberbis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona. • Species is adapted to disturbances.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME **_Scientific Name_**	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Catalina Beardtongue *Penstemon discolor*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Cave Myotis *Myotis velifer*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Chiltepine *Capsicum annuum* var.*glabriusculum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Chihuahuan Sedge *Carex chihuahuensis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Chiricahua Mountain Brookweed *Samolus vagans*	No Impacts.	• No construction in perennial aquatic habitats.
Five-Stripped Sparrow *Aimophila quinquestriata*	No Impacts.	• Potential habitat and know occurrences are outside project area.
Foetid Passionflower *Passiflora foetida*	No Impacts.	• Known populations occur outside project area.
Gentry Indigo Bush *Dalea tentaculoides*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Giant Spotted Whiptail *Cnemidophorus burti strictogrammus*	No Impacts.	• Known populations occur outside project area.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Large-Flowered Blue Star *Amsonia grandiflora*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Lowland Leopard Frog *Rana yavapaiensis*	No Impacts.	• Known populations occur outside project area. • No construction in perennial aquatic habitats.
Lumholtz Nightshade *Solanum lumholtzianum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Mexican Garter Snake *Thamnophis eques megalops*	No Impacts.	• No construction in perennial aquatic habitats. • Minimal impacts to riparian habitat.
Mock-Pennyroyal *Hedeoma dentatum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Nodding Blue-eyed Grass *Sisyrinchium cernuum*	No Impacts.	• Known populations occur outside project area.
Northern Gray Hawk *Asturina nitida maxima*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Mitigation of riparian vegetation. • Populations within Arizona appear stable.
Santa Cruz Beehive Cactus *Coryphantha recurvata*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Santa Cruz Star Leaf *Choisya mollis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Santa Cruz Striped Agave *Agave parviflora* ssp. *parviflora*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Plants occur throughout Nogales Ranger District. • Mitigation plantings of agave will reduce impacts.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME *Scientific Name*	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Seeman Groundsel *Senecio carlomasonii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Sonoran Noseburn *Tragia laciniata*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Southern Pocket Gopher *Thomomys umbrinus intermedius*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Superb Beardtongue *Penstemon superbus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Supine Bean *Macroptilium supinum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Pre-construction surveys will be conducted and, if necessary, mitigation measures will be coordinated with USFS personnel.
Sweet Acacia *Acacia smallii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Thurber Hoary Pea *Tephrosia thurberi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Thurber’s Morning-glory *Ipomoea thurberi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Virlet Paspalum *Paspalum virletti*	No Impacts.	• Known populations occur outside project area.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.

COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Weeping Muhly *Muhlenbergia xerophila*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Western Barking Frog *Eleutherodactylus augusti cactorum*	No Impacts.	• Known populations occur outside project area.
Western Yellow-billed Cuckoo *Coccyzus americanus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Wiggins Milkweed Vine *Metastelma mexicanum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Populations within Arizona appear stable. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Wooly Fleabane *Laennecia eriophylla*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

3.1 PLANTS

Alamos deer vetch (*Lotus alamosanus*)
Alamos deer vetch is a perennial herb found in southern Arizona, and Sonora, Chihuahua, and Durango, Mexico. Within Arizona, this plant is found in Sycamore Canyon and the Pajarito Mountains of Santa Cruz County, and near Garden Valley in Maricopa County. This plant is considered a wetland obligate species that is restricted to stream banks in canyons at elevations ranging from 3,500 ft (1,067 m) to 5,500 ft (1,676 m) (AGFD 1999a). Within the Nogales RD, this plant occurs in the Sycamore Canyon and Peña Blanca Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

Population trends for Alamos deer vetch are unknown (AGFD 1999a). The proposed transmission line may cross potential Alamos deer vetch habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Furthermore, viable populations occur outside of the project area, including the Gooding RNA. There may be an impact to individual plants during development of the line; however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Arid throne fleabane (*Erigeron arisolis*)
Arid throne fleabane is an annual to short-lived perennial forb that occurs in Arizona, southwestern New Mexico and Sonora, Mexico. Within Arizona, this plant is found in Apache, Cochise, Pima, and Santa Cruz counties. This species is typically found on moist rocky soils in grasslands, grassy openings within oak woodlands, and roadsides at elevations between 4,200 ft (1,280 m) and 5,500 ft (1,676 m) (AGFD 2000a). On the CNF Nogales RD, it has been documented from Box Canyon and Ruby Roads (T. Newman, CNF, pers. comm., 20 August 2002).

Arid throne fleabane favors moist areas in grasslands and grassy openings in oak woodlands, areas also favored by livestock for grazing (AGFD 2000a). The proposed transmission line parallels Ruby Road, a known location for this species. Placement of the transmission line may impact individual arid throne fleabane, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Arizona giant sedge (*Carex ultra*)
Arizona giant sedge is the largest sedge found in Arizona. Its range includes southeast Arizona, extreme southwest New Mexico (Hidalgo County, Indian Springs in the Pelocillos) and Mexico (Sonora and Coahila). Within Arizona, this sedge is found in Cochise, Graham, Pinal, Yavapai, Pima (Santa Rita Mountains and the Rincon Valley), and Santa Cruz counties (Santa Rita and Atascosa mountains). Typically only 1 patch per mountain has been found. Like other sedges, this plant is associated with moist soil

near perennial wet springs and streams and undulating rocky-gravelly terrain at elevations ranging from 2,040 ft (622 m) to 6,000 ft (1,829 m) (AGFD 2000b). Within the Nogales RD, Arizona giant sedge is found in Sycamore Canyon and Mule Ridge in the Atascosa Mountains, and at Deering Spring and Big Casa Blanca Canyon in the Santa Rita Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

Small populations of this sedge are vulnerable to local disturbance of aquatic or riparian habitat (AGFD 2000b). The proposed transmission line may cross potential Arizona giant sedge habitat; however, no construction will occur in perennial aquatic habitats and construction within riparian habitats will be minimized to the greatest extent possible. There may be an impact to individual plants during development of the line; however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Bartram's stonecrop (*Graptopetalum bartramii*)
Bartram's stonecrop is a small succulent perennial found in southern Arizona and Chihuahua, Mexico (one record). In Arizona, this plant occurs in Santa Cruz County within the Patagonia, Santa Rita, and Tumacacori Mountains, in Pima County within the Baboquivari, Dragoon, and Rincon mountains, and in Cochise County within the Chiricahua Mountains. Habitat for Bartram's stonecrop consists of cracks in rocky outcrops within shrub live oak-grassland communities located on the sides of rugged canyons. This plant is usually found in heavy litter cover and shade where moisture drips from rocks at elevations ranging from 3,900 ft (1,189 m) to 6,700 ft (2,042 m) (AGFD 1997a). Bartram's stonecrop plants are found on the west side of the Nogales RD in Tres Amigos Gulch; Sycamore, Peña Blanca, Alamo, and Peñasco canyons; in the vicinity of Montana Peak and Peña Blanca Lake (T. Newman, CNF, pers. comm., 20 August 2002).

Bartram's stonecrop populations are typically small and isolated. Illegal collection of the plant is the main management issue at this time. Other factors that may affect populations include mining and mineral exploration, habitat alteration due to livestock grazing, trampling by cattle and recreationists, and road construction and maintenance. The proposed transmission line crosses over known Bartram's stonecrop populations within the Nogales RD. Placement of the transmission line may impact individual Bartram's stonecrop, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to Bartram's stonecrop are not likely to result in a trend toward federal listing or loss of viability.

Beardless chinch weed (*Pectis imberbis*)
Beardless chinch weed is a perennial herb that is found in southern Arizona, western Chihuahua and eastern Sonora, Mexico. Within Arizona, this plant can be found in Cochise, Pima, and Santa Cruz counties (within Santa Cruz County it is found along Ruby Road in the Atascosa Mountains and in the Red Rock area of Canelo Hills). Habitat for this species consists of open areas in grassland and oak-grassland

communities. Beardless chinch weed has an extremely broad habitat range and can be found at elevations from 4,000 ft (1,219 m) to 5,000 ft (1,524 m) (AGFD 1998a).

Populations of beardless chinch weed may be susceptible to impacts from grazing and road maintenance activities but the species is adapted to disturbances and grows along road cuts (AGFD 1998a). The proposed transmission line crosses over known beardless chinch weed populations within the Nogales RD. Placement of the transmission line may impact individual beardless chinch weed, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to beardless chinch weed are not likely to result in a trend toward federal listing or loss of viability.

Catalina beardtongue (*Penstemon discolor*)
Catalina beardtongue is a perennial herbaceous sub-shrub found in southern Arizona. This shrub is found in Cochise, Graham, Pinal, Pima (within the Santa Catalina Mountains), and Santa Cruz counties (within the Atascosa and Tumacacori mountains). Habitat for Catalina beardtongue consists of bare rock outcrops, barren soil outcrops, and bedrock openings in chapparal or pine-oak woodlands at elevations ranging from 4,120 ft (1,256 m) to 7,600 ft (2,316) (AGFD 1999b). On the Nogales RD, this shrub occurs in the upper end of Peck Canyon, Corral Nuevo, and the adjacent Bartalo Mountain (Cedar Canyon), typically on whitish volcanic ash (T. Newman, CNF, pers. comm., 20 August 2002).

Rock climbers threaten some populations of this plant but few other threats exist (AGFD 1999b). The proposed transmission line crosses over known Catalina beardtongue populations within the Nogales RD. Placement of the transmission line may impact individual Catalina beardtongue, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to Catalina beardtongue are not likely to result in a trend toward federal listing or loss of viability.

Chiltepine (*Capsicum annuum* var.*glabriusculum*)
Chiltepine is an herbaceous to woody perennial shrub that is found in south Texas, southern New Mexico, southern Arizona, and south to tropical America. Within Arizona, a few populations of this plant are found in the Chiricahua, Tumacacori, Baboquivari, and Ajo Mountains. This plant occurs in protected, frost-free canyons in oak woodlands of slopes at less than 4,500 ft (1,372 m) elevation (typically found at elevations ranging from 3,600 ft [1,097 m] to 4,400 ft [1,341 m]). Chiltepine plants grow under nurse shrubs and usually are associated with rock ledges and outcrops. Within the Nogales RD, there are populations in the Tumacacori Mountains and Cobre Ridge area, and there are suspected populations on the west side of the RD (AGFD 1991a; T. Newman, CNF, pers. comm., 20 August 2002).

This plant is declining in some areas because of drought, overgrazing, and local over-collection of berries (AGFD 1991a). Placement of the transmission line may impact individual chiltepine plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to chiltepine are not likely to result in a trend toward federal listing or loss of viability.

Chihuahuan sedge (*Carex chihuahuensis*)
Chihuahuan sedge is a grass-like perennial plant that occurs in southeastern Arizona, New Mexico (Hidalgo County), and Mexico (Sonora and Chihuahua). Within Arizona, this plant ranges from Cochise, Graham, Gila, Pima (Santa Catalina, San Luis, and Rincon mountains), and Santa Cruz counties (Atascosa and Santa Rita mountains, and the Santa Cruz River). Chihuahuan sedge can be found in wet soils along streambeds and in shallower draws of pine-oak forests and riparian woodlands. It also is found in wet meadows, cienegas, marshy areas, and canyon bottoms from 1,100 ft (335 m) to 8,000 ft) (AGFD 1999c). Within the Nogales RD, this plant has been found near Arivaca Lake (on private land), Sycamore Canyon, and south of Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement on the population status of Chihuahuan sedge (AGFD 1999c). The proposed transmission line may cross potential Chihuahuan sedge habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. There may be an impact to individual plants during development of the line; however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Chiricahua Mountain brookweed (*Samolus vagans*)
Chiricahua Mountain brookweed is a perennial herb found in southeastern Arizona, western Chihuahua, and eastern Sonora, Mexico. This plant apparently reaches its southern limit in southern Sonora, Mexico. Within Arizona, this species is found in the Huachuca Mountains of Cochise County, the Rincon, Santa Catalina, and Santa Rita mountains of Pima County, and the Canelo Hills and Pajarito mountains of Santa Cruz County. The Chiricahua Mountain brookweed is confined to areas with permanent water, such as springs, seeps, and in and along streams at elevations ranging from 1,219 to 2,195 m (4,000 – 7,200 ft) (AGFD 1999d). Within the Nogales RD, this plant occurs in Florida Canyon of the Santa Rita Mountains and in Sycamore Canyon of the Atascosa Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Chiricahua Mountain brookweed (AGFD 1999d). Because no construction will occur within perennial aquatic habitats, the proposed action will have no effect on the population status of the Chiricahua Mountain brookweed.

Foetid passionflower (*Passiflora foetida*)
The foetid passionflower is a herbaceous vine found in southeastern Texas and the Rio Grande Valley, southern Arizona, and southward throughout Mexico, Central and South America, and the West Indies. Within Arizona, this species is found in the Baboquivari Mountains, Arivaca, and Las Guijas Mountains of Pima County and in California Gulch and the Bartlett Mountains of Santa Cruz County. In Arizona, this plant occurs on hillsides and canyons of the Lower Sonoran zone from 1,067 to 1,707 m (3,500 – 5,600 ft) in elevation (AGFD 2000c). Within the Nogales RD, foetid passionflowers have been recorded in the California Gulch and Holden Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of foetid passionflower (AGFD 2000c). Because the known populations of this plant occur outside of the proposed TEP transmission line corridor, there will be no effect on the population status of the foetid passionflower.

Gentry indigo bush (*Dalea tentaculoides*)
The Gentry indigo bush is an herbaceous perennial shrub found primarily in southern Arizona, but its range may extend into Mexico. Within Arizona, this shrub is found in the Sycamore Canyon drainage of the Atascosa Mountains, in the Pajarito Mountains of Santa Cruz County, and within the Baboquivari Mountains (1930s record) and Mendoza Canyon (1965 record) of Pima County. Gentry indigo bush is typically found along canyon bottoms on cobble terraces subject to occasional flooding and seems to prefer disturbance-prone environments at elevations ranging from 1,097 to 1,341 m (3,600 – 4,400 ft) (AGFD 1998b). Historic collection records indicate that this plant may grow on rocky hillsides. Within the Nogales RD, this plant has been recorded in Sycamore Canyon, in the vicinity of Peñasco Canyon, Kaiser Canyon, and north of Manzanita Mountain (T. Newman, CNF, pers. comm., 20 August 2002).

Potential threats to Gentry indigo bush populations are cattle grazing, recreational foot traffic, and flooding events that eliminate terraces occupied by this species (AGFD 1998b). The proposed TEP transmission line will be placed to minimize disturbance to canyon bottom areas and minimal construction activity (structure placement, line stringing, and vehicle use) will occur within these areas. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Large-flowered blue star (*Amsonia grandiflora*)
The large-flowered blue star is an herbaceous perennial that is found in northern Sonora and Durango, Mexico, and southern Arizona. Within Arizona, this plant is found in the Patagonia, Atascosa/Pajarito mountains of Santa Cruz and Pima counties. Habitat for this species consists of canyon bottoms in oak woodlands typically dominated by Emory oak and Mexican blue oak; however, site-specific qualities are inconsistent. Large-flowered blue star plants have adapted to rock fall disturbance and are typically found at elevations

ranging from 1,189 to 1,372 m (3,900 4,500 ft) (AGFD 1998c). Within the west side of the Nogales RD, this plant occurs at Peña Blanca and Arivaca Lakes, Sycamore Canyon, Chiminea Canyon, California Gulch, and near Ruby (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of large-flowered blue star are rare, with only 15 to 20 populations within 2 mountain ranges as the total world distribution, but populations seem to be stable. This plant is highly susceptible to disturbance, and expanding development in the Nogales area (AGFD 1998c) may impact populations. The proposed TEP transmission line crosses near a known large-flowered blue star population in Peña Blanca Canyon, and some individual plants, comprising a small percentage of the total population, may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Lumholtz nightshade (*Solanum lumholtzianum*)
The Lumholtz nightshade is an herbaceous annual that is found in southern Arizona and northern Mexico. Within Arizona, this plant is found in the Arivaca and San Luis Mountains of Pima County and the Patagonia, Atascosa, and Santa Rita Mountains of Santa Cruz County. Lumholtz nightshade plants are typically found in washes and low ground near wet depressions and along stream banks from 914 to 1,402 m (3,000 – 4,600 ft) elevation in desert grassland plant communities. This plant is also often found in disturbed, weedy areas (AGFD 2000d). Within the Nogales RD, this nightshade is found in the vicinity of Arivaca, Ruby, California Gulch, Nogales, Cobre Ridge, and Oro Blanco Wash (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Lumholtz nightshade (AGFD 2000d). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mock-pennyroyal (*Hedeoma dentatum*)
The mock-pennyroyal is an herbaceous perennial plant found in southeastern Arizona and northern Sonora, Mexico. Within Arizona, this plant is found in the Chiricahua, Huachuca, Mule, Whetstone, and Winchester mountains of Cochise County, the Pinaleno Mountains of Graham County, the Baboquivari, Rincon, and Santa Cruz mountains of Pima County, and the Atascosa, Mustang, Pajarito, and Santa Rita mountains of Santa Cruz County. Habitat for this plant consists of oak woodland, oak-pine forest, and pine forest. It can be found on open roadcuts, steep rocky outcrops, and gravelly slopes in wooded canyons with open to full sunlight at elevations ranging from 1,173 to 2,500 m (3,850 – 8,200 ft) (AGFD 2000e).

Populations of mock-pennyroyal seem to be restricted to a relatively small geographic area, and populations are apparently small. Because habitat for this species is widespread, placement of the transmission line may impact individual plants. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Nodding blue-eyed grass *(Sisyrinchium cernuum*)
Nodding blue-eyed grass is a perennial forb with grass-like leaves that occurs in southeastern Arizona, west Texas, and Mexico. Within Pima and Santa Cruz counties, Arizona it occurs in the Pajarito, Santa Rita, Atascosa, and Rincon mountains as well as Sycamore Canyon. This species can be found in desert grassland and pine-oak woodlands from 1,006 to 2,438 m (3,300 – 8,000 ft) in elevation along streams in partial shade and in canyon bottoms. It grows in wet soil by seeps, pools, or springs in desert scrub. It has also been found on sandy stream banks. On the Nogales RD, this plant has been found at 1,189 m (3,900 ft) in Sycamore Canyon on the west side and at 1,402 m (4,600 ft) in Big Casa Blanca Canyon in the Santa Rita Mountains (AGFD 1999e). The known location of this plant in Sycamore Canyon is within the Goodding RNA, located approximately 1.6 km (1 mi) west of the proposed ROW (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of nodding blue-eyed grass (AGFD 1999e). However, this species is not likely to be affected by the proposed placement of a transmission line within the Nogales RD. The proposed transmission line will not cross over or near known locations of this plant within the Goodding RNA. Therefore, placement of the TEP transmission line from Sahuarita to Nogales will have no impact on the nodding blue-eyed grass.

Santa Cruz beehive cactus (*Coryphantha recurvata*)
The Santa Cruz beehive cactus is a succulent perennial that occurs in southern Arizona and northern Sonora (about 20 km [12.4 mi] south of the international border), Mexico. Within Arizona, this species occurs in western Santa Cruz County from Nogales and the Tumacacori Mountains west to the Atascosa/Pajarito mountains. Santa Cruz beehive cacti are found in alluvial soils of valleys and foothills in grassland and oak woodland habitats from 1,219 to 1,829 m (4,000 – 6,000 ft). These plants are either on rocky hillsides with high grass cover or in rock crevices where runoff accumulates and provides a more favorable moisture relationship than the surrounding soils (AGFD 1998d). Within the Nogales RD known plant locations have increased since 1997 (813 plant clumps in 1997, 807 plant clumps in 1998, and 175 in 1999) (T. Newman, CNF, pers. comm., 20 August 2002).

Accessible populations of the Santa Cruz beehive cactus have declined due to collection, but the status of populations beyond accessible areas is unknown (AGFD 1998d). The proposed TEP transmission line crosses over several known Santa Cruz beehive cactus populations within the Nogales RD. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz star leaf (*Choisya mollis*)
The Santa Cruz star leaf is a perennial shrub that occurs in southern Arizona within the Atascosa, Pajarito, and Tumacacori mountains of Santa Cruz County. Santa Cruz star leaf plants are found primarily within madrean evergreen woodland communities from 1,067 to 1,524 m (3,500 – 5,000 ft) in elevation. This plant is usually found in canyon bottoms and slopes, usually in the shade of oaks and other trees, or rock outcrops (AGFD 1999f). Santa Cruz star leaf plants have been found throughout the eastern portion of the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Santa Cruz star leaf are typically found in rugged and remote mountainous areas where human activity is low and the likelihood of disturbance or removal of plants is minimal. However, the species population trend is unknown and existing populations are relatively rare, have a restricted range, and are only found within specific habitats (AGFD 1999f). The proposed TEP transmission line will cross areas with known populations of Santa Cruz star leaf. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz striped agave (*Agave parviflora* ssp. *parviflora*)
Santa Cruz striped agave is a small perennial succulent found in southern Arizona and northern Mexico. Within Arizona, this species is found near Arivaca in Pima County, and in the Las Guijas, Pajarito, Patagonia, Santa Rita, and Atascosa mountains of Santa Cruz County. Habitat for this agave consists of rocky or gravelly slopes of middle elevation mountains, in desert grassland or oak woodlands. This plant appears to prefer soils on rounded ridge-tops where grasses and shrubs are sparse and soil is bare or nearly so (AGFD 1998e). Santa Cruz striped agave have been found throughout the Nogales RD (primarily within the Atascosa, Pajarito, San Luis, and Las Guijas mountains), and in recent years the documented number of individual plants and number of locations has increased for this area (T. Newman, CNF, pers. comm., 20 August 2002).

Some populations of Santa Cruz striped agave have declined due to illegal collection and loss of habitat due to mining and road construction. Livestock grazing has caused degradation of habitat and browsing of flower stalks (AGFD 1998e). The proposed TEP transmission line crosses areas with known populations of Santa Cruz striped agave and there may be an impact to individual plants during development of the line. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area and transplanting of agave plants in project area will minimize impacts. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Seeman groundsel (*Senecio carlomasonii*)
The seeman groundsel is a perennial herb or subshrub found in southern Arizona and Mexico (Sonora, Chihuahua, Nayarit). Within Arizona, this plant is found in the Chiricahua and Huachuca mountains of Cochise County, the Baboquivari and Santa Rita mountains of Pima County, and the Santa Rita, Pajarito, and Peña Blanca mountains of Santa Cruz County (AGFD 2000f). Within the Nogales RD, seeman groundsel have been recorded in the Peña Blanca Lake and Sycamore Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of seeman groundsel (AGFD 2000f). A potential threat to seeman groundsel habitat may be trampling by hikers. Placement of the proposed transmission line may impact individual plants. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Sonoran noseburn (*Tragia laciniata*)
Sonoran noseburn is an herbaceous perennial that occurs in southern Arizona, Mexico (Sonora and Chihuahua), and possibly New Mexico. Within Arizona this plant can be found in Cochise County in the Huachuca Mountains and Canelo Hills, in Pima County in the Santa Rita Mountains, and in Santa Cruz County in the Atascosa Mountains (Sycamore Canyon), Patagonia Mountains, Pajarito Mountains, Canelo Hills (O'Donnell Canyon), and Santa Rita Mountains. Sonoran noseburn typically occur at elevations of 1,067 to 1,722 m (3,500 – 5,650 ft) along streams and canyon bottoms, on shaded hillsides within the upper parts of the Lower Sonoran and Upper Sonoran biotic communities, and open woodland areas (AGFD 2000g). This species has been found in canyons, along streams, and near roadways of the Nogales RD (AGFD 2000g).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Sonoran noseburn (AGFD 2000g). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Superb beardtongue (*Penstemon superbus*)
The superb beardtongue is a perennial herbaceous forb found in southeastern Arizona, New Mexico, and Mexico (Chihuahua). Within southern Arizona, this species is found in Pima County in the Santa Catalina and Santa Rita mountains, and in Santa Cruz County within the Tumacacori Mountains. This plant is generally found in rocky canyons, dry

hillsides, and along washes in sandy or gravelly soils at elevations between 945 and 1,676 m (3,100 – 5,500 ft) (AGFD 2000h). Within the Nogales RD, it has been found in Rock Corral Canyon and Box Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of superb beardtongue (AGFD 2000h). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Supine bean (*Macroptilium supinum*)
The supine bean is a perennial herb that grows in colonies and produces underground fruits. The total range for this species includes Santa Cruz County, Arizona, south into Mexico, including the states of Sonoran and Nayarit. Within Arizona, this plant can be found in the Atascosa/Pajarito, San Luis, and Patagonia Mountains, and the southern portion of the Santa Cruz River drainage in Santa Cruz County (much of this area is within the Nogales RD). Supine bean are typically found along ridge tops and gentle slopes of rolling hills in semi-desert grassland or grassy openings in oak-juniper woodlands at elevations between 1,097 and 1,494 m (3,600 – 4,900 ft) (AGFD 1999g).

There are currently an estimated 12 populations of this species in Arizona. Populations range from small (around 20 individuals) to relatively large (around 3,500 individuals). A 43% decline in a monitored population was recorded from 1989 to 1993. This decline was apparently due to low reproductive output and poor recruitment, although the reasons for these are unknown (AGFD 1999g). Possible threats to this species include degradation of habitat due to livestock grazing, off-road vehicle activity, recreation (camping and hiking), Border Patrol activities, utility corridor and road construction/maintenance, and home building (AGFD 1999g).

Because of the recent decline in monitored populations and drought conditions noted in 2002, additional surveys will be conducted prior to construction in potential supine bean habitat. If populations of this species are found in the vicinity of construction, consultation with USFS biologists will be initiated to minimize impacts. Development of the proposed TEP transmission line is likely to have an impact on this species. However, once additional surveys are completed, impacts are likely to be limited to individual plants and not whole populations. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Sweet acacia (*Acacia smallii*)
The sweet acacia is a woody perennial spiny shrub or small tree found in Texas, Arizona, and California south to Argentina. Within Arizona, this species is found in the Baboquivari Mountains of Pima County and Sycamore Canyon and Atascosa Mountains of Santa Cruz County. Sweet acacia are typically found in the lower slopes of canyons of

riparian areas in desert grassland communities from elevations ranging from 1,067 to 1,219 m (3,500 – 4,000 ft) (AGFD 1992).

Population trends for the sweet acacia are unknown (AGFD 1992). The proposed TEP transmission line may cross potential sweet acacia habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Thurber hoary pea (*Tephrosia thurberi*)
The Thurber hoary pea is a perennial shrub that occurs in southern Arizona and Mexico (northern Sonora and southwestern Chihuahua). Within Arizona, this plant can be found in Cochise, Santa Cruz, and Pima counties. On the Nogales RD, Thurber hoary pea plants are found in the Santa Rita and Atascosa mountains. This species typically occurs on rocky slopes among oaks, pines, junipers, manzanitas, open hilltops, and grasslands at elevations between 1,067 and 2,134 m (3,500 – 7,000 ft) (AGFD 1999h).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Thurber hoary pea (AGFD 1999h). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Thurber's morning-glory (*Ipomoea thurberi*)
Thurber's morning-glory are perennial herbaceous vines that are found in southern Arizona and Mexico (Chihuahua and Sonora). Within Arizona, this plant is found in the Huachuca and Mule Mountains of Cochise County, the Santa Rita Mountains of Pima County, and in the vicinity of Nogales, the Canelo Hills, and the Patagonia and Atascosa/Pajarito mountains of Santa Cruz County. Habitat in Arizona typically consists of rocky hillsides and canyon slopes in madrean evergreen woodland and semi-desert grassland communities in elevations between 1,158 and 1,570 m (3,800 – 5,150 ft) (AGFD 2000i). On the Nogales RD, this morning glory has been found in the vicinity of Peña Blanca Lake, east of Peñasco Canyon, and Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Thurber's morning-glory (AGFD 2000i). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Virlet paspalum (*Paspalum virletti*)
The virlet paspalum is a perennial grass found in southeastern Arizona and Mexico (Sonora and San Luis Potosi). Within Arizona, this grass is found in the Huachuca Mountains of Cochise County, and in the Pajarito Mountains and Sycamore Canyon of Santa Cruz County. This grass is found in sandy soils of canyon bottoms in semi-desert grassland communities and grassy areas within madrean evergreen woodland communities at elevations ranging from 1,067 to 1,737 m (3,500 – 5,700 ft) (AGFD 1999i). In the Nogales RD, the only known location for this grass is in Sycamore Canyon growing in a sandy canyon bottom (T. Newman, CNF, pers. comm., 20 August 2002).

This species is rare in Arizona, where it is known from only 2 widely separated populations. There is no information on the potential effects of land use activities, such as utility placement, on the population status of virlet paspalum (AGFD 1999i). Known locations of this plant occur outside of the proposed TEP transmission line corridor; therefore, placement of the line is not likely to impact the virlet paspalum.

Weeping muhly (Sycamore Canyon muhly) (*Muhlenbergia xerophila*)
Weeping muhly is a perennial herbaceous grass found only in southern Arizona. Populations occur in the Santa Catalina, Rincon, Santa Rita, Tumacacori, and Baboquivari mountains of Pima County, and in Sycamore Canyon within the Pajarito Mountains of Santa Cruz County. Weeping muhly most often grow in crevices of cliffs, bedrock, and other rocks along canyon bottoms. This grass is also known from rocky canyon slopes in oak, pine-oak, and riparian woodlands at elevations between 1,073 and 1,829 m (3,520 – 6,000 ft) (AGFD 1999j).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of weeping muhly (AGFD 1999j). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Wiggins milkweed vine (*Metastelma mexicanum*)
Wiggins milkweed vine is a perennial herbaceous vine with a woody base found in southeastern Arizona to southern Sonora, Mexico. Within Arizona, this vine occurs around the Nogales and Ruby areas, Sycamore Canyon area, and Patagonia Mountains of Santa Cruz County, and Baboquivari, Coyote, and Catalina mountains of Pima County. This vine is typically found on open slopes within open oak woodland on granite soils of juniper flats at elevations between 1,067 and 1,554 m (3,500 – 5,100 ft) (AGFD 2000j). Wiggins milkweed vine has been found in several locations within the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of Wiggins milkweed vine within Arizona appear to be stable. This vine depends on surrounding vegetation for microhabitat and will be affected by any disturbance to area habitat (AGFD 2000j). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Wooly fleabane (*Laennecia eriophylla*)
Wooly fleabane is a perennial herb found in southeastern Arizona and northern Mexico (Sonora and Chihuahua). In Arizona, wooly fleabane occurs in the Atascosa Mountains, Pajarito Mountains, Santa Rita Mountains, Canelo Hills, and in the vicinity of Sonoita Creek in Santa Cruz County. This species is typically found in gravelly soil of rocky slopes and ridges with dense grass cover in semi-desert grassland, dry oak woodland, and pine-oak woodland communities at elevations between 1,292 and 1,722 m (4,240 – 5,650 ft) (AGFD 1999k). There are known locations of wooly fleabane in the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Population sizes of this plant are usually very small, with typically no more than 40 plants found in any of the populations known from Arizona. Population numbers fluctuate with the amount and timing of summer rains from year to year. This species was probably more common before its habitat was altered by excessive grazing (AGFD 1999k). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

3.2 INVERTEBRATES

Arizona metalmark (*Calephelis rawsoni arizonensis*)
The Arizona metalmark is a small, brown butterfly with bands of blue metallic markings on the upper and underside of the body. This butterfly occurs in Arizona, and from the Animas Mountains in southwestern New Mexico southward to Sonora, Mexico. The southern limits of its range are poorly defined to date. In Arizona, this species is known from as far north as Gila County then southward through Graham, Cochise, Pima, and Santa Cruz counties in most of the mountains therein. Arizona metalmark butterflies occur mostly above the desert floor in mountain foothills. Within these mountains, it is found in riparian canyons in oak woodland or more arid regions at elevations from 716 to 1,676 m (2,350 – 5,500 ft). Canyons with standing water for a major portion of the year appear to contain populations of this species as long as *Agave* spp. are present for larvae development (AGFD 2001a). There is no information on the potential effects of land use activities, such as utility placement, on the population status of Arizona metalmark (AGFD 2001a).

Placement of the transmission line may indirectly impact individuals of this species through habitat modification, however because the species is widely distributed across southern Arizona, only a small percentage of Arizona metalmarks may be impacted. Furthermore, transplanting of agave plants also will minimize impacts. Impacts are not likely to result in a trend toward federal listing or loss of viability.

3.3 BIRDS

American peregrine falcon (*Falco peregrinus anatum*)
The American peregrine falcon subspecies is a medium-sized raptor that nests from central Alaska south to Baja California, Sonora, and the highlands of Central Mexico. Within Arizona, this raptor breeds wherever sufficient prey is available near cliffs. These raptors are rare or absent as breeders in the southwestern quarter of Arizona. Optimum habitat for peregrine falcons consists of steep, sheer cliffs overlooking woodlands, riparian areas, or other habitats supporting avian prey species in abundance. These raptors may also be found in less optimal habitat consisting of small broken cliffs in ponderosa pine forests or large sheer cliffs in very xeric areas. The presence of an open expanse is critical. American peregrine falcons can be found at elevations ranging from 122 to 2,743 m (400 – 9,000 ft) (Glinski 1998, AGFD 1998f). Peregrine falcon nests were found on Ramanote Peak and along Sycamore Canyon (CNF 2000). Both these nests are at least 1.6 km (1 mi) from the proposed ROW. In 2002, another nest was found on Castle Rock, which is within the MSO PAC and within 0.3 km (0.18 mi) of proposed structures. The seasonal restrictions in effect for MSO (SECTION 1.4) will prevent breeding season disturbance of peregrines on Castle Rock.

American peregrine falcons have been found in great numbers in Arizona as well as in areas that will have formerly been considered marginal habitat. This trend suggests that populations in Arizona may have reached levels saturating the optimal habitat available (AGFD 1998f). Placement of the proposed transmission line is not likely to disturb known nesting peregrine falcons. If new nest sites are encountered during construction, conservation measures will be developed in coordination with CNF biologists to prevent adverse effects. Development of the TEP line is not likely to result in a trend toward federal listing or loss of viability of this species.

Five-stripped sparrow (*Aimophila quinquestriata*)
The five-stripped sparrow is found in western portions of northern Sinaloa and Sonora, Mexico and the southeastern most portions of Arizona. This sparrow is primarily found in Mexico, but its range reaches into southeastern Arizona. Here, it is rarely found during breeding season, and there are only a few winter records. Five-stripped sparrow habitat is highly specialized, consisting of tall, dense shrubs on rocky, semi-desert hillsides and canyon slopes (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). Within the Nogales RD, this sparrow has been recorded within Sycamore Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of five-stripped sparrow have declined because of habitat loss, fragmentation, and degradation (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). The proposed TEP transmission line will not cross Sycamore Canyon where these sparrows have been observed. This species is not likely to be affected by the proposed placement of a transmission line within the Nogales RD.

Northern gray hawk (*Asturina nitida maxima*)
The gray hawk is a medium-sized raptor with a gray back, black tail with 2 or 3 white bands, and a finely barred gray and white chest, abdomen, and thighs (Glinski 1998). The gray hawk prefers Sonoran riparian deciduous forest and woodland plant communities and can be found along the Santa Cruz and San Pedro rivers, Sonoita Creek, and Sopori Wash. This species also has been reported from the Hassayampa and Salt rivers. This hawk species is migratory and usually arrives in Arizona in mid-March and returns south during winter months (AGFD 2000k). Gray hawks prefer cottonwood, mesquite, and hackberry woodlands with a prey base of lizards, especially the whiptail lizard *(Cnemidophorus* spp.*)*.

The current population trend for gray hawks is considered stable by the AGFD (2000k). Potential nesting habitat exists along small portions of the proposed TEP transmission line corridor along Sopori Wash. Individual gray hawks may be indirectly impacted by habitat modification from construction activity related to transmission line placement; however, construction within riparian habitats will be minimized to the greatest extent possible. Furthermore, riparian plants within Sopori Wash will be mitigated to facilitate habitat recovery. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)
The western yellow-billed cuckoo is a long and slender bird with short, dark legs that nests from southern California through the northeastern United States, south through the United States to the Florida Keys, Central America and southern Baja California, Mexico. This species winters from South America to central Argentina and Uruguay. Within Arizona, western yellow-billed cuckoo are found in southern and central Arizona and the extreme northeast portion of the state. This species is typically found in streamside areas with cottonwood, willow groves, and larger mesquite bosques (AGFD 1998g). This species has been observed in Sopori Wash and Sycamore, Peck, and Peña Blanca canyons (AGFD 1998g; CNF 2000; P. Titus, T. Furgason, SWCA, pers. comm.16 October 2002).

Populations of western yellow-billed cuckoo have been reduced; a general decline is occurring in all areas with known populations (AGFD 1998g). This species is sensitive to habitat fragmentation and degradation of riparian woodlands due to agricultural and residential development (Hughes 1999). The proposed transmission line may cross potential cuckoo habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted.

Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

3.4 Reptiles and Amphibians

Giant spotted whiptail (*Cnemidophorus burti strictogrammus*)
The giant spotted whiptail is a long, slender lizard found in southeastern Arizona, extreme southwest New Mexico, and northern Sonora, Mexico. Within southeastern Arizona, this lizard is found in Cochise County; the Santa Catalina, Santa Rita, Baboquívari, and Pajarito mountains and in the vicinity of Oracle in Pima County; and in Pinal County. Giant spotted whiptail lizards inhabit mountain canyons, arroyos, and mesas in arid and semi-arid regions, entering lowland deserts along stream courses. They are found in dense shrubby vegetation, often among rocks near permanent and intermittent streams at elevations ranging from near sea level to 1,372 m (4,500 ft). Open areas of bunch grass within these riparian habitats are also occupied (AGFD 2001b).

Giant spotted whiptail populations are thought to be stable and some populations are locally abundant even though this species is limited in distribution (AGFD 2001b). Because the known populations occur outside the project area, the proposed transmission line will have no significant effect on the population status of the giant spotted whiptail.

Lowland leopard frog (*Rana yavapaiensis*)
The lowland leopard frog is found in low elevations in the drainage of the lower Colorado River and its tributaries in Nevada, California, Arizona, New Mexico, northern Sonora and extreme northeast Baja California, Mexico (probably extirpated from California and Nevada). Within Arizona, this frog has been found in the Virginia River drainage in the extreme northwestern part of the state, in the Colorado River near Yuma, and west, central, and southeast Arizona south of the Mogollon Rim. This frog frequents desert, grassland, oak, and oak-pine woodland in permanent pools of foothill streams, rivers, and permanent stock tanks. They typically stay close to water at elevations ranging from 244 to 1,676 m (800 – 5,500 ft) (AGFD 1997b). Within the Nogales RD, this frog has been recorded in Pesquiera and Alamo canyons, California Gulch, Adobe, Temporal Gulch, Big Casa Blanca, Box Canyon, and Gardner Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Lowland leopard frog populations are considered stable in central Arizona but declining in southeast Arizona, and populations have been extirpated from southwestern Arizona. Potential threats to this species are manipulation to major watercourses, water pollution, introduced species (fish, bullfrogs, and crayfish), heavy grazing, and habitat fragmentation (AGFD 1997b). Because no construction will occur within perennial aquatic habitats and known populations occur outside project area, the proposed transmission line will have no significant effect on the population status of the lowland leopard frog.

Mexican garter snake (*Thamnophis eques megalops*)
The Mexican garter snake ranges from southeastern Arizona and extreme southwestern New Mexico, southward into the highlands of western and southern Mexico, to Oaxaca. Within Arizona, this snake occurs in the southeast corner of the state from the Santa Cruz Valley east and generally south of the Gila River. Valid records (post 1980) have recorded this snake in the San Rafael and Sonoita grasslands area and from Arivaca. Mexican garter snakes are most abundant in densely vegetated desert grassland habitat surrounding cienegas, cienega-streams, stock tanks, and in or near water along streams in valley floors and generally open areas, but not in steep mountain canyon stream habitat. This snake is generally found at elevations ranging from 914 to 1,524 m (3,000 – 5,000 ft) but may reach elevations of 2,591 m (8,500 ft) (AGFD 2001c).

Populations of Mexican garter snakes are decreasing, with extirpations at several localities since 1950 as habitat has changed and introduced predators have invaded. Management concerns for this species include predation by introduced bullfrogs and predatory fishes, urbanization and lowered water tables, and habitat destruction, including that due to overgrazing (AGFD 2001c). Because no construction will occur within perennial aquatic habitats and construction within riparian habitats will be minimized, the proposed transmission line will have no significant effect on the population status of the Mexican garter snake.

Western barking frog (*Eleutherodactylus augusti cactorum*)
The western barking frog is a secretive terrestrial frog found in extreme southern Arizona, southeast New Mexico, and central Texas south to the Isthmus of Tehuantepec. In Arizona, this frog historically occurred in Pima and Santa Cruz counties within the Santa Rita and Pajarito mountains. Habitat consists of rocky hillsides of canyons in woodland vegetation at elevations between 1,158 and 2,134 m (3,800 – 7,000 ft). Permanent water is not a necessary component of western barking frog habitat. There are very few records of this species in Arizona, and none have been recorded within the Nogales RD (AGFD 1995b).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of western barking frogs (AGFD 1995b). Because known populations occur outside the project area, the proposed transmission line will have no significant effect on the population status of the western barking frog and is not likely to result in a trend toward listing or loss of viability.

3.5 MAMMALS

Cave myotis (*Myotis velifer*)
The cave myotis is a large bat found in the southwestern half of Arizona and the immediate adjacent parts of California, Nevada, New Mexico, and the northern third of Sonora, Mexico. Within Arizona, this bat is found south of the Mogollon Plateau from Lake Mohave, Burro Creek, Montezuma Well, San Carlos Apache Reservation, and the Chiricahua Mountains south to Mexico. Cave myotis have not been recorded in the extreme southwestern part of the state and are found in small numbers in southeastern

Arizona in the winter. This bat typically prefers desertscrub habitats of creosote, brittlebush, paloverde, and cacti but they sometimes can be found up in pine-oak communities. Cave myotis roost in caves, tunnels, mineshafts, under bridges, and sometimes buildings within a few kilometers of a water source (AGFD 1997c).

Cave myotis colonies are vulnerable at the roost sites, especially maternity roosts, because the congregate in large numbers (AGFD 1997c). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the cave myotis.

Southern pocket gopher (*Thomomys umbrinus intermedius*)
The southern pocket gopher is a small gopher found in extreme southeastern Arizona and southwestern New Mexico, south into Mexico. Within Arizona, this gopher is found primarily in the southern most portion of the state in the oak belt of the Santa Rita, Patagonia, Atascosa, Pajarito, and Huachuca mountains. Southern pocket gophers have been found at Peña Blanca Spring in gravelly soil along a broad wash. Elsewhere, this species is generally found on rocky slopes within open oak woodlands in the lower parts of mountain ranges from 1,372 to 2,743 m (4,500 – 9,000 ft) in elevation. There has been only 1 record for the southern pocket gopher within the Nogales RD, specifically at Peña Blanca Canyon in the Atascosa/Pajarito mountains. However, it is suspected that this species has a much wider range (AGFD 1998h).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of southern pocket gopher (AGFD 1998h). Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

4.0 BLM SENSITIVE SPECIES

Criteria for BLM Sensitive species include those that are:

1. Under status review by the USFWS, or
2. Whose numbers are declining so rapidly that Federal listing may become necessary, or
3. With typically small and widely dispersed populations,
4. Those inhabiting ecological refugia or other specialized or unique habitats.

The potential impacts to BLM Sensitive species were determined based on the habitat conditions within the BLM lands crossed by the proposed action, the life history of the species, and the proposed construction methods. Only those species that have a potential of occurring on or near the BLM parcel were evaluated. The 13 BLM Sensitive species evaluated were identified in the BLM Sensitive species list for Arizona (Instruction Memorandum No. AZ-2000-018) dated 21 April 2000 and are listed in Table4.

TABLE 4. SUMMARY OF EFFECTS ON BUREAU OF LAND MANAGEMENT SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Balloonvine *Cardiospermum corindum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
False grama *Cathestecum erectum brevifolium*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Tumamoc globeberry *Tumamoca macdougalii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Loggerhead shrike *Lanius ludovicianus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Rufous-winged sparrow *Aimophila carpalis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

TABLE 4 (CONTINUED). SUMMARY OF EFFECTS ON BUREAU OF LAND MANAGEMENT SENSITIVE SPECIES.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Western burrowing owl *Athene curnicularia hypugea*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur throughout southwestern U.S.
Texas horned lizard *Phrynosoma cornutum*	No Impacts.	• Known populations occur outside project area.
Big free-tailed bat *Nyctinomops macrotis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
California leaf-nosed bat *Macrotus californicus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Fringed myotis *Myotis thysandodes*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Pocketed free-tailed bat *Nyctinomops femorosaccus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Spotted bat *Euderma maculatum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Underwood's mastiff bat *Eumops underwoodi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.

4.1 PLANTS

Balloonvine (*Cardiospermum corindum*)
This perennial vine is widely distributed in tropical and subtropical regions and is known from the Coyote Mountains in Pima County (Kearny and Peebles 1960). Because potential habitat for this species is widespread, placement of the transmission line may impact individual plants. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

False grama (*Cathestecum erectum* (*brevifolium*))
False grama is a perennial, drought-tolerant grass found on dry hills and plains of Southern Arizona and Northern Mexico. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Tumamoc globeberry (*Tumamoca macdougalii*)
This perennial vine occurs in shade of nurse plants along sandy washes below ~914 m (3,000 ft) in elevation. The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

4.2 BIRDS

Loggerhead shrike (*Lanius ludovicianus*)
The loggerhead shrike occurs in open country with scattered trees and shrubs, savanna, desertscrub and occasionally open woodland (AGFD 2002). In Arizona, this species usually summers throughout open parts of the state below the Transition Zone and is also periodically found along the Mexican border west of Baboquívari Mountains (Phillips et al. 1983). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Rufous-winged sparrow (*Aimophila carpalis*)
The rufous-winged sparrow is classified as a migratory bird and is a resident of eastern Pima County, including Avra Valley, and was once thought to be extirpated in Arizona due to overgrazing but was rediscovered in the Tucson Area in 1936. Rufous-winged sparrows generally use habitats characterized by scattered low shrubs and trees, which provide cover and foraging areas during mid-summer days. Many of these areas contain significant grassland components. Threats to the species include urban development, overgrazing, and exotic species, all of which result in losses of grassland communities utilized by this species (Pima County 2001). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Western burrowing owl (*Athene cunicularia hypugea*)
The Western burrowing owl inhabits heavily grazed tracts of mixed-grass prairie, particularly where there are burrows created by large rodents, such as prairie dogs and Richardson ground squirrels. Distribution extends from southern Canada through the western United States to South America. Arizona is 1 of 3 states that provide important wintering areas for this species (USGS 2003). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur throughout the southwestern United States. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

4.3 Reptiles and Amphibians

Texas horned lizard (*Phrynosoma cornutum*)
The Texas horned lizard occurs from Kansas to extreme southeastern Arizona and lives mainly in sandy areas of deserts, grasslands, prairies, and scrublands (Bartlett and Bartlett 1999) where it often inhabits abandoned animal burrows (Bockstanz 1998). Because known populations occur outside of the project area, the proposed transmission line will have no significant effect on the population status of this species.

4.4 Mammals

Big free-tailed bat (*Nyctinomops macrotis*)
Distribution of the big free-tailed bat occurs from the southwestern United States southward through the Caribbean, Central America, and into the northern part of South America. Northern populations are known to migrate to southern Arizona and Mexico in the fall, yet this species is widely scattered throughout Arizona during the spring and summer too. In Arizona, this bat has been found in pinyon-juniper, Douglas-fir, and Sonoran desertscrub habitats, but it is believed that these locations are foraging sites. Preferred roosting sites include rock crevices and fissures of mountain cliffs in rugged,

rocky areas of desertscrub habitat (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the big free-tailed bat.

California leaf-nosed bat (*Macrotus californicus*)
Distribution of the California leaf-nosed bat in the United States spans southern California, southern Nevada, and southwestern Arizona and extends southward into Mexico, to the southern tip of Baja California, northern Sinaloa, and southwestern Chihuahua. This bat lives predominantly in Sonoran and Mohave desertscrub habitats, but is occasionally found in the Chihuahuan and Great Basin deserts. Daytime roosting sites are usually mines and caves, and nighttime roosts include open buildings, cellars, bridges, porches, and mines. These bats do not hibernate or migrate; therefore, they tend to live in the same area year after year and remain active year-round (AGFD 1993, 2001d; Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the California leaf-nosed bat.

Fringed myotis (*Myotis thysandodes*)
Distribution of the fringed myotis ranges from southern British Columbia, Canada southward throughout the western United States, and down to southern Mexico. It occurs in a variety of habitats – from desertscrub to oak and pinyon woodlands to spruce-fir forests. Roosting sites include caves, mines, and buildings. These bats tend to roost in tight clusters and may change locations periodically in response to thermoregulatory needs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the fringed myotis.

Pocketed free-tailed bat (*Nyctinomops femorosaccus*)
The pocketed free-tailed bat ranges from the southwestern United States (including southern California, Arizona, and New Mexico, and the Trans-Pecos region of Texas), south into Mexico through Baja, Sonora, Durango, and Jalisco to, at least, Michoacan. This bat can be found in the arid lowlands of the desert Southwest, where it roosts in crevices and caves of rugged cliffs, slopes, and rock outcrops (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

Spotted bat (*Euderma maculatum*)

Distribution of the spotted bat ranges throughout centralwestern North America, from southcentral British Columbia down to southern Mexico. In Arizona, its habitat ranges from low desert areas in the Southwest to high desert and riparian habitats in the northwestern part of the state. This bat has also been documented in conifer forests in northern Arizona. Roosting sites are often situated in rock crevices on high cliffs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the spotted bat.

Underwood's mastiff bat (*Eumops underwoodi*)

The range of Underwood's mastiff bat is limited, from south-central Arizona, into the arid lowlands of Sonoran and western Mexico, and into Honduras. It is believed to be a year-round resident of Arizona, ranging from the Baboquívari Mountains down to Organpipe National Monument. This bat prefers Sonoran desertscrub and mesquite/grassland plant communities. Roosting tends to occur in crevices along steep cliffs and sometimes in the cracks of buildings (AGFD 1993). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of this species.

5.0 AGFD WILDLIFE OF SPECIAL CONCERN

AGFD was consulted in regards to state listed special status species and habitats that may be affected by the proposed action. Several state listed special status species and overall wildlife habitat may be affected by the proposed action. The AGFD mission is to conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs. Continued consultation and input from AGFD will ensure that impacts of the proposed action are minimized and mitigation efforts are successful.

Listed in Table 5 are state special status species that may be found in the vicinity of the proposed action, based on AGFD's Heritage Data Management System (HDMS) (1 July 2002). Effects of the proposed action on the majority of these species will be avoided or minimized through mitigation efforts stipulated for federally listed species. However, additional mitigation is recommend for the Sonoran Desert tortoise as 5 individuals were located near the Tinaja Hills area during field surveys of the proposed ROW (HEG 2002, unpublished data).

TABLE 5. SUMMARY OF EFFECTS ON WILDLIFE OF SPECIAL CONCERN IN ARIZONA.

COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Black-bellied whistling duck *Dendrocyna autumnalis*	No Impacts.	• No construction in perennial aquatic habitats.
Crested caracara *Caracara cheriway*	No Impacts.	• Known populations occur outside project area.
Desert tortoise - Sonoran population *Gopherus agassizii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total potential habitat within project area may be impacted. • Pre-construction surveys will minimize impacts to species.
Elegant trogon *Trogon elegans*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Great Plains narrow-mouthed toad *Gastrophryne olivacea*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Mexican long-tongued bat *Choeronycteris mexicana*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total potential habitat within project area may be impacted. • Mitigation plantings of agaves will reduce impacts.

TABLE 5 (CONTINUED). SUMMARY OF EFFECTS ON WILDLIFE OF SPECIAL CONCERN IN ARIZONA.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Mexican vine snake *Oxibelis aeneus*	No Impacts.	• Known occurrences are outside project area.
Osprey *Pandion haliaetus*	No Impacts	• No construction in perennial aquatic habitats.
Rose-throated becard *Pachyramphus aglaiae*	No Impacts.	• Known occurrences are outside project area.
Thick-billed kingbird *Tyrannus crassirostris*	No Impacts	• No potential habitat within project area.
Tropical Kingbird *Tyrannus melancholicus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

Black-bellied whistling duck (*Dendrocyna autumnalis*)
The black-bellied whistling duck is "goose-like" with a long neck and long pink legs. This species has a cinnamon or chestnut breast and back with a black belly and bright coral-red bill. The total range for this species is from the Gulf coast and lower Rio Grande Valley of Texas and central Arizona south through Mexico, Central America to southern Brazil. In Arizona, the range for the black-bellied whistling duck is southeastern and central Arizona. Black-bellied whistling ducks are commonly seen in the Santa Cruz Valley, particularly in ponds near and around Nogales. The habitat for this species consists of the banks of rivers, lakes, ponds, riparian areas, and stock tanks (Brown 1985).

Because of habitat loss and apparent population declines from historic levels, the black-bellied whistling duck has been placed on the AGFD Threatened Native Wildlife of Arizona List as a candidate species. This species appears to be increasing in Arizona in urban settings at man-made ponds and at sewage treatment plants. It also appears to be stable at some private ranch ponds, which tend to be isolated from hunting pressure (Corman 1994).

Because no construction will occur in perennial aquatic habitats, the proposed transmission line will have no effect on the population status of the black-bellied whistling duck.

Crested caracara (*Caracara cheriway*)
The crested caracara is a medium sized raptor with bold black and white plumage and a bright yellow-orange face and legs. The crested caracara ranges from southern Arizona

and northern Mexico to Tierra del Fuego. In the United States, it occurs only along the southern border in Texas and Arizona, and in Florida, where there is an isolated population in the south-central peninsula. In Arizona, their range extends up from San Miguel in the Baboquivari Valley north to Quijotoa, Sells, and Coyote Pass. This raptor occurs regularly on the Tohono O'odham Indian Reservation. Small groups of crested caracara are seen in Sasabe and south of the Mexican border near Sonoyta, Sonora. This raptor is found in open habitats, typically grassland, prairie, pastures, or desert with scattered taller trees, shrubs, or cacti. The crested caracara is found in areas characterized by low-profile ground vegetation and scattered tall vegetation. Specifically in Arizona, vegetation consists of saguaro, mesquite, paloverde, cholla and acacia (Morrison 1996).

Arizona populations of crested caracara on the Tohono O'odham Reservation are likely stable because few threats exist. Reports of individual, and in some cases groups, of this raptor outside of the reservation indicate that its range within Arizona is probably as extensive as it was historically. No apparent threat currently exits to Arizona populations; however, the AGFD has listed the crested caracara as a threatened native wildlife. This species is considered vulnerable if habitat conditions worsen (Morrison 1996).

Habitat surveys did not detect the presence of any bird of prey nests along the corridor. Furthermore, no know populations of this species occur within the project area. Therefore, the proposed action will have no effect on the population status of the crested caracara.

Desert tortoise (Sonoran) (*Gopherus agassizii*)
The Sonoran Desert tortoise ranges from northern Sinaloa, Mexico to southern Nevada and southwestern Utah, and from southcentral California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act. The threatened Mojave population occurs north and west of the Colorado River and the unlisted Sonoran population occurs south and east of the Colorado River. Within Arizona, the Sonoran Desert tortoise is found south and east of the Colorado River from Mojave County to the south, beyond the International Boundary and many scattered locations in between. The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desertscrub at elevations ranging from 152 to 1,615 m (500 – 5,300 ft). Burrows and shelter sites are generally below rocks and boulders, in rock crevices, under vegetation, and also in caliche caves of incised wash banks (AGFD 2001e).

Several threats to tortoise populations in the Sonoran Desert have been identified, including habitat fragmentation, habitat loss and degradation from urban and agricultural development and roads, wildfires associated with invasion of non-native grasses and forbs, illegal collection, and genetic contamination of wild populations by escaped or released captives. Although current evidence suggests that Arizona populations are stable there are substantial gaps in available data (Arizona Interagency Desert Tortoise Team 1996).

During ground surveys of the proposed transmission line corridor, 5 desert tortoise were found (HEG, unpublished data). Per recommendations of Spencer and Humphrey (1999) for any ground disturbing projects, surveys should be conducted a minimum of 48 hours prior to grading and again just prior (as it is occurring) to vegetation clearing (Desert Tortoise Council 1999). While the proposed action may have a minimal effect on the potential habitat of this species, pre-construction surveys will minimize impacts to individual tortoise and is therefore not likely to result in a trend toward listing or loss of viability.

Elegant trogon (*Trogon elegans*)
The elegant trogon is a medium sized bird with a round head, large eyes, a white band on an iridescent green breast, black face and throat, red belly and undertail coverts. The total range for this bird is from southern Arizona and New Mexico south through Mexico to southern Nicaragua to northwestern Costa Rica. In Arizona, the elegant trogon is found in sky island mountains, most commonly the Atascosa, Chiricahua, Huachuca, and Santa Rita mountains. Elegant trogons are found in riparian areas consisting of sycamore, cottonwood, and oak, and also in coniferous woodlands at elevations ranging from 1,036 to 2,073 m (3,400 – 6,800 ft) (AGFD 2001f).

Population trends for the elegant trogon are not well known. No evidence indicates population declines in any of the core canyons occupied over the past few decades. Threats to this species include degradation and loss of native riparian habitat through stream diversion, groundwater withdrawal, erosion, and overgrazing (AGFD 2001f).

The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual trogons, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Great Plains narrow-mouthed toad (*Gastrophryne olivacea*)
The Great Plains narrow-mouthed toad is a small, stout toad with stubby limbs, a small pointed head with a fold of skin on the back of the head. The total range for this species is from southeastern Nebraska and Missouri south through Texas to western Mexico. Within Arizona, the Great Plains narrow-mouthed toad is found in the vicinity of Santa Cruz County, Pima County, to near Casa Grande, Arizona in Pinal County. Habitat for this species in Arizona consists of mesquite semi-desert grassland communities to oak woodland communities near riparian areas at elevations ranging from sea level to around 1,250 m (4,100 ft) (AGFD 1995c).

Population trends for the Great Plains narrow-mouthed toad are currently unknown. Populations in Arizona are at the extreme northwestern edge of the species range and distribution is limited throughout its range (AGFD 1995c). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mexican long-tongued bat (*Choeronycteris mexicana*)
The Mexican long-tongued bat has a long, slender nose with a leaf-like structure on the base of the nose. The total range for this species is from southeastern Arizona, southwestern New Mexico, and California south through Central America to Venezuela. In Arizona, the Mexican long-tongued bat is found from the Chiricahua Mountains extending as far north as the Santa Catalina Mountains and west to the Baboquivari Mountains. Habitat for this bat is typically within canyons of mixed oak-conifer forests in mountains at elevations ranging from 1,082 to 2,231 m (3,550 – 7,320 ft) (AGFD 1994). This species do not congregate in sizeable maternity or bachelor colonies like *Leptonycteris* bats do (Hoffmeister 1986). They feed on nectar and pollen, especially from paniculate agaves (AGFD 1994).

Populations of Mexican long-tongued bats in Arizona appear to be highly variable (AGFD 1994) and there is no evidence of a long-term decline or any clear trend. The limitation of riparian zones and the distribution of food plants may limit populations of this species in Arizona and loss of riparian vegetation may be a greater threat to this species than human disturbance at particular roost sites (Pima County 2001). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during construction; however, these disturbances will be isolated and will impact only a small percentage of potential habitat. Furthermore, transplanting of agave plants also will minimize impacts. Impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mexican vine snake (*Oxibelis aeneus*)
The Mexican vine snake has an elongated head, pointed snout, and is thin bodied with an ash gray to yellow-brown and tan coloring. The total range for this species is from extreme southern Arizona south to Brazil. In Arizona, this species occurs in the Tumacacori, Pajarito, and Patagonia mountains in Santa Cruz County. Habitat for the Mexican vine snake consists of brush-covered hillsides and riparian areas with sycamore, oak, walnut and wild grape trees at elevations ranging from 914 to 1,768 m (3,000 – 5,800 ft) (AGFD 1991b).

Population trends for the Mexican vine snake are currently unknown. Populations in Arizona are at the extreme northern edge of the species range and distribution is limited, with occurrences known from Sycamore Canyon (AGFD 1991b). A potential threat is the high interest by collectors for this species (AGFD 1991b). Because known occurrences of this species are outside the project area, the proposed action will have no effect on the population status of the Mexican vine snake.

Osprey (*Pandion haliaetus*)
This raptor is dark brown on its back and white on the underparts with a prominent dark eye stripe. The total range for the osprey is from Alaska to Newfoundland, along the Atlantic and Pacific coastlines, and in the Rocky Mountains south through central and South America. Within Arizona, the osprey occurs primarily in the White Mountains, along the Mogollon Rim, and along the Salt and Verde rivers. In southeastern Arizona, this raptor is an uncommon spring and fall transient, usually seen at ponds and reservoirs. Nesting habitat of the osprey consists of coniferous trees along rivers and lakes at elevations ranging from 1,829 to 2,377 m (6,000 – 7,800 ft) (AGFD 1997d).

Osprey population trends in Arizona are not well known. Only about 20 nest sites are known in the southwest, all within Arizona. This raptor is threatened by loss of nesting habitat and foraging perch sites. It is also threatened by recreational use of nesting habitat, shooting, and pesticide poisoning on wintering grounds (AGFD 1997d).

Because no construction will occur in perennial aquatic habitats, the proposed action will have no effect on the population status of the osprey.

Rose-throated becard (*Pachyramphus aglaiae*)
The rose-throated becard is a big-headed, thick billed bird that breeds in southeast Arizona, southern Texas (rare visitor along the Rio Grande), south through Mexico to Costa Rica. This species winters from northern Mexico south through to its breeding range. Within Arizona, rose-throated becards have been found breeding along Sonoita and Arivaca creeks, Sycamore Canyon (Atascosa Mountains), and Patagonia. Historically, this species nested in Guadalupe Canyon (east of Douglas) and near Tucson. Rose-throated becards typically inhabit marshes of Sonoran desertscrub communities of open to dense vegetation of shrubs, low trees, and succulents dominated by paloverde, prickly pear, and saguaro. This species also is found in the desert riparian deciduous woodland communities of marsh-woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of deciduous trees and shrubs along the margins. In Arizona, the rose-throated becard is found at elevations ranging from 1,082 to 1,228 m (3,550 – 4,030 ft) (AGFD 2001g).

Population trends for the rose-throated becard are currently unknown. Potential threats to this species include disturbance from bird watchers and degradation and loss of native riparian habitat through overgrazing, urban development, and groundwater depletion (AGFD 2001g). Because known occurrences of this species are outside the project area, the proposed action will have no effect on the population status of the rose-throated becard.

Thick-billed kingbird (*Tyrannus crassirostris*)
The thick-billed kingbird is a relatively stocky flycatcher with a large head and heavy bill. This kingbird occurs from southeastern Arizona and southwestern New Mexico

south through western Mexico to western Guatemala. In Arizona, thick-billed kingbirds are most often seen around Sonoita and Arivaca creeks and in Madera and Guadalupe canyons. This species may occur in mountains of Pima, Santa Cruz and Cochise counties where there are drainages with well-developed riparian areas. Habitat for the thick-billed kingbird consists of broad-leaved, riparian forests usually with well-developed large sycamores and cottonwoods at elevations ranging from 914 to 1,981 m (3,000 – 6,,500 ft) (Tibbitts 1991).

Present distribution of the thick-billed kingbirds in Arizona is very limited. Potential threats include human recreational activities, encroachment of human development into breeding habitat, woodcutting, grazing, and groundwater depletion (Tibbitts 1991). Because no potential habitat occurs within the project area, the proposed action will have no effect on the population status of the thick-billed kingbird.

Tropical Kingbird (*Tyrannus melancholicus*)
The tropical kingbird is a large tyrant-flycatcher with a large bill and long, slightly notched tail. The tropical kingbird ranges from southeastern Arizona through western and central Mexico to central Argentina. Breeding birds have been found in Tucson, along the Santa Cruz Valley from Green Valley south, east of Phoenix in the Salt River Valley, to the San Pedro Valley. This species also has been reported from Sopori Wash. The Tropical Kingbird inhabits open and semi-open areas with scattered trees and shrubs. Also found in urban areas and roadsides with tall human-made fixtures (Stouffer and Chesser 1998).

Tropical kingbirds seem to persist or even thrive in developed areas. No negative effects of human activities have been reported (Stouffer and Chesser 1998). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual tropical kingbirds, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts to tropical kingbirds are not likely to result in a trend toward federal listing or loss of viability.

6.0 LITERATURE CITED

Abbate, D. J., A. Ditty, W. S. Richardson, and R. Olding. 1996. Cactus ferruginous pygmy-owl surveys and nest monitoring in the Tucson Basin area, Arizona. Final Report Internal Enhancement #U95503. Arizona Game and Fish Department, Phoenix, Arizona.

______, W. S. Richardson, R. L. Wilcox, M. J. Terrio, and S. M. Belhumeur. 1999. Cactus ferruginous pygmy-owl investigations in Pima and Pinal Counties, Arizona: 1997-1998. Region V Wildlife Program. Arizona Game and Fish Department, Tucson, AZ. 83 pp.

______, _______, ______, and S. Lantz. 2000. Cactus ferruginous pygmy-owl investigations in Pima and Pinal Counties, Arizona: 1999. Region V Wildlife Program. Arizona Game and Fish Department, Tucson, AZ. 37 pp.

Aiken, C. E. H. 1937. (E.R. Warren, Ed.). Birds of the Southwest. Colorado College Publication, General Series No. 212:1-73.

Alcorn, S. M., S. E. McGregor and G. Olin. 1962. Pollination requirements of the organpipe cactus. Cactus and Succulent Journal 34(5): 135-138.

Allison, L. J., J. Rourke, and T. McCarthey. 2000. Characterizing vegetation in nesting and non-nesting plots for southwestern willow flycatchers within the same patch of continuous riparian vegetation. Page 15 *in* Abstracts of presented papers and posters, The Ecology and Conservation of the Willow Flycatcher, 24-26 October 2000, Arizona State University, Tempe, AZ.

American Ornithologists' Union. 1957. Check-list of North American birds, 5th ed. American Ornithologists' Union, Baltimore, MD.

Anderson, D.E., O.J. Rongstad, and W.R. Mytton. 1990. Home range changes in post-breeding raptors exposed to increased human activity levels in southeastern Colorado. Wildlife Society Bulletin. 18: 134-142.

Arizona Game and Fish Department (AGFD). 1988. Threatened native wildlife in Arizona. Arizona Game and Fish Department, Phoenix, AZ. 32 pp.

______. 1991a. Chiltepine (*Capsicum annuum* var.*glabriusculum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 1991b. Mexican vine snake (*Oxibelis aeneus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 2 pp.

______. 1992. Sweet acacia (*Acacia smallii*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1993. Arizona wildlife views – bats of Arizona. Volume 36, Number 8. 36 pp.

______. 1994. Mexican long-tongued bat (*Choeronycteris mexicana*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1995a. Report on Sonora chub collection in California Gulch. Arizona Game and Fish Department, Phoenix, AZ.

______. 1995b. Western barking frog (*Eleutherodactylus augusti cactorum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1995c. Great Plains narrow-mouthed toad (*Gastrophryne olivacea*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1996. Species of Special Concern. Arizona Game and Fish Department, Phoenix, AZ.

______. 1997a. Bartram's stonecrop (*Graptopetalum beartramii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1997b. Lowland leopard frog (*Rana yavapaiensis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1997c. Cave myotis (*Myotis velifer*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1997d Osprey (*Pandion haliaetus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998a. Beardless chinch weed (*Pectis imberbis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 1998b. Gentry indigo bush (*Dalea tentaculoides*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1998c. Large-flowered blue star (*Amsonia grandiflora*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 9 pp.

______. 1998d. Santa Cruz beehive cactus (*Coryphantha recurvata*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 1998e. Santa Cruz striped agave (*Agave parviflora* ssp. *parviflora*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998f. American peregrine falcon (*Falco peregrinus anatum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998g. Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1998h. Southern pocket gopher (*Thomomys umbrinus intermedius*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1999a. Alamos deer vetch (*Lotus alamosanus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999b. Catalina beardtongue (*Penstemon discolor*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999c. Chihuahuan sedge (*Carex chihuahuensis*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999d. Chiricahua Mountain brookweed (*Samolus vagans*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999e. Nodding blue-eyed grass (*Sisyrinchium cernuum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 1999f. Santa Cruz star leaf (*Choisya mollis*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999g. Supine bean (*Macroptilium supinum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999h. Thurber hoary pea (*Tephrosia thurberi*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999i. Virlet paspalum (*Paspalum virletii)*. Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1999j. Weeping muhly (*Muhlenbergia xerophila*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999k. Woolly fleabane (*Laennecia eriophylla*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000a. Arid throne fleabane (*Erigeron arisolis*). Unpublished draft abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000b. Arizona giant sedge (*Carex ultra*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 2000c. Foetid passionflower (*Passiflora foetida*). Draft Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000d. Lumholtz nightshade (*Solanum lumholtzianum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000e. Mock-pennyroyal (*Hedeoma dentatum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2000f. Seeman groundsel (*Senecio carlomasonii*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2000g. Sonoran noseburn (*Tragia laciniata*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000h. Superb beardtongue (*Penstemon superbus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2000i. Thurber's morning glory (*Ipomiea thurberi*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000j. Wiggins milkweed vine (*Metastelma mexicanum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000k. Northern gray hawk (*Asturina nitida maxima*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 2001a. Arizona metalmark (*Calephelis rawsoni arizonensis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2001b. Giant spotted whiptail (*Cnemidophorus burti strictogrammus*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2001c. Mexican garter snake (*Thamnophis eques megalops*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2001d. California leaf-nosed bat (*Macrotus californicus*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 2001e. Sonoran Desert tortoise (*Gopherus agassizii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 2001f. Elegant trogon (*Trogon elegans*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2001g. Rose-throated becard (*Pachyramphus aglaiae*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2002. Loggerhead shrike *(Lanius ludovicianus)*. Draft unpublished animal abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

Arizona Interagency Desert Tortoise Team. 1996. Management plan for the Sonoran Desert population of the desert tortoise in Arizona.

Avian Power Line Interaction Committee (APLIC). 1996. Suggested practices for raptor protection on power lines: the state of the art in 1996. Edison Electric Institute and Raptor Research Foundation. Washington, D.C.

Bagley, B. E., D. A. Hendrickson, F. J. Abarca, and S. Hart. 1991. Status of the Sonoran topminnow *(Poeciliopsis occidentali*s) and desert pupfish *(Cyprinodon macularius*) in Arizona. Special Report on Project E5-2, Job 9, Title VI of the Endangered Species Act. Arizona Game and Fish Department, Phoenix, AZ.

Bahre, C. J. 1991. A legacy of change. Historic human impact on vegetation in the Arizona borderlands. University of Arizona Press, Tucson, AZ.

Baird, S. F. and C. Girard. 1853. Description of new species of fishes collected by Mr. John H. Clark, on the U.S.-Mexican boundary survey, under Lt. Col. Jas. D. Graham. Proceedings of the Academy of Natural Sciences of Philadelphia 6: 387-390.

Bartlett, P. and R. Bartlett. 1999. A field guide to Texas reptiles and amphibians. Gulf Publishing Company, Houston, TX.

Bell, G. 1984. Sonora chub, Sycamore Canyon. memo, USDA Forest Service, Coronado National Forest, Nogales, AZ. 13pp.

Belnap, J. 1992. Potential role of cryptobiotic soil crusts in semiarid rangelands. Paper presented at the Symposium on Ecology, Management, and Restoration of Intermountain Annual Rangelands, Boise, ID, May 18-22, 1992.

Belsky, A. J., and D. M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the interior west. Conservation Biology 11(2): 315-327.

Bendire, C. E. 1892. *Glaucidium phalænoides* (Daudain), Ferruginous pygmy owl. Pages 409-411 *In* Life Histories of North American Birds with special reference to their habits and eggs. Smithsonian Institute, U.S. National Museum Special Bulletin No. 1.

Berger L., R. Speare, P. Daszak, D. E. Green, A. A. Cunningham, C.L. Goggins, R. Slocombe, M. A. Ragan, A. D. Hyatt, K. R. McDonald, H. B. Hines, K. R. Lips, G. Marantelli, and H. Parkes. 1998. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. Proceedings of the National Academy of Science, USA 95: 9031-9036.

Bevanger, K. 1994. Bird interactions with utility structures: collision and electrocution, causes and mitigating measures. Ibis 54: 419-431.

Blackburn, W. H. 1984. Impacts of grazing intensity and specialized grazing systems on watershed characteristics and responses. Pages 927-983 *In* Developing strategies for rangeland management. National Research Council/National Academy of Sciences. Westview Press, Boulder, CO.

Bloomquist, S. M., K. J. Field, and M. J. Sredl. 2002. General Visual Encounter Survey Protocol, Chiricahua leopard frog. Guidelines published for the Arizona Game and Fish Department, Phoenix, Arizona.

Bockstanz, Lori. 1998. Herps of Texas – lizards: Texas Horned Lizard (*Phrynosoma cornutum*). http://www.zo.utexas.edu/research/txherps/lizards/phrynosoma.cornutum.html. 22 September 1999.

Brooks, J. E. 1985. Factors affecting the success of Gila topminnow introductions on four Arizona National Forests. Report to U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico. Arizona Game and Fish Department, Phoenix, AZ.

______. 1986. Status of natural and introduced Sonoran topminnow *(Poeciliopsis o. occidentalis)* populations in Arizona through 1985. Report to U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico. Arizona Game and Fish Department, Phoenix, AZ.

Brown, D. E., C. H. Lowe, and J. F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona *In* R. R. Johnson and D. A. Jones [Eds.], Importance, preservation, and management of riparian habitats: a symposium. General Technical Report RM-43. USDA Forest Service, Denver, CO.

______. 1983a. On the status of the jaguar in the Southwest. Southwestern Naturalist 28: 459-460.

______. 1983b. The wolf in the southwest. University of Arizona Press, Tucson, AZ. 195 pp.

______. 1985. Black-bellied whistling duck. Pages 110 – 112 *In* Arizona Wetlands and Waterfowl. The University Press, Tucson, AZ.

______. 1991. Revival for El Tigre? Defenders 66(1): 27-35.

______. (Ed.). 1994. Biotic communities: southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City, UT. 342 pp.

Brown, M. and F. J. Abarca. 1992. An update status report of the Sonoran topminnow, *Poeciliopsis occidentali*s, and desert pupfish, *Cyprinodon macularius*, in Arizona. Arizona Game and Fish Department, Phoenix.

Browning, M. R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). Western Birds 24: 241-257.

Busby, F. E. and G. F. Gifford. 1981. Effects of livestock grazing on infiltration and erosion rates measured on chained and unchained pinyon-juniper sites in southeastern Utah. Journal of Range Management 34: 400-405.

Carpenter, J. 1992. Summer habitat use of Sonora chub in Sycamore Creek, Santa Cruz County, Arizona. M.S. Thesis, University of Arizona, Tucson. 83 pp.

______. and O.E. Maughan. 1993. Macrohabitat of Sonora chub *(Gila ditaeni*a) in Sycamore Creek, Santa Cruz County, Arizona. Journal of Freshwater Ecology 8: 265-278.

Cartron, J. E., W. S. Richardson, and G. A. Proudfoot. 2000a. The cactus ferruginous pygmy-owl: taxonomy, distribution, and natural history. Pages 5-15 *In* J. E. Cartron and D. M. Finch [Eds.], Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. Gen. Tech. Rpt. RMRS-GTR-43. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT. 68 pp.

Cartron, J. E., S. H. Soleson, S. Russell, G. A. Proudfoot, and W. S. Richardson. 2000b. The ferruginous pygmy-owl in the tropics and at the northern end of its range: habitat relationships and requirements. Pages 47-53 *In* J. E. Cartron and D. M. Finch [Eds.], Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. Gen. Tech. Rpt. RMRS-GTR-43. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT.

Chapman, D. W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117: 1-21.

Clarkson, R. W. and J. C. Rorabaugh. 1989. Status of leopard frogs *(Rana pipiens* Complex) in Arizona and southeastern California. Southwestern Naturalist 34(4): 531-538.

Cockrum, E.L. 1991. Seasonal distribution of northwestern populations of the long-nosed bat, *Leptonycteris sanborni*, Family Phyllostomidae. Anales Inst. Biol. Univ. Nac. Auton. Mexico, Ser. Zool. 62(2): 181-202.

Constantine, D.G. 1966. New bat locality records from Oaxaca, Arizona and Colorado. Journal of Mammalogy 47(1): 125-126.

______. 1998. Range extensions of ten species of bats in California. Bulletin of Southern California Academy of Science 97(2): 49-75.

Constantz, G. D. 1974. Reproductive effort in *Poeciliopsis occidentalis* (Poeciliidae). Southwestern Naturalist 19: 47-52.

______. 1975. Behavioral ecology of mating in the male Gila topminnow, *Poeciliopsis occidentalis* (Cyprinodontiformes: Poeciliidae). Ecology 56: 966-973.

______. 1976. Life history strategy of the Gila topminnow, *Poeciliopsis occidentali*s: a field evaluation of theory on the evolution of life histories. Ph.D. Dissertation, Arizona State University, Tempe.

______. 1979. Life history patterns of a livebearing fish in contrasting environments. Oecologia 40: 189-201.

______. 1989. Reproductive biology of poeciliid fishes. Pages 33-50 *In* G. K. Meffe and F. F. Snelson Jr. [Eds.], Ecology and Evolution of Livebearing Fishes (Poeciliidae). Prentice Hall, Englewood Cliffs.

Corman, T. E. 1994. Black-bellied whistling duck. Page 18 *In* Nongame Field Notes. AGFD Wildlife News, Arizona.

Coronado National Forest (CNF). 2000. FY 1999 Annual monitoring and evaluation report. Coronado National Forest report, 27 pp.

Coues. E. 1872. A new bird to the United States. American Naturalist 6: 370.

Cox, J. R., H. L. Morton, T. N. Johnsen, Jr., G. L. Jordan, S. C. Martin, and L. C. Fierro. 1984. Vegetation restoration in the Chihuahuan and Sonoran Deserts of North America. Rangelands 6: 112-116.

______. and G. B. Ruyle. 1986. Influence of climatic and edaphic factors on the distribution of *Eragrostis lehmanniana* Nees. in Arizona, U.S.A. Journal of the Grassland Society of South Africa 3: 25-29.

Dalton, V. M. and D. C. Dalton. 1993. Assessment of the impacts of low-level military aircraft on *Leptonycteris curasoae*, an endangered bat, at Organpipe Cactus National Monument, Arizona. Contract Nos. USAF/Luke AFB F0260492MS359 and NPS/ORPI O.M. 1443 PX866092081. Report to Organpipe Cactus National Monument and 58th Civil Eng. Sq. Luke AFB. 54 pp.

Dalton, V. M., D .C. Dalton and S. L. Schmidt. 1994. Roosting and foraging use of a proposed military training site by the long-nosed bat, *Leptonycteris curasoae*. Contract Nos. DACA65-94-M-0831 and DACA65-94-M-0753. Report to Luke Air Force Natural Resources Program. 34 pp.

Davidson, C. 1996. Frog and toad calls of the Rocky Mountains. Library of Natural Sounds, Cornell Laboratory of Ornithology, Ithaca, NY.

Davidson, D., A. P. Pessier, J. E. Longcore, M. Parris, J. Jancovich, J. Brunner, D. Schock, and J. P. Collins. 2000. Chytridiomycosis in Arizona (USA) tiger salamanders. Page 23 *In* Conference and Workshop Compendium: Getting the Jump! On amphibian disease. Cairns, Australia, August 2000.

DeBano, L. F. and L. J. Schmidt. 1989. Interrelationships between watershed condition and health of riparian areas of southwestern United States. Pages 45-52 *In* M. T. Billings, R. E. Gresswell, B. A. Barton, and J. L. Kershner [Eds.], Practical approaches to riparian resource management. An educational workshop. May 8-11, 1989. U.S. Bureau of Land Management, Billings, MT.

Declining Amphibian Populations Task Force. 1993. Post-metamorphic death syndrome. Froglog 7: 1-2.

Degenhardt, W. G., C. W. Painter, and A. H. Price. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press, Albuquerque, NM.

Delaney, D. K., T. G. Grubb, P. Beier, L. L. Pater, and M. H. Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. Journal of Wildlife Management 63: 60-76.

Desert Tortoise Council. 1994 (Revised 1999). Guidelines for handling desert tortoises during construction projects. Edward L LaRue, Jr. [Ed.]. Wrightwood, CA. 19 pp.

Dickerman, R. W. 1997. Geographic variation in southwestern U.S. and Mexican spotted owls, with the description of a new subspecies. Pages. 45-55 *In* R.W. Dickerman (Compiler), The era of Allan R. Phillips: A festschrift. Horizon Communications, Albuquerque, NM.

Drost, C. A., M. K. Sogge, and E. Paxton. 1998. Preliminary diet study of the endangered southwestern willow flycatcher. Report to U. S. Bureau of Reclamation. USGS, Biological Resources Division/Colorado Plateau Research Station, Flagstaff, AZ. 26 pp.

Fleming, T. H. 1991. Nectar corridors and the diet of migratory nectarivorous bats. Bat Research News 33: 71.

______. 1994. Lesser long-nosed bat recovery plan. U. S. Fish and Wildlife Service, Albuquerque, NM. 49 pp.

______. 1995. Lesser long-nosed bat recovery plan. U.S. Fish and Wildlife Service. Albuquerque, NM. Page 29.

Forrest, R. E. 1992. Habitat use and preference of Gila topminnow. M.S. Thesis, University of Arizona, Tucson, AZ.

Ganey, J. L. 1998. Spotted owl. Pages 170-174 *In*: R.L. Glinski [Ed.], The raptors of Arizona. University of Arizona Press, Tucson, AZ.

______. and R. P. Balda. 1989. Distribution and habitat use of Mexican spotted owls in Arizona. Condor 91: 355-361.

______, ______, J. K. Dwyer, B. E. Strohmeyer, and J. S. Jenness. 1998. Dispersal movements and survival rates of Mexican spotted owls in northern Arizona. Wilson Bull. 110: 206-217.

______ and J. L. Dick, Jr. 1995. Habitat relationships of the Mexican spotted owl: Current knowledge. Chapter 4 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

______, R. B. Duncan, and W. M. Block. 1992. Use of oak and associated woodlands by Mexican spotted owls in Arizona. Pages 125-128 *In* P. F. Ffolliot, G. J. Gottfried, D. A. Bennett, V. M. Hernandez, C. A. Ortega-Rubio, and R. H. Hamre [Tech. Coords.], Ecology and management of oak and associated woodlands: perspectives in the southwestern United States and Mexico. Gen. Tech. Rep. RM-218, U.S. Forest Service, Ft. Colins, CO.

Gentry, H. S. 1982. Agaves of Continental North America. University of Arizona Press, Tucson, AZ. Pages 443-447 and 538-545.

Gerking, S. D. and D. V. J. Plantz. 1980. Size-biased predation by the Gila topminnow, *Poeciliopsis occidentalis* (Baird and Girard). Hydrobiologia 72: 179-191.

Gifford, G. F. and R. H. Hawkins. 1978. Hydrologic impact of grazing on infiltration: a critical review. Water Resour. Res. 14: 305-313.

Glenn, W. 1996. Eyes of fire: encounter with a borderlands jaguar. Printing Corner Press, El Paso, TX.

Glinski, R. L. 1998. The raptors of Arizona. Arizona Game and Fish Department and University of Arizona Press, Tucson, AZ. 220 pp.

Goldman, E. A. 1932. The jaguars of North America. Proc. Biol. Soc. Washington 45: 143-146.

Green, L. R. 1977. Fuelbreaks and other fuel modifications for wildland fire control. Agric. Handb. 499. Washington, DC: U.S. Department of Agriculture, Forest Service. 79 pp.

Greenberg, C. H.; Crownover, S. H.; Gordon, D. R. 1997. Roadside soils: a corridor for invasion of xeric scrub by nonindigenous plants. Natural Areas Journal. 17(2): 99-109.

Gucinski, H.; M. J. Furniss, R. R. Ziemer, and M. H.Brookes. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 pp.

Gunderson, D. R. 1968. Floodplain use related to stream morphology and fish populations. Journal of Wildlife Management 32(3): 507-514.

Gutiérrez, R. J., A. B. Franklin, and W. S. Lahaye. 1995. Spotted owl (*Strix occidentalis*). North American Birds No. 179 (A Poole and F. Gill, eds.). Acad. Nat. Sci, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Hale, S. F., and C. J. May. 1983. Status report for *Rana tarahumarae* Boulenger. Arizona Natural Heritage Program, Tucson. Report to Office of Endangered Species, U.S. Fish and Wildlife Service, Albuquerque, NM.

______. and J. L. Jarchow. 1988. The status of the Tarahumara frog *(Rana tarahumarae*) in the United States and Mexico: part II. Report to the Arizona Game and Fish Department, Phoenix, Arizona, and the Office of Endangered Species, U.S. Fish and Wildlife Service, Albuquerque, NM.

______. 1992. A survey of the historic and potential habitat for the Tarahumara frog, (*Rana tarahumarae*) in Arizona. Report to the Arizona Game and Fish Department, Phoenix, AZ.

Hall, E. R. 1981. The mammals of North America. Second Edition. John Wiley and Sons, New York, 2:601-1181 + 90.

Harness, R. E. and K. R. Wilson. 2000. Raptor electrocutions and outages: a review of rural utility records spanning 1986-1996. Pages 765-771 *In* R. D. Chancellor and B. U. Meyburg [Eds.], Raptors at risk. Hancock House Publishers, Blaine, WA.

Harris, L. K. and R. B. Duncan. 1998. Cactus ferruginous pygmy-owl 1998 survey of southern Arizona, final report. United States Fish and Wildlife Service grant agreement # 1448-20181-98-G915. 39 pp.

______. and ______. 1999. Pima County cactus ferruginous pygmy-owl survey, final report. Pima County Government Contract #07-26-H-125828-0499. 78 pp.

Harvey, M. J., J. S. Altenbach, and T. L. Best. 1999. Bats of the United States. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service – Asheville Field Office. 64 pp.

Hatten, J., C. Paradzick, and M. Sumner. 2000. Constructing a nest-site suitability model for the southwestern willow flycatcher in Arizona. Page 20 *In* Abstracts of presented papers and posters, The Ecology and Conservation of the Willow Flycatcher, 24-26 October 2000, Arizona State University, Tempe.

Hayward, B. and E. L. Cockrum. 1971. The natural history of the western long-nosed bat, *Leptonycteris sanborni*. Western New Mexico University, Research Science 1(2): 74-123.

Heath, W. G. 1962. Maximum temperature tolerance as a function of constant temperature acclimation in the Gila topminnow, *Poeciliopsis occidentali*s. Ph.D. Dissertation, University of Arizona, Tucson.

Hendrickson, D. A. and L. Juarez-Romero. 1990. Los peces de la cuenca del Rio de la Concepcion, Sonora, Mexico, y el estatus del charalito Sonorense, *Gila ditaeni*a, una especie en amenaza de extincion. Southwestern Naturalist 35(2): 177-187.

Hillis, D. M., J. S. Frost, and D. A. Wright. 1983. Phylogeny and biogeography of the *Rana pipens* complex: a biochemical evaluation. Systematic Zoology. 32(2): 132-143.

Hoffmeister, D. F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, AZ. 602 pp.

Howell, D. J. and B. S. Roth. 1981. Sexual reproduction in agaves: the benefits of bats; cost of semelparous advertising. Ecology 62: 3-7.

Howell, S. N. G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, NY. 851 pp.

Hubbs, C. L. and R. R. Miller. 1941. Studies of the fishes of the order Cyprinodontes. XVII – genera and species of the Colorado River system. Occasional Papers of the Museum of Zoology, University of Michigan 433: 1-9.

Hubbard, J. P. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, NM. 29 pp.

Hughes, J. M. 1999. Yellow-billed cuckoo (*Coccyzus americanus*). *In* The Birds of North America, No. 418 (A. Poole and F Gill, eds.). The Birds of North America, Inc., Philadelphia, PA. 28 pp.

Jennings, M. R. 1987. Status of the western painted turtle *(Chrysemys picta belli*i) in Arizona. Journal of the Arizona-Nevada Academy of Sciences 22: 129-133.

Johnson, R. R. and L.T. Haight. 1985. Avian use of xeroriparian ecosystems in the North American warm deserts. Pages 156-160 *In* R. R. Johnson et al., technical coordinator. Riparian ecosystems and their management: reconciling conflicting uses.

Kearney, T. H. and R. H. Peebles. 1960. Arizona flora – 2nd edition. University of California Press, Berkeley and Los Angeles, CA. 1,085 pp.

Keitt, T., A. B. Franklin, and D. Urban. 1995. Landscape analysis and metapopulation structure. Chapter 3 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

Kerlinger, P. 2000. Avian mortality at communication towers: a review of recent literature, research, and methodology. USFWS Office of Migratory Bird Management. 38 pp.

Lange, K. K. 1960. The jaguar in Arizona. Transactions of the Kansas Academy of Science 63: 96-101.

Lesh, T. D. and T. E. Corman. 1995. Cactus ferruginous pygmy-owl surveys in Arizona: 1993-1995. Nongame and Endangered Wildlife Program Technical Report 76. Arizona Game and Fish Department, Phoenix, AZ. 23 pp.

Loncore, J. E., A. P. Pessier, and D. K. Nichols. 1999. *Batracytrium dendrobatidis* gen. Et sp. Nov., a chytrid pathogenic to amphibians. Mycologia 91(2): 219-227.

Lonsdale, W. M and A. M. Lane. 1994. Tourist vehicles as vectors of weed seeds in Kadudu National Park, northern Australia. Biological Conservation 69(3): 277-283.

Lyon, L. J. 1983. Road density models describing habitat effectiveness for elk. Journal of Forestry. 81: 592-595.

Marsh, P. C. and W. L. Minckley. 1990. Management of endangered Sonoran topminnow at Bylas Springs, Arizona. Description, critique and recommendations. Great Basin Naturalist 50(3): 265-272.

Marti, C. D. 2002. Enhancing raptor populations, a technique manual. The Peregrine Fund. Boise, ID. 77 pp.

Maynard, W. R. 1995. Summary of 1994 survey eforst in New Mexico for southwestern willow flycatcher (*Empidonax traillii extimus*). Contract #94-516-69. New Mexico Department of Game and Fish, Santa Fe, New Mexico. 48 pp.

McCarthey, T. D., C. E. Paradzick, J. W. Rourke, M. W. Sumner, and R. F. Davidson. 1998. Arizona partners in flight southwestern willow flycatcher 1997 survey and nest monitoring report. Report to the Bureau of Reclamation, Phoenix, AZ.

McDonald, C. B., J. Anderson, J. C. Lewis, R. Mesta, A. Ratzlaff, T. J. Tibbitts, and S. O. Williams. 1991. Mexican Spotted owl (*Strix occidentalis lucida*) status report. U.S. Fish and Wildl. Serv., Albuquerque, NM.

McGregor, S. E., S. M. Alcorn, and G. Olin. 1962. Pollination and pollinating agents of the saguaro. Ecology 43: 259-267.

McNeil, R., J. R. Rodriguez Sr., and H. Ouellet. 1985. Bird mortality at a power transmission line in northeastern Venezuela. Biological Conservation 31: 151-165.

McPherson, G. R. 1995. The role of fire in desert grasslands. Pages 130-151 *In* M. P. McClaran and T. R. Van Devender [Eds.], The Desert Grassland. University of Arizona Press, Tucson, AZ.

Mech, L. D. 1973. Wolf numbers in the Superior National Forest of Minnesota. Res. Pap. NC-97. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Experiment Station. 10 pp.

Meffe, G. K., D. A. Hendrickson, and W. L. Minckley. 1983. Factors resulting in decline of the endangered Sonoran topminnow, *Poeciliopsis occidentalis* (Antheriniformes: Poeciliidae) in the United States. Biological Conservation 25:135-159.

______. 1984. Effects of abiotic disturbance on coexistence of predator-prey fish species. Ecology 65(5): 1525-1534.

Miller, R. R. 1945. A new cyprinid fish from southern Arizona, and Sonora , Mexico, with the description of a new subgenus of *Gila* and a review of related species. Copeia 1945: 104-110.

Minckley, W. L. and J. E. Deacon. 1968. Southwestern fishes and the enigma of "endangered species." Science 159: 1424-1432.

_____. 1973. Fishes of Arizona. Arizona Game and Fish Department, Sims Printing Company, Inc., Phoenix, AZ. 293 pp.

_____. and J. E. Brooks. 1985. Transplantations of native Arizona fishes: records through 1980. Journal of the Arizona-Nevada Academy of Sciences 20(2): 73-90.

Mladenoff, D. J., T. A. Sickley, R. G. Haight, and A. P. Wydevens. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes region. Conservation Biology 9(2): 279-294.

Monson, G. and A. R. Philips. 1981. Annotated checklist of the birds of Arizona, 2nd edition, University of Arizona Press, Tucson, AZ. 292 pp.

_____. 1987. An "almost certain" ferruginous pygmy-owl was heard along lower Aravaipa Canyon (Woods Ranch now owned by TNC) on 28 July 1987. American Birds 41:1471.

_____. 1998. Ferruginous pygmy-owl. Pages 159-161 *In* R. Glinski [Ed.]. The Raptors of Arizona. University of Arizona Press, Tucson, AZ. 220 pp.

Morell, V. 1999. Are pathogens felling frogs? Science 284: 728-731.

Morrison, J. L. 1996. Crested Caracara (*Caracara plancus*) *In* The Birds of North America, No. 249 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Muiznieks, B. D., S. J. Sferra, T. E. Corman, M. K. Sogge, and T. J. Tibbitts. 1994. Arizona Partners in Flight southwestern willow flycatcher survey 1993. Draft report: Nongame and endangered wildlife program, Arizona Game and Fish Department, Phoenix, AZ. Draft of April 1994. 28 pp.

Nelson, E.W. and E.A. Goldman. 1933. Revision of the jaguars. Journal of Mammalogy 14:221-240.

New Mexico Game and Fish Department and The Fish and Wildlife Information Exchange. 2000. Five-Stripped Sparrow (*Aimophila quinquestriata*). [Web page] No archive known [Accessed 7 June 2002]. BISON. http://www.fw.vt.edu/fishex/nmex_main/species/041830.htm

Nobel, T. A. 1995. Birds and power lines: selected interaction and managment issues in the electric utility industry. M. S. Thesis, Prescott College, Prescott, AZ.

Nowak, R. M. 1994. Walker's bats of the world. Johns Hopkins University Press, Baltimore, MD. 287 pp.

Paradzick, C. E., R. F. Davidson, J. W. Rourke, M. W. Sumner, and T. D. McCarthey. 1999. Southwestern willow flycatcher 1998 survey and nest monitoring report. Nongame and Endangered Wildlife Program, Arizona Game and Fish Department, Phoenix, AZ, Technical Report 141.

______, ______, ______, ______, A. M. Wartell, and T. D. McCarthey. 2000. Southwestern willow flycatcher 1999 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 151. Arizona Game and Fish Department, Phoenix, AZ. 93 pp.

Parsons, D. R. 1996. Case study: the Mexican wolf. Pages 101-123 *In* E. A. Herrera and L. F. Huenneke [Eds.] New Mexico's Natural Heritage: Biological Diversity in the Land of Enchantment. New Mexico Journal of Science, Volume 36.

Peterson, R. T. 1990. A field guide to western birds. Third Edition. Houghton Mifflin Company, Boston, MA. 432 pp.

Phillips, A., J. Marshall, and G. Monson. 1983. The birds of Arizona. University of Arizona Press, Tucson, AZ. 212 pp.

Phillips, A. R. 1948. Geographic variation in *Epidonax traillii*. The Auk 65: 507-514.

______, J.T. Marshall Jr., and G. Monson. 1964. The Birds of Arizona. University of Arizona Press, Tucson, AZ. 220 pp.

Pima County. 2001. Priority vulnerable species: analysis and review of species proposed for coverage by the multiple-species conservation plan DRAFT. Pima County, AZ. 385 pp.

Platz, J. E. and J. S. Mecham. 1979. *Rana chiricahuensis*, a new species of leopard frog (*Rana pipiens* Complex) from Arizona. Copeia 1979(3): 383-390.

______. and ______. 1984. *Rana chiricahuensis*. Catalogue of American Amphibians and Reptiles 347.1.

Postovit, H. R. and B. C. Postovit. 1987. Impacts and mitigation techniques. Pages 183-213 *In* G. B. Pendleton, B. A. Mildsap, K. W. Cline, and D. M. Bird [Eds.], Raptor management techniques manual. National Wildlife Federation, Washington, D.C. Scientific Technical Series 10.

Proudfoot, G. and S. M. Beasom. 1997. Food habits of nesting ferruginous pygmy-owls in southern Texas. Wilson Bulletin 109:741-748.

______. and R. D. Slack. 2001. Comparisons of ferruginous pygmy-owl mtDNA at local and international scales. Department of Wildlife and Fisheries Sciences, Texas A & M University. A Report for Pima County. 11 pp.

Pyle, P. 1997. Identification guide to North American birds. Part I Columbidae to Ploceidae. Slate Creek Press, Bolinas, CA.

Reichenbacher, F. W. and R .B. Duncan. 1992. Diet of Mexican spotted owls on National Forest system lands in Arizona and New Mexico. Final report to USDA, Forest Service, Southwestern Regional Office, Albuquerque, NM.

Richardson, W. S., J. E. Cartron, D. J. Krueper, L. Turner, and T. H. Skinner. 2000. The status of the cactus ferruginous pygmy-owl in Arizona: Population surveys and habitat assessment. Pages 27-39 *In:* J. E. Cartron and D. M. Finch [Eds.], Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. General Technical Report, RMRS-GTR-43, Ogden, Utah. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 68 pp.

Ricklefs, R. E. 1990. Ecology. 3rd ed. W.H. Freeman Co., New York, NY.

Ridgely, R. S. and G. Tudor. 1994. The birds of South America: suboscine passerines. University of Texas Press, Austin, TX.

Rinne, J. N. 1976. Cyprinid fishes of the genus *Gila* from the lower Colorado River basin. The Wasmann Journal of Biology 34: 65-107.

Rogers, G. F. and J. Steele. 1980. Sonoran desert fire ecology. Pages 15 -16 *In* M. A. Stokes and J. H. Dieterich [Tech. Coord.]. Proceedings of the fire history workshop. United States Forest Service General Technical Report RM-81.

Roller, P. S. 1996. Distribution, growth and reproduction of Pima pineapple cactus *(Coryphantha scheeri* Kuntz var. *robustispina* Schott). M. S. Thesis, University of Arizona.

Rosen, P. C., C .R. Schwalbe, D. A. Parizek, P. A. Holm, and C. H. Lowe. 1994. Introduced aquatic vertebrates in the Chiricahua region: effects on declining native ranid frogs. Pages 251-261 *In* L. F. DeBano, G. J. Gottfried, R. H. Hamre, C. B. Edminster, P. F. Ffolliott, and A. Ortega-Rubio [Tech. Coords.], Biodiversity and management of the Madrean Archipelago. USDA Forest Service, General Technical Report RM-GTR-264.

______, ______, and S. S. Sartorius. 1996a. Decline of the Chiricahua leopard frog in Arizona mediated by introduced species. Report to Heritage program, Arizona Game and Fish Department, Phoenix, AZ. IIPAM Project No. I92052.

______, S. S. Sartorius, C. R. Schwalbe, P. A. Holm, and C. H. Lowe. 1996b. Draft annotated checklist of the amphibians and reptiles of the Sulphur Springs Valley, Cochise County, Arizona. Final Report, part 1, to the Arizona game and Fish Department, Phoenix. Heritage Program, IIPAM Project No. I92052.

Rostagno, C. M. 1989. Infiltration and sediment production as affected by soil surface conditions in a shrubland of Patagonia, Argentina. Journal of Range Management 2: 382-385.

Rudis, V. A. 1995. Regional forest fragmentation effects on bottomland hardwood community types and resource values. Landscape Ecology 10(5): 291-307.

San Diego Natural History Museum. 1995. *Empononax traillii extimus* in California. The willow flycatcher workshop. 17 November 1995. 66 pp.

Salazar, L. A. and A. Gonzalez-Caban. 1987. Spatial relationship of a wildfire, fuelbreaks, and recently burned areas. Western Journal of Applied Forestry 2(2): 55-58.

Schoenherr, A. A. 1974. Life history of the topminnow, *Poeciliopsis occidentalis* (Baird and Girard) in Arizona, and an analysis of its interaction with the mosquitofish *Gambusia affinis* (Baird and Girard). Ph.D. Dissertation, Arizona State University, Tempe.

______. 1977. Density dependent and density independent regulation of reproduction in the Gila topminnow, *Poeciliopsis occidentalis* (Baird and Girard). Ecology 58:438-444.

Schultz, R. J. 1961. Reproductive mechanism of unisexual and bisexual strains of the viviparous fish *Poeciliopsi*s. Evolution 15:302-325.

Secretaria de Desarrollo Social. 1994. NORMA oficial Mexicana NOM-059-ECOL01994, que determina las especies y subespecies de flora y fauna silvestres y acuatics en peligro de extincion, amenazadas, raras y sujetas a proteccion especial, y que establece especificaciones para su proteccion. Diaro Oficial 488(10): 2-60.

Sferra, S. J., R. A. Meyer, and T. E. Corman. 1995. Arizona Partners in Flight 1994 southwestern willow flycatcher survey. Final Technical Report 69. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, AZ. 46 pp.

______, T. E. Corman, C. E. Paradzick, J. W. Rourke, J. A. Spencer, and M. W. Sumner. 1997. Arizona Partners in Flight southwestern willow flycatcher survey 1993-1996 summary report. Technical Report. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, AZ. 97 pp.

Simms, J. K. and K. M. Simms. 1992. What constitutes quality habitat for Gila topminnow *(Poeciliopsis occidentali*s)? An overview of habitat parameters supporting a robust population at Cienega Creek, Pima County, AZ. Abstract. Proceedings of the Desert Fishes Council 22-23:82.

Simons, L. H. 1987. Status of the Gila topminnow *(Poeciliopsis o. occidentali*s) in the United States. Special Report on Project E-1, Title VI of the Endangered Species Act of 1973, Arizona Game and Fish Department, Phoenix.

Smith, A. B., C. E Paradzick, A. A. Woodward, P. E. T. Dockens, and T. D. McCarthey. 2002. Southwestern willow flycatcher 2001 survey and nest monitoring report. Technical Report 191. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, AZ. 63 pp.

Sogge, M. K. and T. J. Tibbitts. 1992. Southwestern willow flycatcher (*Empidonax trailli extimus*) surveys along the Colorado River in Grand Canyon National Park and Glen Canyon National Recreation Area. NPS CPSU/Northern Arizona University, Flagstaff, AZ. 43 pp.

______, ______, and S. J. Sferra. 1993. Status of the southwestern willow flycatcher along the Colorado River between Glen Canyon Dam and Lake Mead – 1993. Summary Report. National Park Service Cooperative Park Studies Unit/Northern Arizona University, U. S. Fish and Wildlife Service, and Arizona Game and Fish Department, Flagstaff, AZ. 69 pp.

______. and ______. 1994. Distribution and status of the southwestern willow flycatcher along the Colorado River in the Grand Canyon – 1994. Summary Report. National Biological Service, Colorado Plateau Research Station, Northern Arizona University, Flagstaff, AZ. 37 pp.

______, R. M. Marshall, S. J. Sferra, and T. J. Tibbitts. 1997. A southwestern willow flycatcher survey protocol and breeding ecology summary. National Park Service/Colorado Plateau Research Station, Northern Arizona University, Technical Report NRTR-97/12. 37 pp.

Soule, M. E. 1986. Conservation biology. The science of scarcity and diversity. Sinauer Association, Inc. Sinderland, MA. 584 pp.

Speare, R. and L. Berger. 2000. Global distribution of chytridiomycosis in amphibians. Http://www.jcu.edu.au/school/phtm/PHTM/frogs/chyglob.htm. .11 November 2000.

Spencer, J. A., S. J. Sferra, T. E. Corman, J. W. Rourke, and M. W. Sumner. 1996. Arizona Partners in flight 1995 southwetern willow flycatcher survey. Technical Report 97, March 1996. Arizona Game and Fish Department, Phoenix, AZ. 69 pp.

______. and D. P. Humphrey. 1999. Species of concern at the Arizona Army National Guard's Florence Military Reservation, Pinal County, AZ. Arizona Army National Guard. 32 pp.

Sredl, M. J. and J. M. Howland. 1994. Conservation and management of madrean populations of the Chiricahua leopard frog, *Rana chiricahuensi*s. Arizona Game and Fish Department, Nongame Branch, Phoenix, AZ.

______, ______, J. E. Wallace, and L. S. Saylor. 1997. Status and distribution of Arizona's native ranid frogs. Pages 45-101 *In* M. J. Sredl [Ed.], Ranid frog conservation and management. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 121.

______. and L. S. Saylor. 1998. Conservation and management zones and the role of earthern cattle tanks in conserving Arizona leopard frogs on large landscapes. Pages 211-225 *In* Proceedings of Symposium on Environmental, Economic, and Legal Issues Related to Rangeland Water Developments. November 13-15, 1997, Tempe, AZ.

______. and D. Caldwell. 2000. Wintertime populations surveys - call for volunteers. Sonoran Herpetologist 13: 1.

State of Arizona. 1990. Final report and recommendations of the Governor's riparian habitat task force. Executive Order 89-16. Streams and riparian resources. October 1990. Phoenix, AZ. 28 pp.

Stiles, F. G. and A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.

Stouffer, P. C. and R. T. Chesser. 1998. Tropical Kingbird (*Tyrannus melancholicus*) *In* A. Poole and F. Gill, [Eds.], The Birds of North America, No. 358. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Stromberg, J. C., J. A. Tress, J. D. Wilkins, and S. D. Clark. 1992. Response of velvet mesquite to groundwater decline. Journal of Arid Environments 23: 45-58.

______. 1993a. Fremont cottonwood-Goodding willow riparian forests: a review of their ecology, threats, and recovery potential. Journal of the Arizona-Nevada Academy of Science 26(3): 97-110.

______. 1993b. Fremont cottonwood-Goodding willow riparian forests: a review of their ecology, threats, and recovery potential. Journal of the Arizona-Nevada Academy of Science 27(1): 111-124.

Swank, W. G. and J. G. Teer. 1989. Status of the jaguar-1987. Oryx 23: 14-21.

Tetra Tech, Inc. 2003. Draft TEP Sahuarita - Nogales transmission line Environmental Impact Statement.

Thiel, R. P. 1985. The relationship between road densities and wolf habitat suitability in Wisconsin. American Midland Naturalist 113(2): 404-407.

Thomas, P. A. 1991. Response of Succulents to Fire: A Review. International Journal of Wildland Fire 1(1): 11 – 22.

Tibbitts, T. J. 1991. Thick-billed kingbird (*Tyrannus crassirostris*). Wildlife Views, Arizona Game and Fish Department. Page 17.

Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. Western Birds 18: 137-162.

URS. 2003. Tucson Electric Power Sahuarita-Nogales transmission line project - roads analysis.

U. S. Census Bureau. 2000. Arizona state and county facts, deprived from population estimates, 2000 census of population and housing, 1990 census of population and housing, small area income and poverty estimates, county business patterns, and 1997 census of governments. http://quickfacts.census.gov/qfd/states/04/04023.html.

U.S. Department of the Interior. 1967. Native fish and wildlife. Endangered Species. Federal Register 32(48): 4001.

U.S. Fish and Wildlife Service (USFWS). 1982. Mexican Wolf Recovery Plan. USFWS, Albuquerque, NM. 103 pp.

______. 1984. Gila and Yaqui Topminnow Recovery Plan. USFWS, Albuquerque, NM.

______. 1986. Endangered and threatened wildlife and plants; final rule to determine the Sonora chub to be a threatened species and to determine its critical habitat. Federal Register 51: 16042-16047.

______. 1988. Endangered and threatened wildlife and plants; determination of endangered status for two long-nosed bats. Federal Register 53(190): 38456-38460.

______. 1990. Listed cats of Texas and Arizona recovery plan (with emphasis on the ocelot). U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 131 pp.

______. 1992. Sonora Chub Recovery Plan. USFWS Region 2 Office, Albuquerque, NM. 83 pp.

______. 1993a. Endangered and threatened wildlife and plants; final rule to list the Mexican spotted owl as a threatened species. Federal Register 58: 14248-14271.

______. 1993b. Determination of endangered status for the plant Pima pineapple cactus (*Coryphantha scheeri* var. *robustispin*a). Federal Register 58 (158): 49875-49880.

______. 1995a. Recovery plan for the Mexican spotted owl (*Strix occidentalis lucida*) Vols. 1 & 2. USFWS New Mexico Field Office, Albuquerque, NM. 169 pp.

______. 1995b. Determination of critical habitat for the Mexican spotted owl; final rule. Federal Register 60: 29913-29951.

______. 1997a. Endangered and threatened wildlife and plants: determination of endangered status for the cactus ferruginous pygmy-owl in Arizona. Federal Register 62: 10730-10747.

______. 1997b. Final determination of critical habitat for the southwestern willow flycatcher. Federal Register 62 (140): 39129-39146.

______. 1998. Endangered and threatened wildlife and plants; revocation of critical habitat for the Mexican spotted owl, loach minnow, and spikedace. Federal Register 63: 14378-14379.

______. 1999a. Endangered and threatened wildlife and plants; Final Rule: designation of critical habitat for the cactus ferruginous pygmy-owl. Federal Registrar 64: 37419-37440.

______. 1999b. Biological Opinion for Southwest Region U.S. Forest Service Ongoing Livestock Grazing Activities on Allotments. 378 pp.

______. 2000a. Endangered and threatened wildlife and plants; proposed designation of critical habitat for the Mexican spotted owl. Federal Register 65: 45336-45353.

______. 2000b. Recommended guidance for private landowners concerning the cactus ferruginous pygmy-owl: and the cactus ferruginous pygmy-owl survey protocol. Federal Register 65: 14999-15000.

______. 2001a. Endangered and threatened wildlife and plants; Final designation of critical habitat for the Mexican spotted owl. Federal Register 66: 8530-8553.

______. 2001b. Biological Opinion on the effects of proposed livestock grazing and management on the Montana Allotment on the Nogales Ranger District, Santa Cruz County, Arizona. 51 pp.

______. 2001c. Biological Opinion on the effects of the proposed construction of Madera Highlands east of Green Valley in Pima County, Arizona. 18 pp.

______. 2001d. Biological Opinion on the effects of the scour protection project on I-19 and Frontage Road bridges over Peck Canyon near Santa Cruz River confluence in Santa Cruz County, Arizona. 38 pp.

______. 2001e. Mexican gray wolf (*Canis lupus baileyi*). Unpublished abstract, U. S. Fish and Wildlife Service, Arizona Ecological Services. 1 page.

______. 2002a. Biological Opinion on the effects of the Thornydale Road improvement project in Pima County, AZ. 66 pp.

______. 2002b. Biological Opinion on the effects of the proposed Pueblo Oasis Development in Pima County, AZ. 60 pp.

______. 2002c. Endangered and threatened wildlife and plants; Listing of the Chiricahua leopard frog (*Rana chiricahuensis*); Final Rule. Federal Register 67: 40790-40811.

______. 2002d. Biological Opinion on the effects of the proposed issuance of a NPDES permit for ASARCO's Mission Mine Complex in Pima County, AZ. 15 pp.

U.S. Forest Service. 1999. Memo 2670 of July 21, 1999, from Eleanor Towns, Regional Forester, to Forest Supervisors and Staff Directors re: Sensitive species list revision. USDA Forest Service, Southwestern Region, Albuquerque, NM.

______. 2000. Survey Report on presence/absence of Sonora chub in California Gulch, Santa Cruz County, Arizona during July-October, 2000.

______. 2002. Scoping Report: noxious weed and invasive exotic plant management program. Coronado National Forest, Pima County, Arizona. 29 pp.

U.S. Geological Survey (USGS). 2003. Northern Prairie Wildlife Research Center. North Dakota's federally listed endangered, threatened, and candidate species – 1995: Western burrowing owl *(Athene cunicularia hypugea*). http://www.npwrc.usgs.gov/resource/distr/others/nddanger/species/athecuni.htm. 28 March 2003.

Ward, J. P. and W. E. Block. 1995. Mexican spotted owl prey ecology. Chapter 5 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

______, A. B. Franklin, S. E. Rinkevich, and F. Clemente. 1995. Distribution and abundance of Mexican spotted owls. Chapter 1 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

Webb, R. G. and R. H. Baker. 1984. Terrestrial vertebrates of the Cerro Mohinora region, Chihuahua, Mexico. Southwestern Naturalist 29: 243-246.

Weedman, D. A. and K. L. Young. 1997. Status of the Gila topminnow and desert pupfish in Arizona. Arizona Game and Fish Department, Phoenix, AZ.

White, G. C., A. B. Franklin, and J. P. Ward. 1995. Population biology. Chapter 2 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

Wilcox, R., W. S. Richardson, and D. Abbate. 2000. Habitat selection by cactus ferruginous pygmy-owls in southern Arizona: Preliminary results. Arizona Game and Fish Department, Phoenix, AZ. 43 pp.

Wood, T. 1991. Results of 1991 amphibian monitoring of the Coronado National Forest. Report to the Coronado National Forest and the Nature Conservancy, Tucson, AZ.

7.0 LIST OF ACRONYMS

ACC	Arizona Corporation Commission
ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
AOU	American Ornithologists' Union
ASLD	Arizona State Land Department
AUM	Animal Unit per Month
BA	Biological Assessment
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
CFPO	Cactus Ferruginous Pygmy Owl
Citizens	Citizens Communications
CLF	Chiricahua Leopard Frog
CNF	Coronado National Forest
DBH	Diameter Breast Height
DOE	Department of Energy
EMA	Ecosystem Management Area
ESA	Endangered Species Act
GPS	Global Positioning System
HDMS	Heritage Data Management System
HEG	Harris Environmental Group, Inc.
I-19	Interstate 19
LLNB	Lesser Long-nosed Bat
MOA	Memorandum of Agreement
MSO	Mexican Spotted Owl
NPDES	National Pollutant Discharge Elimination System
OHV	Off-Highway Vehicle
PAC	Protected Activity Center

PPC	Pima Pineapple Cactus
RNA	Research Natural Area
ROW	Right-of-way
RD	Ranger District
RU	Recovery Units
SL	Standard Length
SWFL	Southwestern Willow Flycatcher
TEP	Tucson Electric Power
USDOI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USFS	United States Department of Agriculture Forest Service
YOY	Young-of-the-year

APPENDIX A

Natural Resource Agencies Correspondence.

1. U.S. Fish and Wildlife Service, dated 14 May 2002.

2. Arizona Game and Fish Department, dated 25 April 2002.

APPENDIX B

Plants documented along proposed ROW of the TEP Citizens Interconnect Project, July to October 2002.

	SCIENTIFIC NAME	COMMON NAME	FAMILY
CACTUS & SUCCULENTS			
	Agave parryi	century plant	Agavaceae
	Agave schottii	shindagger	Agavaceae
	Coryphantha scheeri var. *robustispina*	Pima pineapple cactus	Cactaceae
	Dasylirion wheeleri	sotol	Agavaceae
	Echinocereus spp.	hedgehog cactus	Cactaceae
	Echinocereus pectinatus var. *rigidissimus*	Arizona rainbow cactus	Cactaceae
	Ferocactus wislizenii	fishhook barrel cactus	Cactaceae
	Fouquieria splendens	ocotillo	Fouquieriaceae
	Mammillaria spp.	pincushion cactus	Cactaceae
	Nolina microcarpa	beargrass	Agavaceae
	Opuntia spp.	cholla	Cactaceae
	Opuntia spp.	prickly pear	Cactaceae
	Opuntia spinosior	walkingstick cactus	Cactaceae
	Yucca elata	soaptree yucca	Agavaceae
GRASSES			
	Bouteloua barbata or *B. rothrockii*	six-weeks or Rothrock grama	Poaceae
	Bothriochloa barbinodis	cane beard grass	Poaceae
	Bouteloua curtipendula	side oats grama	Poaceae
	Bouteloua gracilis	blue grama	Poaceae
	Bouteloua hirsuta	hairy grama	Poaceae
	Bouteloua parryi	Parry grama	Poaceae
	Bouteloua repens	slender grama	Poaceae
	Digitaria californica	Arizona cottontop	Poaceae
	Erioneuron pulchellum	fluffgrass	Poaceae
	Hilaria belangeri	curly mesquite	Poaceae
	Leptochloa dubia	green sprangletop	Poaceae
	Muhlenbergia emersleyi	bull grass	Poaceae
	Muhlenbergia rigens	deer grass	Poaceae
	Piptochaetium fimbriatum	pinyon rice grass	Poaceae
	Sporobolus spp.	dropseed	Poaceae
FORBS			
	Abutilon incanum	Indian mallow	Malvaceae
	Allionia incarnata	trailing windmills	Nyctaginaceae
	Ambrosia confertiflora	weakleaf burr ragweed	Asteraceae
	Amoreuxia palmatiflida	Arizona yellow show	Cochlospermaceae
	Argemone sp.	prickly poppy	Papaveraceae
	Artemisia ludoviciana		Asteraceae
	Asclepias asperula	antelope horns	Asclepiadaceae
	Asclepias nummularia	tufted milkweed	Asclepiadaceae
	Asclepias tuberosa	butterfly milkweed	Asclepiadaceae
	Aspicarpa hirtella	aspicarpa	Malpighiaceae
	Boerhaavia coccinea	red spiderling	Nyctaginaceae
	Bouchea prismatica	bouchea	Verbenaceae

	SCIENTIFIC NAME	COMMON NAME	FAMILY
FORBS (*Cont.*)			
	Bouvardia glaberrima	smooth bouvardia	Rubiaceae
	Brickellia spp.	brickellbush	Asteraceae
	Chamaecrista serpens var. *wrightii*	sensitive pea	Fabaceae
	Cheilanthes fendleri	cloak fern	Pteridaceae
	Cheilanthes spp.	claok fern	Pteridaceae
	Chenopodium fremontii	lamb's quarter	Chenopodiaceae
	Clitoria mariana	butterfly pea	Fabaceae
	Cnidosculus angustidens	mala mujer	Euphorbiaceae
	Cologania longifolia	narrowleaf tick clover	Fabaceae
	Commelina dianthifolia	western dayflower	Commelinaceae
	Cucurbita digitata	coyote gourd	Cucurbitaceae
	Datura metaloides	sacred datura	Solanaceae
	Eleocharis spp.	spikerush	Cyperaceae
	Eriogonum wrightii	buckwheat	Polygonaceae
	Eryngium heterophylla	button snakeroot	Apiaceae
	Evolvulus alsinoides		Convolvulaceae
	Evolvulus arizonicus	Arizona blue eyes	Convolvulaceae
	Galium wrightii	northern bedstraw	Rubiaceae
	Glandularia gooddingii	verbena	Verbenaceae
	Gnaphalium leucocephalum	white cudweed	Asteraceae
	Gnaphalium wrightii	cudweed	Asteraceae
	Gomphrena sp.	globe amaranth	Amarnathaceae
	Gutierrezia spp.	snakeweed	Asteraceae
	Ipomoea barbatisepala	morning glory	Convolvulaceae
	Ipomoea coccinea	scarlet creeper	Convolvulaceae
	Ipomoea hirsutula	wooly morning glory	Convolvulaceae
	Ipomoea leptotoma	bird's foot morning glory	Convolvulaceae
	Ipomoea longifolia	long leaf morning glory	Convolvulaceae
	Isocoma tenuisecta	burroweed	Asteraceae
	Jatropha macrorhiza	Arizona desert potato	Euphorbiaceae
	Kallstroemia grandiflora	Arizona caltrop	Zygophyllaceae
	Krameria parvifolia	range ratany	Krameriaceae
	Machaeranthera spp.	spiny aster	Asteraceae
	Macroptilium gibbosifolium	variableleaf bushbean	Fabaceae
	Milla biflora	Mexican star	Liliaceae
	Oenothera rosea	evening primrose	Onagraceae
	Oxalis albicans	wild oxalis	Oxalidaceae
	Penstemon linarioides	linear leaf penstemmon	Scrophulariaceae
	Phaseolus ritensus	eggleaf stringbean	Fabaceae
	Phaseolus sp.	stringbean	Fabaceae
	Portulaca suffrutescens	portulaca	Portulacaceae
	Portulaca umbraticola	portulaca	Portulacaceae
	Proboscidea sp.	unicorn plant, devil's claw	Pedaliaceae
	Salvia subincisa	sawtooth sage	Lamiaceae

	SCIENTIFIC NAME	COMMON NAME	FAMILY
FORBS (*Cont.*)			
	Schoenocrambe linearifolia	schoenocrambe	Brassicaceae
	Scirpus sp.	bulrush	Cyperaceae
	Senna covesii	desert senna	Fabaceae
	Senna hirsuta	woolly senna	Fabaceae
	Solanum douglassii	greenspot nightshade	Solanaceae
	Solanum elaeagnifolium	silverleaf nightshade	Solanaceae
	Sphaeralcea spp.	globe mallow	Malvaceae
	Tagetes sp.	marigold	Asteraceae
	Talinum angustissimum	talinum	Portulacaceae
	Talinum aurantiacum	orange fameflower	Portulacaceae
	Tetramerium hispidum	tetramerium	Acanthatceae
	Thalictrum fendleri	Fendler's meadow rue	Ranunculaceae
	Vitis arizonica	Arizona grape	Vitaceae
	Zinnia acerosa	desert zinnia	Asteraceae
TREES & SHRUBS			
	Acacia angustissima	white ball acacia	Fabaceae
	Acacia constricta	whitethorn acacia	Fabaceae
	Acacia greggii	catclaw acacia	Fabaceae
	Aloysia wrightii	oreganillo	Verbenaceae
	Arctostaphylos sp.	manzanita	Ericaceae
	Baccharis salicifolia	seep willow	Asteraceae
	Baccharis sarothroides	desert broom	Asteraceae
	Calliandra eriophylla	fairyduster	Fabaceae
	Celtis pallida	desert hackberry	Ulmaceae
	Celtis reticulata	netleaf hackberry	Ulmaceae
	Chrysothamnus teretifolius	green rabbitbrush	Asteraceae
	Dodonaea viscosa	hopbush	Sapindaceae
	Ericameria laricifolia	turpentine bush	Asteraceae
	Erythrina flabelliformis	coral bean	Fabaceae
	Eysenhardtia orthocarpa	kidney wood	Fabaceae
	Fraxinus velutina	velvet ash; Arizona ash	Oleaceae
	Gossypium thurberi	desert cotton	Malvaceae
	Guardiola platyphylla	Apache plant	Asteraceae
	Hibiscus coulteri	desert rosemallow	Malvaceae
	Indigofera spaerocarpa	Sonoran Indigo	Fabaceae
	Juglans major	Arizona walnut	Juglandaceae
	Juniperus deppeana	alligator juniper	Cupressaceae
	Lasianthaea podocephala	San Pedro daisy	Asteraceae
	Lycium spp.	wolfberry	Solanaceae
	Mimosa biuncifera	catclaw mimosa	Fabaceae
	Mimosa dysocarpa	velvet pod mimosa	Fabaceae

	SCIENTIFIC NAME	COMMON NAME	FAMILY
TREES & SHRUBS *(Cont.)*			
	Parkinsonia microphylla	yellow paloverde	Fabaceae
	Populus fremontii	Fremont cottonwood	Salicaceae
	Prosopis velutina	velvet mesquite	Fabaceae
	Q. arizonica	Arizona white oak	Fagaceae
	Q. garrya	silktassel	Fagaceae
	Quercus emoryii	Emory oak	Fagaceae
	Rhus aromatica	skunkbush	Anacardiaceae
	Rhus choriophylla	sumac	Anacardiaceae
	Salix exigua	coyote willow	Salicaceae
	Tamarix pentandra	salt cedar	Tamaricaceae
	Ziziphus obtusifolia	graythorn	Rhamnaceae

APPENDIX C

TEP-Citizen's Interconnect Project

Environmental Training Guidelines for Construction Supervisors

- Stay in the designated work areas. Approved work areas, access roads, and staging areas will be clearly marked. All project activities must remain in these areas. Do not work or trespass beyond the signed or fenced restricted work areas.
- Restrict vehicle access to public roadways and designated access roads. Cross-country driving is prohibited.
- No driving or parking within 100 feet of ponds and tanks.
- Do not transfer water from one pond or tank to another or between any other bodies of water.
- No in-stream activity or disposal of construction debris or fill is allowed.
- Store topsoil and trench spoils behind sediment control structures at least 20 feet from any stream bank, including dry washes.
- Check equipment for leaks or heavy surface oil build-up before working in streams or washes.
- The use or transfer of hazardous materials will not be allowed within 100 feet of any stream or wash is prohibited.
- Do not litter. Dispose of trash in designated containers. Uncontained trash can attract wildlife and unwanted pests. Cigarette butts are considered litter, and should be extinguished and disposed of appropriately. All litter and construction debris must be removed from the job site daily.
- No pets or firearms. They are prohibited for job-site protection and protection of wildlife.
- Hunting is prohibited.
- Clearing will be limited to the minimum required to provide a safe construction area. Make sure you know the clearing limit, and if possible, leave plant root systems in place when clearing vegetation.
- It is illegal to harm, harass, pursue, hunt, shoot, wound, trap, kill capture, or collect wildlife officially listed as threatened or endangered. Violation of threatened and endangered special laws can result in penalties of up to $100,000 and/or 1year in jail.
- Do not approach or feed wildlife. Keep away form their burrows and nests. Do not harm or kill any wildlife encountered.
- If animal is harmed or found harmed, contact your Construction Supervisor or the Environmental Inspector. Do not attempt to move the animal yourself.

APPENDIX D

APPENDIX D. Federally Listed, Proposed, and Candidate Species under jurisdiction of the U.S. Fish and Wildlife Service in Pima County, Arizona as of 14 August 2002, excluded from further consideration.

COMMON NAME	SCIENTIFIC NAME	STATUS	HABITAT	JUSTIFICATION
PLANTS				
Canelo Hills ladies' tresses	*Spiranthes delitescens*	Endangered	Finely grained, highly organic, saturated soils of cienegas. Potential habitat occurs in Sonora, Mexico, but no populations have been found.	No habitat present.
Huachuca water umbel	*Lilaeopsis schaffneriana* ssp. *recurva*	Endangered	An emergent aquatic plant that requires marshy wetlands.	No habitat present.
Kearney's blue star	*Amsonia kearneyana*	Endangered	Known only from the Baboquivari Mountains.	ROW is outside of known range.
Nichol's Turk's head cactus	*Echinocactus horizonthalonius* var. *nicholii*	Endangered	Dependent on limestone substrates in desert hills.	No habitat present.
FISH				
Desert pupfish	*Cyprinodon macularius*	Endangered	Shallow springs, small streams, and marshes. Tolerates saline and warm water.	No habitat present in area.
Gila chub	*Gila intermedia*	Proposed Endangered	Small streams and cienegas; prefer deeper pools with cover.	No habitat present in area.
Loach minnow	*Tiaroga cobitis*	Threatened	Requires perennial streams with swift water over cobble or gravel	No habitat present in area.
Spikedace	*Meda fulgida*	Threatened	Requires perennial streams with swift velocities over sand and gravel.	No habitat present in area.
AMPHIBIANS				
Sonoran tiger salamander	*Ambystoma tigrinum stebbinsi*	Endangered	Stock tanks and impounded cienegas in San Rafael Valley, Huachuca Mountains at 4,000-6,300 ft.	ROW is outside of known range. This species is not known to occur in the Nogales RD.

APPENDIX D (*cont.*). Federally Listed, Proposed, and Candidate Species under jurisdiction of the U.S. Fish and Wildlife Service in Pima County, Arizona as of 14 August 2002, excluded from further consideration.				
BIRDS				
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.	Winter surveys of Peña Blanca and Arivaca lakes were conducted in 1994, 1995, 1996, 1998, 2000, 2001, and 2002. No bald eagles have been observed.
California brown pelican	*Pelecanus occidentalis californicus*	Endangered	Coastal land and islands; species is found around many Arizona lakes and rivers.	No habitat present in area.
Masked bobwhite	*Colinus virginianus ridgewayi*	Endangered	Only known Arizona population has been reintroduced on Buenos Aires Natl. Wildl. Refuge	ROW is outside of known range.
Mountain plover	*Charadrius montanus*	Proposed Threatened	Open arid plains, short grass prairies, and cultivated farms.	No habitat present in area.
Northern apolomado falcon	*Falco femoralis septentrionalis*	Endangered	Grassland and savannah habitats.	No recent confirmed reports for Arizona.
MAMMALS				
Ocelot	*Felis pardalis*	Endangered	Prefers humid tropical & sub-tropical habitats; typically found at higher elevations.	ROW is outside of known range.
Jaguarundi	*Felis yagouaroundi tolteca*	Endangered	Deciduous forests, riparian areas, swampy grasslands, upland dry savannahs, etc.	ROW is outside of known range.
Sonoran pronghorn	*Antilocapra americana sonoriensis*	Endangered	Grassy desertscrub in northwestern Sonora and adjacent Arizona borderlands, mainly Yuma Co.	ROW is outside of known range.

STATUS DEFINITIONS: ENDANGERED SPECIES ACT
Endangered: Imminent jeopardy of extinction.
Threatened: Imminent jeopardy of becoming endangered.
Proposed: Proposed Rule has been published in Federal Register to list as Threatened or Endangered.

Appendix E

Harris Environmental Group, Inc.
Draft Biological Assessment
TEP Proposed Sahuarita-Nogales
Transmission Line Project
Central Corridor (HEG 2003b)

BIOLOGICAL ASSESSMENT

OF THE

TUCSON ELECTRIC POWER

SAHUARITA – NOGALES TRANSMISSION LINE

CENTRAL CORRIDOR

DRAFT

15 MAY 2003

PREPARED FOR:
TUCSON ELECTRIC POWER
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TABLE OF CONTENTS

EXECUTIVE SUMMARY ... 3
1.0 PROJECT DESCRIPTION ... 5
1.1 Proposed Action ... 5
1.3 Project Area ... 9
1.4 Conservation Measures ... 11
2.0 FEDERALLY LISTED SPECIES ... 15
2.1 Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) (Endangered) ... 17
2.1a Action Area ... 17
2.1b Natural History and Distribution: ... 17
2.1c Critical Habitat ... 19
2.1d Current Status Statewide ... 19
2.1e Environmental Baseline ... 20
2.1f Effects of Proposed Action on the CFPO ... 21
2.1g Cumulative Effects ... 24
2.1h Effects Determination and Incidental Take ... 24
2.2 Southwestern willow flycatcher (*Empidonax traillii extimus*) (Endangered) ... 25
2.2a Action Area ... 25
2.2b Natural History and Distribution ... 25
2.2c Critical Habitat ... 26
2.2d Current Status Statewide ... 26
2.2e Environmental Baseline ... 27
2.2f Effects of Proposed Action on the SWFL ... 28
2.2g Cumulative Effects ... 29
2.2h Effects Determination and Incidental Take ... 30
2.3 Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) (Endangered) ... 31
2.3a Action Area ... 31
2.3b Natural History and Distribution ... 31
2.3c Critical Habitat ... 33
2.3d Current Status Statewide ... 33
2.3e Environmental Baseline ... 34
2.3f Effects of Proposed Action on LLNB ... 34
2.3g Cumulative Effects ... 36
2.3h Incidental Take ... 37
2.4 Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) (Endangered) ... 38
2.4a Action Area ... 38
2.4b Natural History and Distribution ... 38
2.4c Critical Habitat ... 38
2.4d Current Status Statewide ... 38
2.4e Environmental Baseline ... 39
2.4f Effects of Proposed Action on the PPC ... 40
2.4g Cumulative Effects ... 41
2.4h Effects Determination ... 42
2.5 Jaguar *(Panthera onca)* (Endangered) ... 43

2.5a Action Area 43
2.5b Natural History and Distribution 43
2.5c Critical Habitat 44
2.5d Current Status Statewide 44
2.5e Environmental Baseline 44
2.5f Effects of Proposed Action on the Jaguar 45
2.5g Cumulative Effects 47
2.5h Effects Determination and Incidental Take 47
2.6 Gila Topminnow (*Poeciliopsis occidentalis occidentalis*) (Endangered) 48
2.6a Action Area 48
2.6b Natural History and Distribution 48
2.6c Critical Habitat 50
2.6d Current Status Statewide 50
2.6e Environmental Baseline 51
2.6f Effects of Proposed Action on the Gila topminnow 52
2.6g Cumulative Effects 52
2.6h Effects Determination and Incidental Take 53
2.7 Mexican Gray Wolf (*Canis lupus baileyi*) (Endangered) 54
2.7a. Action Area 54
2.7b. Natural History and Distribution 54
2.7c Critical Habitat 55
2.7d Current Status Statewide 55
2.7e Environmental Baseline 55
2.7f Effects of Proposed Action on the Mexican Gray Wolf 56
2.7g Cumulative Effects 57
2.7h Effects Determination and Incidental Take 57
3.0 USFS SENSITIVE SPECIES 58
3.1 Plants 64
3.2 Invertebrates 77
3.3 Birds 77
3.4 Reptiles and Amphibians 79
3.5 Mammals 81
4.0 BLM SENSITIVE SPECIES 83
4.1 Plants 84
4.2 Birds 85
4.3 Reptiles and Amphibians 86
4.4 Mammals 86
5.0 AGFD WILDLIFE OF SPECIAL CONCERN 89
6.0 LITERATURE CITED 96
7.0 LIST OF ACRONYMS 116
APPENDIX A 118
APPENDIX B 119
APPENDIX C 125
APPENDIX D 126

EXECUTIVE SUMMARY

Tucson Electric Power (TEP) and Citizens Communications (Citizens) are proposing to build a new, dual-circuit, 345,000-volt (345-kV) transmission line from the TEP South Substation in the vicinity of Sahuarita, Arizona to interconnect with Citizens system at a Gateway Substation that TEP will construct west of Nogales, Arizona. From the Gateway Substation, the proposed transmission line will continue south across the United States-Mexico border for approximately 60 miles (mi) (98 kilometers [km]) into the Sonoran region of Mexico, connecting with the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico) at the Santa Ana Substation. The proposed transmission line will improve Citizens' service in Nogales and allow for the transfer of blocks of electrical energy between the United States and Mexico. Southern Arizona and Sonora, Mexico have experienced rapid growth, and forecasts predict this growth will continue. Citizens' customers have already experienced outages due to limited transmission facilities into the region. TEP recognizes the need to improve transmission into the southern Arizona region and proposes to assist Citizens in meeting an Arizona Corporation Commission (ACC) mandate to improve the reliability and service of its Nogales electrical system. The ACC has ordered Citizens to improve its system by the end of 2003. The TEP Sahuarita – Nogales Transmission Line, a double-circuit 345-kV transmission line will provide the additional reliability that Citizens requires while providing additional capacity into the southern Arizona region for future needs.

This Biological Assessment (BA) was prepared to meet the requirements of Section 7 of the Endangered Species Act (ESA) of 1973, 16 U.S.C. Section 1536(a)(2). Section 7 requires all federal agencies to consult with the United States Fish and Wildlife Service (USFWS) if an action may affect listed species or their designated critical habitat. Section 7 consultation is required for any project that requires a federal permit or receives federal funding. Action is defined broadly to include funding, permitting, and other regulatory actions. All activities associated with construction of the TEP Sahuarita – Nogales Transmission Line are included in the proposed action being evaluated for this BA. Because TEP has applied for a Presidential Permit to construct the transmission line across the international border, the Department of Energy (DOE) is preparing a Draft Environmental Impact Statement (DEIS) (Tetra Tech 2003) concurrently with this document.

Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat. This is accomplished through consultation with the USFWS. If such species may be present, the applicant must conduct a BA to determine if a proposed action is likely to adversely affect listed species or designated critical habitat. USFWS will review this BA and issue a biological opinion (BO). DOE is the permitting agency for this proposed action, and therefore the lead federal agency in Section 7 consultation with USFWS.

The proposed action crosses a variety of land jurisdictions: including private, Arizona State Land Department (ASLD), Bureau of Land Management (BLM), and United States Department of Agriculture Forest Service (USFS). Because each jurisdiction has different requirements for environmental review of the proposed action, this document is subdivided by agency. SECTION 2 addresses species that receive protection under the ESA of 1973. SECTION 3 reviews the potential effects of the proposed action on those species classified as "Sensitive" by the USFS. SECTION 4 reviews the potential effects of the proposed action on those species classified as "Sensitive" by the BLM. SECTION 5 addresses those species that are considered "Wildlife of Special Concern" by the Arizona Game and Fish Department (AGFD). Because habitats often overlap different jurisdictions, many species have classifications within each agency. In these instances, the species is evaluated under the jurisdiction which affords the highest level of protection.

We contacted federal (USFWS) and state (AGFD) natural resource agencies to request information on possible special status species (sensitive, threatened, and endangered) that may exist on or near the proposed Central Corridor of the TEP Sahuarita – Nogales Transmission Line from Sahuarita to Nogales, Arizona. Agency correspondence is presented in Appendix A.

SUMMARY OF DETERMINATIONS FOR FEDERALLY LISTED SPECIES

Based on contact with USFWS, USFS, BLM, and AGFD, 7 federally listed species may be affected by the proposed action. Upon review of the current status of these species, the environmental baseline of the project area, the effects of the proposed actions on the species as well as cumulative effects, the following determinations are made for the 7 affected species (Table 1).

Table 1. Effects of the proposed action on federally listed species.

SPECIES	**POTENTIAL EFFECT**
Cactus ferruginous pygmy-owl	The proposed action may affect and is likely to adversely affect this species.
Southwestern willow flycatcher	The proposed action may affect but is not likely to adversely affect this species.
Lesser long-nosed bat	The proposed action may affect and is likely to adversely affect this species.
Pima pineapple cactus	The proposed action may affect and is likely to adversely affect this species.
Jaguar	The proposed action may affect but is not likely to adversely affect this species.
Gila topminnow	The proposed action may affect but is not likely to adversely affect this species.
Mexican gray wolf	The proposed action may affect but is not likely to adversely affect this species.

1.0 PROJECT DESCRIPTION

1.1 PROPOSED ACTION

The proposed TEP Central Corridor Sahuarita – Nogales Transmission Line will consist of 12 transmission line wires, or conductors, and 2 neutral ground wires that will provide lightning protection and fiber optic communication, on a single set of support structures. The transmission line will originate at the existing South Substation, in the vicinity of Sahuarita, Arizona, and interconnect with Citizens system at a Gateway Substation that TEP will construct west of Nogales, Arizona. The double-circuit transmission line will continue from the Gateway Substation south to cross the United States-Mexico border and extend approximately 60 mi (98 km) into the Sonoran region of Mexico, connecting with the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico) at the Santa Ana Substation. Figure 1 shows the overall proposed project location.

The South Substation in Sahuarita will be upgraded and expanded to provide interconnection between a new TEP 345-kV transmission line and the new Gateway Substation west of Nogales. The South Substation will be expanded by approximately 1.3 acres (0.53 ha) to add a switching device that will connect to the proposed transmission line, with a 100 ft (30 m) expansion of the existing fence line for the addition of the second 345-kV circuit. The new Gateway Substation will include a 345-kV to 115-kV power transformer to provide power to the local area. The new Gateway Substation will be constructed within a developed industrial park north of Mariposa Road (State Route 189), approximately 0.5 mi (0.8 km) east of the Coronado National Forest (CNF) boundary (Northeast ¼ of Section 12, Township 24 South, Range 13 East). The TEP portion of the site is approximately 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has purchased the substation site and preliminary construction activities have been completed. TEP is flexible in the placement of a fiber-optic regeneration site, but it will likely be located in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita on private land. The fiber optic regeneration site will consist of an approximate 0.5-acre (0.2-ha) fenced yard, containing a 10 ft (3 m) by 20 ft (6 m) concrete pad with an equipment house. The cleared area for the equipment house will be approximately 20 ft (6 m) by 30 ft (9 m). There will be three 3-acre (1.2-ha) construction staging areas (located near the South and Gateway Substations and the Interstate 19 [I-19]/Arivaca Road interchange) and an 80 acre (32 ha) temporary laydown yard (also near the I-19/Arivaca Road interchange) used during construction of the proposed line.

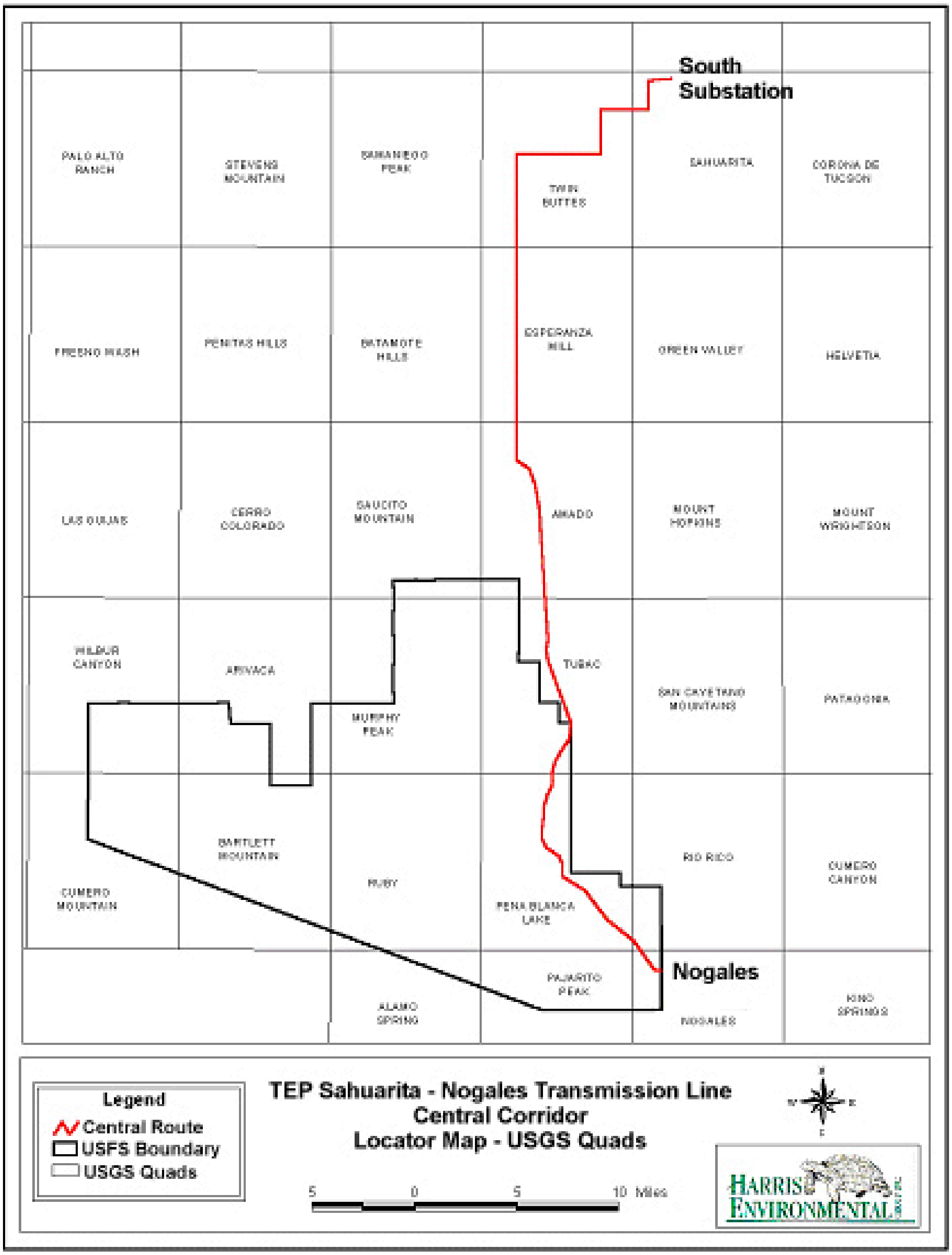

Figure 1. Map of the TEP Sahuarita – Nogales Transmission Line Central Corridor.

The primary support structures to be used for the transmission line are self-weathering steel single structures, or monostructures (Figure 2). Dulled, galvanized steel lattice towers (Figure 3) will be used in locations where their use will minimize overall environmental impacts, in accordance with Arizona Corporation Commission (ACC) Decision No. 64356 (ACC 2001).

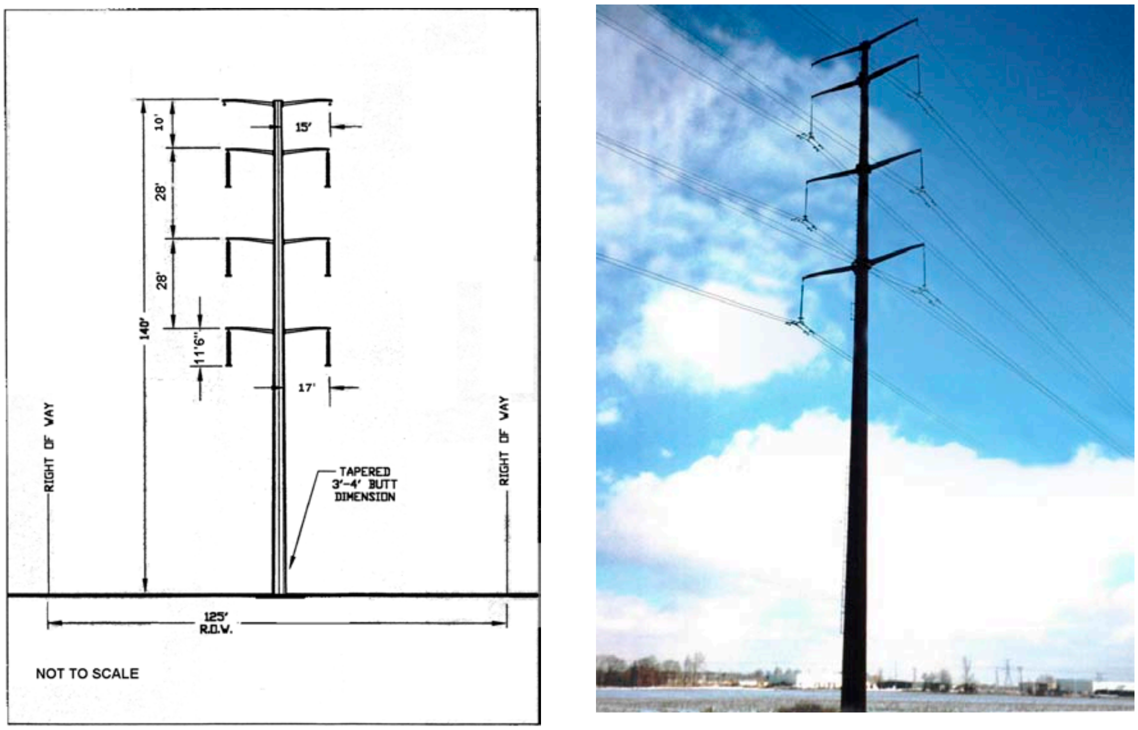

Figure 2. Monopole Transmission Line Structure Drawing and Photo.

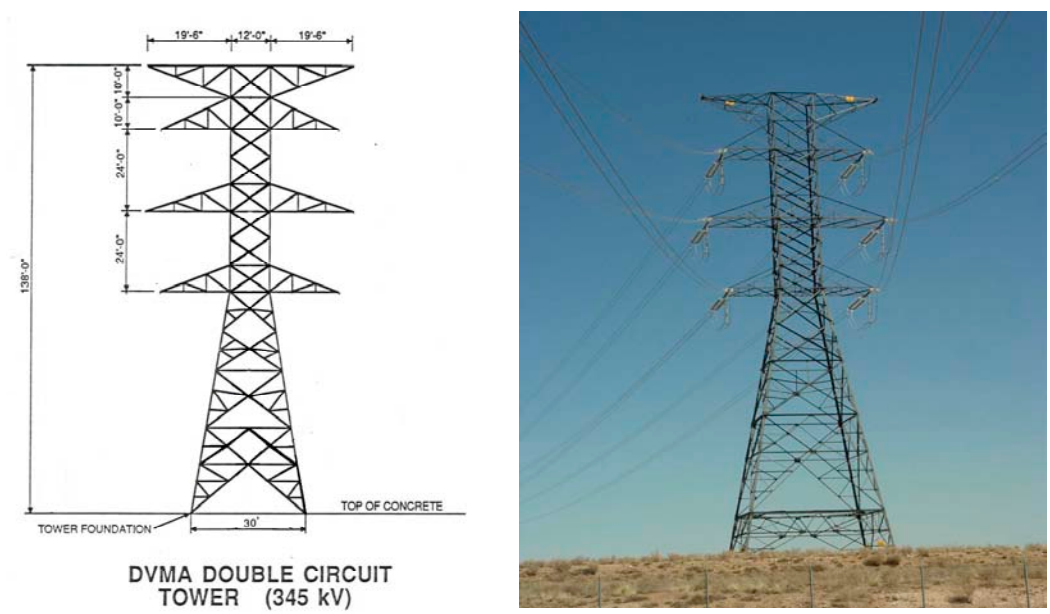

Figure 3. Lattice Tower Transmission Line Structure Drawing and Photo.

1.2 PROJECT LOCATION

The Central Corridor extends for approximately 57.1 mi (91.9 km), from the South Substation to the United States-Mexico border, including 43.2 mi (69.5 km) along the El Paso Natural Gas Company (EPNG) gasline right-of-way (ROW). The length of the Central Corridor is approximately 15.1 mi (24.3 km) within the CNF, and approximately 1.25 mi (2.01 km) on BLM land. The Central Corridor will require approximately 390 support structures, including approximately 102 within the CNF and 9 on BLM land. The Cental Corridor exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceeds westerly for approximately 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). The corridor turns west across I-19 and continues through Pima County to the southwest, crossing approximately 1.25 mi (2.01 km) of federal land managed by BLM parallel to 2 existing TEP transmission lines (138-kV and 345-kV). The Central Corridor turns south to parallel the EPNG gasline ROW until reaching approximately 3 mi (4.8 km) south of the existing TEP Cyprus Sierrita Substation. South of the TEP Cyprus Sierrita Substation, the Central Corridor continues south to follow the EPNG gasline ROW to the south.

The Central Corridor continues south about 1.0 mi (1.6 km) west of I-19, and passes Amado, Tubac, and Tumacacori. The Central Corridor continues approximately 2.0 mi (3.2 km) south of Tumacacori, and enters the CNF, adjacent to the EPNG gasline ROW. The Central Corridor centerline diverges from the EPNG gasline ROW for approximately 1.9 mi (3.1 km) and avoids the USFS inventoried roadless area (IRA). The Central Corridor continues through the CNF, paralleling the EPNG gasline ROW to the southeast for several miles to the forest boundary. The proposed corridor exits CNF onto private land and proceeds 0.5 mi (0.8 km) east to the Gateway Substation. From the Gateway Substation, the proposed corridor returns to the west through private land and then turns south to parallel the CNF boundary. The proposed corridor meets the United States-Mexico border approximately 3,300 ft (1,006 m) west of Arizona State Highway 189 in Nogales, Arizona.

TEP will use existing access when feasible. Approximately 13.8 mi (22.2 km) of temporary new roads will be built for construction of the Central Corridor on the CNF (URS 2003a); spur roads off existing access roads adjacent to TEP transmission lines will provide project access on BLM land. Transmission line tensioning and pulling and fiber-optic splicing sites will also disturb land. The total new temporary area of disturbance on the CNF during construction of the Central Corridor will be approximately 105 acres (42.5 ha) (URS 2003a). Following construction, TEP will close new roads, construction areas, and existing roads not required for project maintenance in accordance with agreements with land owners or managers (e.g., BLM or USFS). On national forest land, TEP will close existing road mileage equal to that required for project maintenance, to avoid impacting the current road density. The maintenance access required by TEP will be limited to roads to selected structures, rather than a single cleared ROW leading to the United States-Mexico border. On the CNF transmission line tensioning and pulling sites, fiber-optic splicing sites, and construction yard areas will be obliterated within six months of the project becoming fully operational (URS 2003a).

1.3 PROJECT AREA

The project area includes the location where all construction and associated activities will occur along the ROW. Action areas are locations affected directly or indirectly by these activities and often include sites outside the immediate area of construction. Action areas are unique for each listed species and are outlined in SECTION 2.0 of this document.

Between Sahuarita and Nogales, the proposed action crosses four distinct biotic communities, or biomes (Brown 1994). A complete list of plant species documented during field surveys in 2002 is presented in Appendix B.

Figure 4. Sonoran desertscrub.

The northern end of the corridor contains vegetation characteristic of the Sonoran desertscrub biome (Figure 4). This biome is typically represented by saguaro (*Carnegiea gigantea*), cholla and prickly pear (*Opuntia* spp.) cacti, ocotillo (*Fouquieria splendens*), mesquite, (*Prosopis velutina*), acacia (*Acacia* spp.) paloverde (*Parkinsonia* spp.), creosote (*Larrea tridentata*), triangle-leaf bursage (*Ambrosia deltoidea*), and brittlebush (*Encelia farinosa*).

Vegetation south of the ASARCO mine transitions into the semidesert grassland biome (Figure 5). This area is dominated by grama (*Bouteloua* spp.), lovegrass (*Eragrostis* spp.), and three-awn (*Aristida* spp.) grasses, with low shrubs such as mesquite and acacia locally co-dominant. Agave (*Agave* spp.) and yucca (*Yucca* spp.) are also common in this biome. These grasslands are transected by desert riparian scrub dominated by mesquite and netleaf hackberry (*Celtis reticulata*).

Figure 5. Semidesert grassland.

Figure 6. Madrean oak woodland.

The higher elevations (above 3,500 ft [1,067 m]) of the project area are within the madrean oak woodland biome (Figure 6). Representative plants of this biome within the project area include Mexican blue oak (*Quercus oblongifolia*) and emory oak (*Q. emoryi*) trees, side-oats grama (*B. curtipendula*), hairy grama (*B. hirsuta*), and fluffgrass (*Erioneuron pulchellum*).

The 4th biome represented within the project area is the Sonoran deciduous riparian forest (Figure 7), which is located within or near the ROW in Peck Canyon and in the Santa

Cruz River. The high water table in these areas supports stands of Fremont cottonwood (*Populus fremontii*), ash (*Fraxinus pennsylvanica* ssp. *velutina*), walnut (*Juglans major*), and willow (*Salix* spp.) trees.

The proposed ROW begins at an elevation of approximately 2,674 ft (815 m) at the TEP South Substation and reaches its maximum elevation of approximately 4,321 ft (1,317 m) near Tinaja Peak located southwest of the ASARCO Mine complex.

Figure 7. Sonoran deciduous riparian forest.

The Chiltepine Botanical Area is a 2,836 ac (1,148 ha) reserve located approximately 2 mi (1.2 km) west of the Central Corridor, in the northern portion of the Tumacacori Ecosystem Management Area (EMA) of the CNF. This area was established in June 1999 for the purpose of protecting and facilitating the study of chiltepine. These wild chiles typically are found in the more tropical environments between Mexico and South America. This area has been noted as the northernmost occurrence of chiltepine in the world.

Between 12 June and 22 June 2002, the Walker Fire, a human-caused fire, burned 16,369 ac (6,624 ha) of land along the United States-Mexico border approximately 1mi (1.6 km) west of the southern end of the Central Corridor. Portions of the Walker fire were very hot, especially near the international border and the upper slopes of ridges, while other areas, like Walker Canyon, burned relatively cool (T. Newman, CNF, pers. comm., 26 November 2002). While vegetation has begun to recover in some areas, other areas are highly susceptible to erosion due to reduced groundcover (Figure 8).

Figure 8. Area burned in Walker fire.

1.4 CONSERVATION MEASURES

PROJECT-WIDE CONSERVATION MEASURES

1. Environmental Training - All construction supervisors will be required to attend environmental training, which will outline their obligation to obey applicable laws and regulations regarding wildlife and habitats (Appendix C).

2. Erosion Control Measures - TEP is in consultation with CNF regarding development of Best Management Practices (BMPs) for minimizing proposed project impacts on geologic, soil, and water resources on national forest land, in accordance with the USFS "Soil and Water Conservation Practices Handbook" (USFS 1990). Specific BMPs will be identified after coordination with Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, for the entire length of the selected corridor.

3. Fire Prevention Plan - A Fire Prevention Plan is under development to minimize the risk of accidental wildfire. All construction activities will adhere to this plan and fire suppression equipment will be available to all work crews. On CNF lands, the Fire Prevention Plan will comply with Forest Service Manual 5100.

4. Hazardous Material Spill Response Plan - A Hazardous Material Spill Response Plan is under development which will describe the measures and practices to prevent, control, cleanup, and report spills of fuels, lubricants, and other hazardous substances during construction operations. This plan will ensure that no hazardous materials are stored, dispensed, or transferred in streams, watercourses, or dry washes, and vehicles are regularly inspected and maintained to prevent leaks.

5. Invasive Species Control - An Invasive Species Management Plan in accordance with Executive Order 13112 is under development in coordination with CNF, ASLD, and BLM to identify problem areas and mitigation measures.

6. Road Closure/Obliteration - TEP has committed to obliterate and permanently close 1 mi (1.6 km) of existing road on CNF (to be identified by CNF) for every 1 mi (1.6 km) of proposed new road used in the construction, operation, or long-term maintenance of the proposed action. TEP will monitor road closures during regularly scheduled inspection flights and/or ground inspections, and repair or replace road-closure structures as necessary following construction. Furthermore, TEP will cooperate with landowners on all ongoing road closure maintenance.

   The following selective criteria and techniques for closing roads are taken from Section 1.3.2 of the Roads Analysis (URS 2003) and applies to access roads on CNF. Administrative roads will be closed to the general public but made available to TEP and its assigned contractors for the evaluation, maintenance, or upgrading of existing facilities.

Closure methods for administrative roads will include the following:

a. Placement of heavy pipe posts with an attached, locked chain entrance on the road.

b. Placement of heavy pipe posts with an attached, locked gate in a manner that blocks entrance on the road.

c. Placement of a pipe barricade across the roadbed, locked in place in multiple locations in concrete sleeves.

The following methods may be used for the long-term closure of transmission line access roads used during construction and those roads required to be closed by the CNF. These roads may be reopened for emergency repair of transmission facilities, but will not be used intermittently as with administrative roads. Techniques include:

a. Placement of boulders or other natural impediments across the road.

b. Placement of a berm or trench across the the road.

c. Rip, obliterate, and reseed/revegetate portions of roadbed as needed. This effort could be applied to the initial visual portion of roadway (e.g., first 100 ft [30 m]) to effectively obscure the roadway. This could be accomplished by transplanting native species of medium and large vegetation from the general area and reseeding with native grasses. By obscuring visible portions of roadway, future vehicular travel could be more effectively discouraged than by placing berms or other unnatural impediments to an otherwise visually inviting roadway.

7. Additional mitigation measures are outlined in Table 2.2-2 of the DEIS (Tetra Tech 2003).

SPECIES-SPECIFIC CONSERVATION MEASURES

Cactus ferruginous pygmy-owl (CFPO)

1. Protocol surveys – 2 consecutive years of protocol surveys must be conducted before construction activities can begin within 1,312 ft (400 m) of designated habitat. If a CFPO is detected, USFWS has determined that certain continued construction activities will not harm or harass a CFPO as defined by ESA regulations. In areas where two consecutive years of protocol surveys cannot be completed, construction will occur outside of the breeding season.

   Four zones are described (Zone I through Zone IV) that are based upon the distance of construction activity from a known nest or activity center. Certain levels of construction can occur within each zone without resulting in harm or harassment of the species. Situations that do not comply with the restrictions provided for each zone will require USFWS authorization before construction continues. Specific development restrictions that apply to each of the four zones are described in the sections below:

Zone I: 0 to 328 ft (100 m) from the CFPO Activity Center

1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

2. Construction-related activities may continue on land that has been cleared of vegetation provided that they do not exceed the level and/or intensity of activity that was occurring during the period of time that the territory was established.

3. Activities that will be more intense or cause more noise disturbance than was occurring during the period of time that the territory was established cannot proceed without authorization from USFWS and relevant land management agencies.

Zone II: 328 ft (100 m) to 1,312 ft(400 m) from the CFPO Activity Center

1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

2. No restrictions on the nature or type of construction activity (excluding the clearing of vegetation) from 1 August through 31 January of the following calendar year.

3. Construction activities during the breeding season (1 February to 31 July) cannot exceed the levels or intensity of activities that occurred at the time the territory was established.

Zone III: 1,312 ft (400 m) to 1,969 ft (600 m) from the CFPO Activity Center

1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

2. No restrictions on the levels or intensity of construction activity (excluding the clearing of vegetation) at any time of the year.

Zone IV: Greater than 1,969 ft (600 m) from the CFPO Activity Center

1. No restrictions – any activity consistent with the project description provided to USFWS (as amended by supplemental reports) is allowed. For the purposes of this consultation, USFWS assumes that all construction or construction-related activities referred to under each zone description will be limited to those described in the project description in this BA.

2. All saguaros within construction areas will be transplanted or mitigated with

minimum 6.5 ft (2 m) specimens. Within riparian desertscrub and deciduous riparian areas, tree and shrub removal will be minimized to the greatest extent possible.

Lesser long-nosed bat (LLNB)

1. Agave within construction areas will be transplanted or replaced with similar age and size class individuals.

Pima pineapple cactus (PPC)

1. Purchase of credits in a USFWS-approved conservation bank for PPC at a ratio to be determined in consultation with USFWS.

Jaguar

1. Two remote cameras will be donated to the Jaguar Conservation Team to assist with monitoring of jaguar movements across the Arizona-Mexico border. These cameras will all be placed within the Tumacacori EMA under permit from CNF. If female jaguar or cubs are documented by the Jaguar Management Team within the Tumacacori EMA, consultation with USFWS will be reinitiated.

2.0 FEDERALLY LISTED SPECIES

Special status species are plant and wildlife species that are of concern because their populations are either in jeopardy of extinction or are declining in number. The AGFD and USFWS were contacted concerning information on possible threatened and endangered species that may exist on or near the proposed action. In a letter dated 14 June 2002, USFWS listed 17 endangered species, seven threatened species, and two proposed species that occur in Pima and Santa Cruz counties, Arizona (Table 2). Agency correspondence is presented in Appendix A. Species included in USFWS correspondence, but excluded from evaluation are addressed in Appendix D.

Meetings with USFWS and USFS personnel were held on 9 April, 13 May, 3 December 2002, and 28 March 2003 to discuss the potential effects of the proposed action on special status species. BLM personnel also attended the 3 December 2002 meeting. Additional meetings were held with USFWS on 30 May, 6 November, 10 December 2002, and 19 March 2003, and with AGFD on 19 April 2002.

Table 2. Federally listed species that may occur near the proposed action.		
SPECIES	STATUS	*DRAFT* DETERMINATION
Canelo Hills ladies' tresses	Endangered	No Effect
Cactus ferruginous pygmy-owl	Endangered	May affect, likely to adversely affect
Desert pupfish	Endangered	No Effect
Gila topminnow	Endangered	May affect, not likely to adversely affect
Huachuca water umbel	Endangered	No Effect
Jaguar	Endangered	May affect, not likely to adversely affect
Jaguarundi	Endangered	No Effect
Kearney’s blue star	Endangered	No Effect
Lesser long-nosed bat	Endangered	May affect, likely to adversely affect
Masked bobwhite	Endangered	No Effect
Mexican gray wolf	Endangered	May affect, not likely to adversely affect
Nichols turk's head cactus	Endangered	No Effect
Northern aplomado falcon	Endangered	No Effect
Ocelot	Endangered	No Effect
Pima pineapple cactus	Endangered	May affect, likely to adversely affect
Sonoran pronghorn	Endangered	No Effect
Sonoran tiger salamander	Endangered	No Effect
Southwestern willow flycatcher	Endangered	May affect, not likely to adversely affect
Bald eagle	Threatened	No Effect
Brown pelican	Threatened	No Effect
Chiricahua leopard frog	Threatened	No Effect
Loach minnow	Threatened	No Effect
Mexican spotted owl	Threatened	No Effect
Sonora chub	Threatened	No Effect
Spikedace	Threatened	No Effect
Mountain plover	Proposed	No Effect
Gila chub	Proposed	No Effect

2.1 CACTUS FERRUGINOUS PYGMY-OWL (*Glaucidium brasilianum cactorum*) (Endangered)

2.1a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. The action area for the CFPO includes those areas of habitat below 4,000 ft (1,219 m) that may be directly impacted by construction as well as potential nesting sites within 1,312 ft (400 m) of the proposed action (USFWS 2000) that may be subject to noise disturbance during construction. In addition, an 7.08 mi (11.4 km) buffer area surrounding the project area is included in the action area because juvenile CFPO have been documented traveling up to 7.08 mi (11.4 km) during dispersal (M. Wrigley, USFWS, pers. comm., May 2001).

2.1b Natural History and Distribution:

USFWS listed CFPO in Arizona on 10 March 1997 (USFWS 1997a) as endangered. Listing was based on historical and current evidence that suggested a significant population decline of this subspecies had occurred in Arizona. USFWS considered the loss and alteration of habitat as the primary threat to the remaining population. A recovery plan for the species is currently in development by the CFPO recovery team.

CFPO (Figure 9) are small brown birds, with a cream-colored belly streaked with paler brown (Pyle 1997). The *cactorum* race; however, is described as "a well-marked, pale grayish extreme for the species" (Phillips et al. 1964). The call for this mostly diurnal owl is heard chiefly near dawn and dusk. The best field identification features are its small size, eyespots on the nape of the neck, and long reddish-barred tail, which is often nervously wagged or twitched (Monson 1998).

Figure 9. Cactus ferruginous pygmy-owl.

Originally CFPO were described as a separate subspecies based on specimens from Arizona and Sonora, Mexico. CFPO were first documented in the United States from a collection by Lieutenant Charles E. Bendire on 24 January 1872 in the "heavy mesquite thickets along Creek" near the present day site of historic Camp Lowell, Tucson (Coues 1872, Bendire 1892).

Very little is known about the life history of CFPO in Arizona (Cartron et al. 2000a). Little or no literature currently exists concerning life history variables such as longevity, age distribution, and recruitment. Current studies undertaken by AGFD, USFWS, and The University of Arizona are examining these variables.

The diet of CFPO is not well understood, but they are believed to be prey generalists (Cartron et al. 2000a). Observations, stomach content analysis, and records of Texas pygmy-owls suggest that these owls have a diverse diet that includes mammals, birds, reptiles, and insects (Proudfoot and Beasom 1997).

CFPO nest in cavities of larger trees (typically defined as a tree with a trunk at least 6 in [15 cm] diameter at breast height [DBH]) or large columnar cactus. Cavities may be naturally formed (e.g. knotholes) or excavated by woodpeckers. CFPO do not construct their own nest holes. All currently known CFPO nest sites in Arizona are in woodpecker excavated cavities in saguaros. Historically, the species also has been documented nesting in cottonwood, paloverde, and mesquite trees in Arizona.

Nesting activity for this owl species in Arizona begins in late winter to early spring (Lesh and Corman 1995, Abbate et al. 1996). Little is known about its courtship flight behavior. Egg laying begins by late April with three to four eggs typically laid. It is uncertain if only one brood is hatched per year. Nestlings have been observed through the end of July. During nesting, the male brings food to the female and young (Glinski 1998).

Historically, CFPO occurred from the lowlands of central Arizona, south through western Mexico to the states of Colima and Michoacan, and from southern Texas south through the Mexican states of Tamaulipas and Nuevo Leon. In Arizona, the species was documented as far north as New River and Cave Creek in northern Maricopa County (Harris and Duncan 1999). Elsewhere in Maricopa County, the species has been found near the Yuma County line along the Gila River at Agua Caliente, along the Salt River at Phoenix, and near the Verde River confluence. The eastern most verifiable record was along the Gila River at Old Fort Goodwin, located approximately 2 mi (1.2 km) southwest of present day Geronimo, Graham County, Arizona (Aiken 1937). In the southeastern part of the state, the species has been documented in recent times near Dudleyville along the lower San Pedro River between 1985 and 1987 (Harris and Duncan 1999), and probably also along lower Aravaipa Creek in 1987 (Monson 1987). Other localities in south central Arizona include historical records in Pinal County near Sacaton and Blackwater on the Gila River Indian Reservation, and at Casa Grande (Harris and Duncan 1999). Near the Mexican border, the species has been found in Santa Cruz County near Patagonia and in Sycamore Canyon west of Nogales. A likely accidental sighting was documented once on 10 April 1955 in eastern Yuma County near the Mexican border at Cabeza Prieta Tanks on the Cabeza Prieta National Wildlife Refuge (Monson and Phillips 1981, Harris and Duncan 1998).

Surveys conducted by University of Arizona biologists in Sonora, Mexico found 280 CFPO during the 2000 survey season. CFPO within Sonora, Mexico and Arizona may have been the same population prior to agricultural expansion within the last 75 years. However, due to isolation, the genetic connection of the Arizona population to owls in the nearby state of Sonora, Mexico may be tenuous (USFWS 2002a).

CFPO have been documented in several habitat types in the northern portion of its range in Arizona and adjacent Mexico. In Arizona, these include streamside Sonoran riparian deciduous forest and woodland associations and Sonoran desertscrub. CFPO also inhabit Sinaloan deciduous forest and thornscrub in Mexico (not discussed here). The streamside associations include such species as cottonwood, ash, netleaf hackberry, willows, velvet mesquite, and others. The Sonoran desertscrub associations are composed of relatively dense saguaro cactus stands associated with short trees such as paloverde, mesquite, and ironwood (*Olneya tesota*), and an open understory of triangle-leaf bursage, creosote, and various other cacti and shrubs. Throughout its range, CFPO occur at low elevations, generally below 4,000 ft (1,219 m).

CFPO found in Sonoran desertscrub habitats are typically associated with structurally diverse stands of desert riparian scrub with saguaros along washes (Wilcox et al. 2000). Such habitat is often referred to as xeroriparian vegetation (Johnson and Haight 1985). These washes have no permanent water flow. Instead, flow is intermittent and based on seasonal rainfall as well as strength and duration of individual storms. Desert riparian scrub vegetation is easily recognizable by the presence of a linear assemblage of trees and shrubs that grow along the wash. Density is higher and taller than the sparse desertscrub vegetation that typically exists in the adjacent uplands. Before listing the species as endangered, all known CFPO were documented in such Sonoran desertscrub habitat (Lesh and Corman 1995, Abbate et al. 1996).

At the northern periphery of the subspecies range in southern Arizona, CFPO distribution and preferred habitat is not well understood. It is believed CFPO require the cover of denser wooded areas with understory thickets, like riparian habitat, for nesting, foraging, and predator avoidance (Abbate et al. 2000). Riparian habitat also is known for its high density and diversity of animal species that constitute the prey base of CFPO.

A significant decline in the Arizona population has occurred over the past several decades (USFWS 1997a, Richardson et al. 2000). Loss or modification of habitat from woodcutting, agriculture, groundwater pumping, and related human activities has presumably contributed to the population decline (USFWS 1997a).

2.1c Critical Habitat

On 12 July 1999, USFWS designated approximately 731,712 acres (296,113 ha) of critical habitat supporting riverine, riparian, and upland vegetation in seven critical habitat units, located in Pima, Cochise, Pinal, and Maricopa counties of Arizona (USFWS 1999). However, on 21 September 2001, the U.S. District Court for the State of Arizona vacated this final rule designating critical habitat for CFPO, and remanded its designation back to the USFWS for further consideration. On 27 November 2002, USFWS proposed designating 1.2 million acres (485,000 ha) of critical habitat for CFPO in southern Arizona (Federal Register Vol. 67, No 229:71031-71064). The proposed action does not enter any areas proposed as critical habitat.

2.1d Current Status Statewide

USFWS determined that CFPO in Arizona were endangered because of the following factors (USFWS 1997a):

- present or threatened destruction, modification, or curtailment of its habitat or range;
- inadequacy of existing regulatory mechanisms;

- other natural and manmade factors, which include low genetic viability.

Surveys conducted statewide during the 2002 season confirmed a total of 18 adult CFPO and three nests in Arizona. Similar to the previous four years, there was greater than 50 percent fledgling mortality documented in 2002, with only one juvenile confirmed surviving dispersal (S. Richardson, USFWS, pers. comm., 3 December 2002).

One of most urgent threats to CFPO in Arizona is thought to be the loss and fragmentation of habitat (USFWS 1997a, Abbate et al. 1999). The complete removal of vegetation and natural features required for many large-scale and high-density developments directly and indirectly impacts CFPO survival and recovery (Abbate et al. 1999). In recent decades, CFPO riparian habitat has continually been modified and destroyed by agricultural development, woodcutting, urban expansion, and general watershed degradation (Phillips et al. 1964, Brown et al. 1977, State of Arizona 1990, Bahre 1991, Stromberg et al. 1992, Stromberg 1993a and 1993b). Sonoran desertscrub has been affected to varying degrees by urban and agricultural development, woodcutting, and livestock grazing (Bahre 1991). Pumping of groundwater and the diversion and channelization of natural watercourses are also likely to have reduced CFPO habitat.

Proudfoot and Slack (2001) found that CFPO in northwestern Tucson may be isolated from other populations in Arizona and Mexico. Low genetic variability can lead to a reduction in reproductive success and environmental adaptability. In 1998 and 1999, two cases of sibling CFPO pairing and breeding were documented (Abbate et al. 1999). In both cases, young were fledged from the nesting attempts. These unusual pairings may have resulted from extremely low numbers of available mates within dispersal range, and/or from barriers (including fragmentation of habitat) that have influenced dispersal and limited the movement of young owls (Abbate et al. 1999).

Soule (1986) notes that very small populations are in extreme jeopardy due to their susceptibility to a variety of factors, including variations in birth and death rates that can result in extinction. In small populations such as with CFPO, each individual is important for its contribution to the genetic variability of that population.

2.1e Environmental Baseline

CFPO habitat north of Sahuarita Road consists of Sonoran desertscrub with relatively high species diversity and structural diversity, including scattered saguaro cacti containing potential nesting cavities. This area is within Survey Zone 1 (USFWS 2000) and has the highest potential for occupancy of the entire action area. Land status in this area is a mixture of private and state land. The Mission Mine Complex also is located within this section of the proposed action and grazin
in the area.

CFPO habitat south of Sahuarita Road consists
dominated by mesquite and acacia trees, mixed-c
including non-native Lehmann's lovegrass (*Erag*

primarily undeveloped, but does contain some existing electrical distribution lines and associated roads (Figure 10) as well as low density housing developments. These grasslands are transected by desert riparian scrub dominated by mesquite and netleaf hackberry trees. Some areas of deciduous riparian forests are also found south of Arivaca Road in Sopori Wash and Peck Canyon. Land jurisdictions in this area include private, state, BLM, and USFS.

Figure 10. Example of existing disturbance within the corridor.

CFPO surveys were conducted by Harris Environmental Group, Inc. (HEG) biologists in 2001 and 2002 (data previously submitted to USFWS) in accordance with the approved protocol (USFWS 2000). Surveys were conducted in Sonoran desertscrub habitat where saguaros were present and in desert riparian scrub and deciduous riparian habitats that contained large trees (over 6 in [15.2 cm] DBH). No CFPO were detected during either survey year.

The only historical records of CFPO within the Nogales Ranger District (RD) of the CNF are in Sycamore Canyon (CNF 2000) and a dispersing juvenile in the Jarillas Alloment. USFS surveys in Sycamore Canyon in 1997 and 1998 did not locate CFPO. Additionally, USFS personnel surveyed 2,300 acres (930 ha) in 1999 with negative results and conducted 58 habitat assessments for CFPO habitat (CNF 2000). The habitat assessments identified four areas that ranked high enough to warrant CFPO surveys. No CFPO have been detected during surveys of these four areas (T. Newman, CNF, pers. comm., 9 October 2002).

2.1f Effects of Proposed Action on the CFPO

<u>Direct Effects</u>

Vehicle and Powerline Collisions

CFPO collisions with windows and fences have been documented in the Tucson area (USFWS 2002a), and observations of low flying CFPO across roadways indicate vehicle collisions are a realistic hazard (Abbate et al. 1999). While CFPO may be active during daylight, no CFPO have been detected within the action area, therefore, CFPO collisions with construction related vehicles are unlikely.

There is a small risk of a CFPO collision with power lines, however, raptors have lower rates of collision with power lines than passerine birds (McNeil et al. 1985). This reduced collision rate may be due to the visual acuity, maneuverability, and non-flocking tendencies (Nobel 1995). To minimize the risk of powerline collisions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996" (APLIC 1996).

Electrocution

Because power structures and towers are attractive perching and nesting sites for some raptor species, significant raptor mortality from electrocution has been reported in North

America (Harness and Wilson 2000). Electrocution occurs when a bird simultaneously touches two phase conductors or a conductor and a ground wire (Bevanger 1994). Most electrocutions occur on distribution lines (34-kV or less) rather than on transmission lines (69-kV or more), primarily because clearances between wires on distribution lines are less and distribution lines have an array of uninsulated, structure-mounted equipment (Marti 2002). To minimize the risk of raptor electrocutions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996" (APLIC 1996). Furthermore, on the structures to be used in the proposed action, the distance between the power lines is at least 18 ft (5.5 m). Because the average wingspan of an adult CFPO is 15 in (38 cm), there is no foreseeable risk of electrocution.

Construction Noise and Activity
Although no CFPO have been detected in the project area, short term noise disturbance and human activity associated with construction may discourage CFPO from using habitat within and adjacent to the proposed ROW. Human activity near nest sites at critical periods of the nesting cycle may cause CFPO to abandon their nests (USFWS 2002a). While CFPO may tolerate low level noise disturbances, such as those in low density residential areas (Cartron et al. 2000b), they will probably not tolerate noise levels associated with construction activities in close proximity to a nest. The greatest likelihood of noise disturbance will result from the use of helicopters during the installation of the transmission lines, but also could result from the presence of heavy machinery or large groups of construction personnel. If CFPO are not detected during the two consecutive years of protocol surveys, the potential for direct impacts to this species is minimal.

Indirect Effects
Habitat Modification and Fragmentation
The proposed action will result in the disturbance of areas that could provide potential nesting, foraging, and dispersal habitat for CFPO. Because many access roads will be closed and restored and all disturbed areas will be reseeded, this disturbance will be temporary. The proposed action could potentially result in temporary disturbance to habitat from access roads and structure installations in the following amounts: 33.99 acres (13.76 ha) in Sonoran desertscrub, 16.70 ha (41.27 acres) in desert riparian scrub, and 0.05 acres (0.02 ha) in deciduous riparian.

While all large saguaros within construction sites will be transplanted, construction could temporarily degrade CFPO habitat by removing vegetation that provides forage and shelter. Elimination of groundcover plant species, rodent burrows, and native soils, as well as loss of trees and shrubs, may impact local reptile and bird populations that are important to the pygmy-owl diet. Loss of complex vegetation structure increases energy demands on owls that must forage at greater distances and risk exposure to a variety of hazards (Abbate et al. 1999). Because of the linear nature of the proposed action, these impacts will be widely distributed and relatively minor in any single area.

Increased Legal and Unauthorized Access to CFPO Habitat

Although CFPO have not been detected in the project area, recreationists may access potential CFPO habitat using temporary construction roads associated with the proposed action. While hikers and other non-motorized recreationists will create minimal disturbance, noise from Off Highway Vehicle (OHV) users are much more likely to disturb CFPO, especially if the activity occurs over an extended period of time in or near a CFPO nesting territory. Increased access to CFPO habitat may subject the species to poaching or other harassment. While TEP will prevent unauthorized access to the ROW across private land, closure of the ROW on public land, particularly state land, is not feasible. Therefore, some increase in access to potential CFPO habitat is anticipated.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, CFPO will not likely be directly impacted by wildfires. However, wildfires may destroy columnar cacti and trees that provide nesting cavities as well as affect CFPO prey species through direct mortality from the fire or habitat destruction. Herbaceous plant species that serve as cover and forage for small mammals could be drastically reduced. Because of reduced groundcover, predation upon surviving small mammals by CFPO may actually increase in the short term. Furthermore, increased herbaceous production in the years following a fire may improve habitat for small mammals in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977).

The measures outlined in the Fire Prevention Plan will minimize the risk of wildfire associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.1g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this biological assessment. While the action area for this species crosses private, state, and federal lands, the habitat with the highest potential for occupancy by CFPO occurs on state and private lands in Pima County. Future federal actions on these lands will be subject to Section 7 consultation. These actions will not be considered cumulative.

Although the amount of future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). Because of the growth rate and the development pressures from nearby Tucson and Sahuarita, it is foreseeable that land adjacent to the proposed ROW will be developed. These developments will likely include increases in associated infrastructure such as roads, groundwater use, and commercial services, all resulting in the degradation of CFPO habitat.

An undetermined level of border crossings by undocumented immigrants (UDI) occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase. Additionally, agriculture, recreation, OHV use, grazing, and other activities continue to occur on private and state land and adversely affect CFPO and their habitats.

2.1h Effects Determination and Incidental Take

While CFPO are not currently known to occupy the action area, the disturbance of potential habitat from construction activities and increased access may affect, and are likely to adversely affect, this species.

Take of CFPO is not anticipated because construction activities during breeding season will only occur following protocol surveys and the Conservation Measures outlined in SECTION 1.4 will minimize disturbance to potential habitat and prevent disturbance to nesting CFPO within the action area should any be detected in the future.

2.2 SOUTHWESTERN WILLOW FLYCATCHER (*Empidonax traillii extimus*) (Endangered)

2.2a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. While habitat for SWFL does not exist within the Central Corridor, migratory SWFL have been documented along the Santa Cruz River, which is within 0.5 mi (0.8 km) of the proposed action near the community of Tumacacori, Arizona.

2.2b Natural History and Distribution

SWFL (Figure 11) are small passerine bird (Order Passeriformes; Family Tyrannidae) measuring approximately 5.75 in (14.6 cm) in length from the tip of the bill to the tip of the tail and weighing only 0.4 ounces (11.34 grams). This species has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark and the lower is light yellow grading to black at the tip. SWFL are riparian obligate species, nesting along rivers, streams, and other wetlands where dense growths of willow, seepwillow (*Baccharis* sp.), buttonbush (*Cephalanthus* sp.), boxelder (*Acer negundo*), saltcedar (*Tamarix* spp.), carrizo (*Phragmites australis*) or other plants are present, often with a scattered overstory of cottonwood and/or willow.

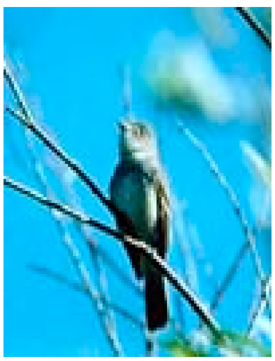

Figure 11. Southwestern willow flycatcher.

One of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993), SWFL are neotropical migratory species that breed in the southwestern U.S. from approximately 15 May to 1 September. This species migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical range of SWFL included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987).

SWFL breed in dense riparian habitats from sea level in California to just over 7,000 ft (2,134 m) in Arizona and southwestern Colorado. Historic egg/nest collections and species descriptions throughout SWFL range describe the widespread use of willow for nesting (Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987, San Diego Natural History Museum 1995). Currently, SWFL primarily use Geyer willow (*Salix geyeriana*), Goodding willow (*Salix gooddingii*), boxelder, saltcedar, Russian olive (*Elaeagnus angustifolio*), and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush, black twinberry (*Lonicera involucrata*), cottonwood, white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), carrizo, and stinging nettle (*Urtica* spp.). Nesting SWFL exhibit a strong preference for dense vegetation at the nest site, but high variation and density of vegetation at the patch scale (Hatten et al. 2000). Nesting sites are typically close to the edge of the vegetation patch and close to water (Allison et al. 2000). Based on the diversity of plant species composition and complexity of habitat structure, four basic nesting habitat types can be described for SWFL: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge et al.1997).

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of SWFL territories and nests; SWFL sometimes nest in areas where nesting substrates are in standing water (Maynard 1995, Sferra et al. 1995, 1997). Hydrological conditions at a particular site can vary remarkably in the arid southwest within a season and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June). However, the total absence of water or visibly saturated soil has been documented at several sites where the river channel has been modified (e.g. creation of pilot channels), where modification of subsurface flows has occurred (e.g. agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer et al. 1996). Throughout their range, SWFL arrive on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge et al. 1993, Sogge and Tibbitts 1994, Muiznieks et al. 1994, Maynard 1995, Sferra et al. 1995, 1997). Nesting begins in late May and early June, and young fledge from late June typically through mid August, but as late as early September.

SWFL are insectivores, foraging in dense shrub and tree vegetation along rivers, streams, and other wetlands. Flying insects are the most important SWFL prey item; however, they will also glean larvae of non-flying insects from vegetation (Drost et al. 1998). Drost et al. (1998) found that the major prey items of SWFL (in Arizona and Colorado), consisted of true flies (Diptera); ants, bees, and wasps (Hymenoptera), and true bugs (Hemiptera). Other insect prey taxa include leafhoppers (Homoptera: Cicadellidae), dragonflies and damselflies (Odonata); and caterpillars (Lepidoptera larvae). Non-insect prey include spiders (Araneae), sowbugs (Isopoda), and fragments of plant material.

2.2c Critical Habitat

Critical habitat for SWFL was originally designated on 22 July 1997 (USFWS 1997b), but on 11 May 2001, the 10th Circuit Court of Appeals set aside the critical habitat designation and instructed USFWS to issue a new designation in compliance with the court ruling. USFWS is currently soliciting information regarding areas important for the conservation of this species in order to re-propose critical habitat.

2.2d Current Status Statewide

The following status of SWFL in Arizona was summarized from Smith et al. (2002). In 2001, 177 sites covering approximately 139 mi (225 km) of riparian habitat were surveyed for SWFL in Arizona. Sites range from 98 ft (30 m) to 8,802 ft (2,683 m) in elevation and 98.5 ft (30 m) to 10 mi (16.1 km) in length. The mean site length was 1 mi (1.6 km). Fifty-two of the 177 sites were not surveyed according to protocol. This was due to time or funding limitations or because unsuitable SWFL habitat was found during the first survey. Of the 177 sites, 20 had not been previously surveyed. Most new survey sites were located along the Colorado River (n = 9) and Gila River (n = 4). Six hundred thirty-five resident SWFL were documented within 346 territories at 46 sites. AGFD personnel and statewide cooperators recorded 311 pairs.

SWFL were documented along 11 drainages. The greatest concentrations of SWFL were found at Roosevelt Lake (40 percent) and the Winkelman Study Area (35 percent). Resident SWFL were detected at five sites that had been surveyed at least once in previous years. Resident SWFL were documented in two drainages (Virgin River and Cienega Creek) for the first time since protocol surveys began. No historical occurrence record exists for SWFL along the Virgin River and SWFL have not been reported at Cienega Creek since 1964. These colonizations yield evidence of habitat restoration potential in these drainages that can aid in recovery of the SWFL.

2.2e Environmental Baseline

Deciduous riparian vegetation only occurs within the project area at the Peck Canyon crossing. The canyon and associated riparian area supports ash, walnut, and netleaf hackberry but consists primarily of scattered, individual trees with low understory density (Figure 12). This reach of Peck Canyon is ephemeral and water is probably present only for short periods of time following precipitation events. Semidesert grasslands that are subject to grazing characterize the uplands surrounding Peck Canyon. Because of the patchy habitat and lack of surface water, this area likely will not function as SWFL habitat.

Figure 12. Central Corridor crossing of Peck Canyon.

The Central Corridor also passes within 0.5 mi (0.8 km) of the Santa Cruz River near the community of Tumacacori, Arizona. The riparian vegetation within the Santa Cruz floodplain in this area consists of mature Fremont cottonwood and Goodding willow with a greater than 75 percent canopy cover in most places (Figure 13), as well as a well-developed understory. This reach of the Santa Cruz River is perennial.

Figure 13. Santa Cruz River near Tumacacori, Arizona.

The nearest recent (1999) reports of SWFL are from the Santa Cruz River between Tubac and Rio Rico (McCarthey et al. 1998, Paradzick et al. 1999, Paradzick et al. 2000). All of these reports were of migrant SWFL. Additionally, in May 1998, USFWS personnel located a calling willow flycatcher at the I-19 frontage road across Peck Canyon (USFWS 2001a), 2.5 mi (4 km) east of the proposed action. No follow-up surveys were conducted and it is unknown if this was a migrant or breeding flycatcher.

2.2f Effects of Proposed Action on the SWFL

<u>Direct Effects</u>

Construction Noise and Activity

Noise from helicopter flights associated with construction activities may disturb SWFL using suitable habitat along the Santa Cruz River. However, because I-19 is adjacent to the Santa Cruz River, any SWFL using the river will already be subject to a certain level of ambient noise from traffic. Because of the distance of the proposed action from the

Santa Cruz River and the existing noise level along I-19, any increase in noise associated with the proposed action will be minimal and short term.

Indirect Effects

Habitat Modification and Fragmentation

Deciduous riparian vegetation only occurs within the project area at the Peck Canyon crossing. The proposed action spans Peck Canyon parallel to the existing EPNG gasline and no new access roads are planned within the habitat. This portion of riparian habitat is not suitable for breeding SWFL, therefore, no indirect effects to SWFL through habitat modification are anticipated.

Increased Legal and Unauthorized Access to SWFL Habitat

Access and construction roads for the proposed action will typically be spurs off the existing EPNG gasline and range between 500 – 1,000 ft (152 m and 305 m) in length. Because of the short lengths of the new roads and the presence of I-19 between the proposed action and the Santa Cruz River, there will not be any foreseeable increase in access to SWFL habitat.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). New roads also may act as firebreaks and improve response times of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977).

While there is a minimal risk from accidental wildfire associated with the proposed action, any fire will have to spread a significant distance to the east before impacting suitable SWFL habitat. Several roads that could serve as firebreaks and afford firefighting accessibility, most notably I-19, occur between the proposed action and suitable SWFL habitat. Furthermore, measures oulined in the Fire Prevention Plan will minimize the risk of wildfire associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). The short lengths of new access roads, their distance from SWFL habitat, as well as the measures outlined in the Invasive Species Management Plan, will minimize the introduction or spread of invasive species into SWFL habitat.

2.2g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. The land between the proposed action and the Santa Cruz River consists almost exclusively of private land. While Federal actions on these lands will be subject to Section 7 consultation, and therefore not considered cumulative, many private actions could occur without consultation.

Although the amount of planned private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Pima County grew by 26.5 percent and Santa Cruz County by 29.3 percent (U.S. Census Bureau 2000). Because of these growth rates and the trend of rural development to occur in areas with some existing infrastructure, it is foreseeable that the private ranches adjacent to Arivaca Road could be sold and subdivided for residential homes and ranchettes. Any substantial population increase in the area also could increase demands for access to recreational land, increase groundwater pumping, and foster the development of commercial services. These impacts to the watershed could degrade the value of habitat within Sopori Wash preventing its use by a variety of species.

An undetermined level of border crossings by UDI occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase into the foreseeable future.

2.2h Effects Determination and Incidental Take

Noise from construction of the proposed action may affect SWFL, but it is not likely to adversely affect the species because any increase in noise will be minimal compared to ambient noise levels and short term in duration. Because the proposed action is not likely to adversely affect the species, no take of SWFL is anticipated.

2.3 LESSER LONG-NOSED BAT (*Leptonycteris curasoae yerbabuenae*) (Endangered)

2.3a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential roosting habitat for LLNB occurs in the Tumacacori and Atascosa/Pajarito mountains, and foraging habitat occurs through those portions of the proposed ROW that contain agave and saguaro cacti. Because LLNB have been documented foraging up to 40 mi (64 km) from roost sites, the action area for the LLNB consists of all potential foraging and roosting habitat within a 40 mi (64 km) buffer surrounding the proposed action.

2.3b Natural History and Distribution

LLNB (formerly Sanborn's long-nosed bat) are one of three members of American leaf-nosed bats (Family Phyllostomidae) in Arizona (Hoffmeister 1986). LLNB (Figure 14) is one of the larger Arizona bats, gray to reddish brown in color. This bat has an erect triangular flap of skin (nose leaf) at the end of a long slender nose. LLNB can be distinguished from *Macrotus* by a much longer nose, greatly reduce tail membrane, and smaller ears; and from *Choeronycteris*, which has a shorter tail, larger tail membrane, and longer, narrower nose than LLNB.

Figure 14. Lesser long-nosed bat.

LLNB occur from the southern United States to northern South America, including several islands and the adjacent mainland of Venezuela and Colombia. LLNB are found between 4 degrees to 32 degrees N latitude in semiarid to arid conditions (Nowak 1994). This bat is typically associated with their primary food source, flower nectar and fruit of columnar cacti, and flower nectar of certain agave species. Because of the seasonal nature of their food source, they must migrate to follow flowering and fruiting plants. In addition to food availability, there must be suitable roosting within commuting distance of the food source. Currently, the longest known commute distance is about 48 km (30 mi).

The primary range of this bat lies in Mexico and Central America. Occurrences in Arizona probably represent range expansion. Prior to the 1930s, there are no records of LLNB in Arizona (Cockrum 1991). Colossal Cave and the Old Mammon Mine are the most northern sites known to house colonies of these bats. However, these sites support colonies of about 5,000 individuals, versus sites in Mexico, which are as large as 150,000 individuals.

LLNB have a bi-seasonal occurrence in Arizona. The maternity season, when bats migrate to southwestern Arizona, represents a United States population of about 30,000 individuals. The other is the fall agave flowering season, located in southeastern Arizona, which attracts about 70,000 bats. Each of these areas contains three known primary roosts and some number of secondary/transient or night roosts (sheltering ten to a few hundred individuals/site).

With the exception of a small bachelor roost located in the Chiricahua Mountains, all remaining records represent small numbers (usually single individuals) at hummingbird feeders, caught in mist nets, or chance findings in residential areas. Constantine (1966) reported two immature females from Maricopa County, one in Phoenix on 30 August 1963 and the other in Glendale on 16 September 1963. The Glendale specimen was found dead. The other was hanging on a screen door (not a normal place) indicating something was likely wrong with that bat. He also reported two males from southern California: one was taken alive on 3 October 1993 outside a home in Yucaipa, the other was taken on 18 October 1996 from the outside of a building in Oceanside (Constantine 1998). LLNB also have been reported from the Aravaipa Canyon area (Cockrum 1991). Hoffmeister (1986) has a record in the Santa Catalina Mountains, but Cockrum (1991) states it was probably a transcription error because the nectar-feeding bats found there belong to the genus *Choeronycteris*. However, Cockrum (1991) does report LLNB from the Santa Catalina Mountains but only once in a mist net set in Sabino Canyon (a female in June).

The diet of LLNB in Arizona consists primarily of the nectar, pollen, and ripe fruit of columnar cacti (particularly saguaro) and agave (e.g., *Agave chrysantha*, *A. deserti*, *A. palmeri*, and *A. parryi*). LLNB have been demonstrated to be a significant pollinator of saguaros, organpipe cacti (*Stenocereus thurberi*), and agaves (Howell and Roth 1981, Alcorn et al. 1962, and McGregor et al. 1962). Generally, LLNB in Arizona forage after dusk to nearly dawn during the months of May through September. In a single night, LLNB will forage well away from their daytime roost sites. In Sonora, Mexico, bats feed on the mainland by night at Bahia Kino and roost by day on Isla Tiburon, 15 to 20 mi (24 to 32 km) away. The closest sizable densities of columnar cacti to LLNB roosts in the Sierra Pinacate, Sonora, Mexico, are found in Organpipe Cactus National Monument in Arizona, about 25 to 30 mi (40 to 48 km) away (Fleming 1991).

In Arizona, females arrive in late March and early April, then migrate northward through Mexico along a “nectar corridor” provided by columnar cacti such as saguaro and organpipe (Fleming 1991). Female LLNB usually arrive in Arizona pregnant and congregate in traditional maternity roosts at lower elevations, feeding primarily on saguaro nectar (Cockrum 1991). Adult males arrive later in the summer and, along with dispersing members of the maternity roosts, usually roost at higher elevations, especially within proximity to significant stands of flowering agave.

LLNB are gregarious and form large maternity colonies that number in the thousands (Hayward and Cockrum 1971, Hoffmeister 1986). All four of the verified LLNB maternity roosts in the United States are found in Arizona (Cockrum 1991). The largest and most important of the four is found in a mine located in Organpipe Cactus National Monument. About 15,000 LLNB use this mine as a maternity roost. Young are typically born between mid-May and early June (Cockrum 1991, Hayward and Cockrum 1971).

While in the roost during the day, LLNB engage in various activities such as flying, suckling of young, grooming, resting, and interacting with neighbors. LLNB are particularly active during the day and any disturbance, such as aircraft or other human activities, may cause an expenditure of extra energy (Dalton and Dalton 1993, Dalton et al. 1994). Female LLNB gathered in large maternity colonies are particularly vulnerable to disturbances. Maternity colonies are more sensitive because of the vulnerability of nonvolant young, whose recruitment into the population is essential to maintain a viable population.

2.3c Critical Habitat
No critical habitat has been designated for LLNB.

2.3d Current Status Statewide
USFWS listed LLNB as endangered throughout its range in the southwestern United States and Mexico on 30 September 1988 (USFWS 1988). Loss of roost and foraging habitat, as well as direct take of individual bats during animal control programs (particularly in Mexico) have contributed to the current endangered status of the species. All available information on the species through 1994 was summarized in the Lesser Long-nosed Bat Recovery Plan approved in 1997 (Fleming 1994). The Plan indicates that the species is not in danger of extinction in Arizona or Mexico. The species still warrants some protection, as it is vulnerable to human disturbance at roost sites because of its gregarious behavior. There also is particular concern for the protection of forage plants from disturbance or destruction near roost sites.

The primary threats to LLNB populations are agave harvesting and human disturbance of roosting and maternity colonies. Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial to LLNB (Fleming 1995). The USFWS determined that the LLNB was endangered because of the following factors (USFWS 1988):

- A long term decline in population,
- Reports of absence from previously occupied sites
- Decline in the pollination of certain agaves.

Known major roost sites include 16 large roosts in Arizona and Mexico (Fleming 1995). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known from Arizona and Mexico. Disturbance of these roosts, or removal of the food plants associated with them, could lead to the loss of the roosts. Limited numbers of maternity roosts may be the critical factor in the survival of this species.

2.3e Environmental Baseline

LLNB roosts are not known within the proposed corridor, but field surveys did locate small caves and crevices nearby that could serve as LLNB day roosts (HEG 2002, unpublished data). Furthermore, unsurveyed caves, mineshafts, and adits, which may provide suitable roost sites, occur within the Tumacacori-Atascosa mountains. The two closest known LLNB roost sites are the Cave of the Bells in the Santa Rita Mountains, approximately 32 km (20 mi) to the west, and a cave in the Patagonia Mountains, approximately 56 km (35 mi) to the west. Both of these roost sites are within the known flight distance to the proposed action and may utilize the proposed corridor for foraging.

Saguaro cacti occur within the proposed corridor north of Duval Mine Road, and agaves are present in varying densities south of Arivaca Road. While the exact densities of agaves and saguaro cacti were not determined for this BA, CNF estimates that Palmer's agave is widely scattered over 1 million ac (400,000 ha) at densities of 10 to 200 per acre, generally between the elevations of 3,000 ft (914 m) and 6,000 ft (1,829 m) (USFWS 2002b).

The northern portion of the proposed action is primarily undeveloped but does contain some existing electrical distribution lines as well as low density housing developments near Sahuarita Road. The Mission Mine Complex also is located within this section of the project area and the proposed action passes through the Tumacacori EMA of the CNF. Range condition in areas crossed by the proposed action is moderately high with a stable or unknown trend. While agaves have persisted in areas grazed for more that 100 years, mortality through direct herbivory and trampling is known to occur. There is a forest-wide study to determine the effects of livestock grazing on agaves currently underway (USFWS 2001b). Livestock stocking rates for the allotments within the Tumacacori EMA range from 1,320 AUMs in the Peña Blanca Allotment to 2400 AUMs in the Bear Valley Allotment. Allotment Management Plans for Bear Valley and Sardinia Allotments are currently being revised.

2.3f Effects of Proposed Action on LLNB

<u>Direct Effects</u>

Construction Noise and Activity

Although LLNB roosts have not been detected within the proposed corridor, short term noise disturbance and human activity associated with construction activities may disturb LLNB if they are present in undetected roosts adjacent to the proposed corridor. The greatest likelihood of noise disturbance will result from the use of helicopters during the installation, but could also result from the presence of heavy machinery or large groups of construction personnel in close proximity to an undetected roost. The consequences of disturbance to small numbers of LLNB in day roost will be less serious than disturbance of large aggregations of bats at one location.

<u>Indirect Effects</u>

Habitat Modification

Indirect effects to LLNB may result from the potential reduction in forage resources (agaves and saguaro cacti) during construction of temporary access roads or the installation of transmission structures. Because agaves and saguaro cacti are unevenlydistributed and the nectar provided by them are seasonally and geographically separated, the loss of significant numbers of either species may alter LLNB foraging patterns and roost selection within the action area. Even if the loss of a high density patch of flowering agaves does not cause the abandonment of a roost, bat survivorship may be reduced through increased foraging flight distances, related energy expenditures, and increased exposure to predators. Because of the linear nature of the proposed action, however, these impacts will be widely distributed and relatively minor in any single area.

Although all agave and saguaro disturbed as a result of the proposed action will be transplanted immediately outside of the construction zone, the long term survival and future flowering of these specimens is uncertain. Agaves are typically easy to cultivate in warm climates with well drained soils (Gentry 1982), but no long term studies of agave transplant survival have been conducted. Transplantation of saguaro is a common practice within southern Arizona, but preliminary results from a 10 year study indicate that smaller saguaros (<16 ft [5 m] tall) are more successfully transplanted than larger saguaros (HEG, unpublished data).

Even in areas where no agave or saguaro presently exist, dormant seeds may be present in the soil. Construction activities associated with the proposed action may compact soil and alter water infiltration, which may prohibit seed germination.

Increased Legal and Unauthorized Access to LLNB Habitat

Because LLNB are sensitive to human disturbance, (to the point of temporarily abandoning a day roost after a single human intrusion) increased human access to roost sites could negatively impact LLNB. The presence of new roads on state land will not likely result in disturbance to undetected roosts because few sites in this area support the rock outcropings, caves, and mine shafts necessary for LLNB roosts. The greatest potential for undetected roosts occurs on CNF land. The road closures on CNF land outlined in SECTION 1.4 and in the RA (URS 2003) will minimize the probability of increased human access and disturbance of LLNB in undetected roosts in these areas.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human caused ignitions in some areas (Gucinski et al. 2001). Agaves in desert grasslands have evolved with fire, but unnaturally high fire frequency and intensity can lead to the decline or elimination of agave populations. Furthermore, agave mortality from fire may affect the abundance and distribution of blooming agaves for a number of years, especially if there is high mortality within certain age and size classes.

New roads also may act as firebreaks and improve the response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of supplying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.3g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. The action area for this species crosses private, state, and federal land. Future federal actions on USFS land will be subject to Section 7 consultation but these actions will not be considered cumulative. Because the action area for this species includes a 40 mi (64 km) buffer, some of the future planned actions on private and state land in southern Pima County and much of Santa Cruz County may be considered cumulative.

Although the amount of this future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). In the same time period, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000).

An undetermined level of border crossings by UDI occurs within the action area resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase. Additionally, agriculture, recreation, OHV use, grazing, and other activities continue to occur on private and state land that adversely affect LLNB and their habitats.

2.3h Incidental Take

The potential disturbance of LLNB in undetected roosts from construction noise and potential mortality of transplanted forage species may affect, and is likely to adversely affect, this species.

No take of LLNB is anticipated as a result of the proposed action for the following reasons. First, noise disturbance will likely impact small numbers of individuals and will be short term in duration, and secondly, changes in agave and saguaro distribution will not be significant in any single location.

2.4 PIMA PINEAPPLE CACTUS (*Coryphantha scheeri* var. *robustispina*) (Endangered)

2.4a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential habitat for the PPC includes the entire proposed Central Corridor.

2.4b Natural History and Distribution

PPC (Figure 15) are small, round cacti with finger-like projections. Adult cacti range in size from 1.8 in (4.6 cm) to 18 in (46 cm) in height. At the tip of each projection or tubercle is a rosette of 10 to 15 straw-colored spines with one central hooked spine. Plants can be single or multi-stemmed and produce bright yellow flowers after summer rains (Roller 1996).

Figure 15. Pima pineapple cactus.

Populations of PPC are known to occur south of Tucson, in Pima and Santa Cruz counties, Arizona and in adjacent northern Sonora, Mexico. It is distributed at low densities within the Altar and Santa Cruz Valleys, as well as in low lying areas connecting these valleys.

PPC populations are generally found in open patches within semidesert grassland and Sonoran desertscrub plant communities (Brown 1994). They are typically found on flat alluvial bajadas that are comprised of granitic material and are most abundant within the ecotone between the grassland and desertscrub biomes (Roller 1996). This plant is found at elevations between 2,362 (720 m) and 4,593 ft (1,400 m). Typically, PPC are not found in washes or riparian areas.

2.4c Critical Habitat

No critical habitat has been designated for this species.

2.4d Current Status Statewide

USFWS listed PPC as endangered throughout its range on 25 October 1993 (58 FR 49875). Habitat loss and degradation, habitat modification and fragmentation, limited geographic distribution, the rarity fo this plant species, illegal collection, and difficulties in protecting areas large enough to maintain functioning populations, all are factors that contribute to the current endangered status of this species. Due to the limited information on PPC population distributions under current habitat conditions, it is difficult to determine the current status of the plant statewide. USFWS has insufficient data to determine if the majority of populations of PPC can be sustained under current reduced and fragmented conditions. PPC densities vary throughout its range with the highest densities occurring south of Tucson through the Santa Cruz Valley (to Amado and surrounding developed parts of Green Valley and Sahuarita, and parts of the San Xavier

District of the Tohono O'odham Nation). Continued urbanization, farm and crop development, mine expansion, and invasion of non-native species are primary threats to PPC populations. Overgrazing by livestock, illegal plant collection, and fire-related interactions involving non-native Lehmann's lovegrass also may have negative impacts on PPC (USFWS 1993).

2.4e Environmental Baseline

The environmental baseline for the PPC evaluates the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat and ecosystem within the action area. Based on monitoring results, the status of the PPC appears to have been recently affected by threats that completely alter or considerably modify more than one-third of the species surveyed habitat and have caused the elimination of nearly 60 percent of documented locations (USFWS 2001c). Dispersed, patchy clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to negatively impact PPC habitat.

The Central Corridor is primarily undeveloped but contains some existing electrical distribution lines and associated roads (Figure 14) and is in close proximity to low density housing developments, and the Mission Mine Complex. A majority of the corridor also parallels the previously disturbed EPNG gasline. While portions of the existing EPNG gasline access road appear relatively unused and support early successional plants (Figure 12), other areas are severely eroded and virtually impassable by motor vehicles.

Surveys for PPC were conducted using an approved survey protocol (Roller 1996) by establishing a belt transect across identified potential habitat with each surveyor covering a 16.4 to 23 ft (5 to 7 m) swath. One survey pass of the entire corridor was conducted with more intensive area searches around confirmed PPC locations. Surveys on state, private, and BLM land covered a 200 ft (61 m) wide area centered on the proposed structure alignment. On the CNF, the coverage was expanded to 750 ft (229 m) wide. All detected PPC locations were recorded using a Global Positioning System (GPS) unit. To determine the extent of proposed disturbance to PPC habitat, recent aerial photography was used to eliminate areas not suitable for PPC, including slopes over 15 percent, high clay or bedrock soils, washes, and previously distrubed areas such as roads, buildings, mining disturbance, etc. During surveys conducted between July 2002 and March 2003, 78 PPC were detected within the 125 ft (38.1 m) ROW between the TEP South Substation and the CNF boundary (HEG 2003, unpublished data). Based on the acreage surveyed, the density of PPC within this area is approximately 0.13 PPC/ac (0.32 PPC/ha).

2.4f Effects of Proposed Action on the PPC

<u>Direct Effects</u>
Because the precise locations of structures and access roads can be modified to avoid sensitive resources, the proposed action will not result in the loss of any individual PPC. All known individual PPC near construction areas and along main access routes will be clearly marked and protected to avoid impacts.

<u>Indirect Effects</u>
Modification of Habitat
The construction of new access roads and the installation of structures will alter PPC seed sources in unoccupied, but potential PPC habitat. Construction vehicles will compact soil, changing water infiltration rates, and road construction will dramatically alter soil structure and seed source depth. Areas around structure sites and many access roads will be temporary and will regenerate as potential PPC habitat in the future. Recent observations indicate that PPC may readily establish in recently disturbed habitats (USFWS 2002c), but these areas must be allowed to recover for years or possibly decades.

Detailed analysis of impacts to habitat for this species is ongoing. To mitigate for the potential loss of PPC habitat, TEP will purchase credits in a USFWS-approved conservation bank for PPC at a ratio determined in consultation with the USFWS.

Increased Legal and Unauthorized Access to PPC Habitat
Much of the proposed corridor through PPC habitat parallels existing electrical distribution lines with existing utility access roads. Some new access roads, however, will be constructed, potentially resulting in unintended access into previously undisturbed PPC habitat (especially by OHV users). Off-road travel could directly impact additional PPC or impede seedling establishment through changes in soil characteristics. Where possible, TEP will review the potential for closure of roads on private land to limit unauthorized access to the ROW.

Accidental Wildfire
Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). It is widely regarded that most succulent species are negatively impacted by fire and are not fire adapted (Rogers and Steele 1980, McLaughlin and Bowers 1982). Plants die by direct heating of the fire or later through indirect fire effects such as grazing of spineless plants, post-fire increase in plant tissue temperature, or the introduction of disease or infestation into weakened plants (Thomas 1991). The sparse distribution of this species across the landscape can mean that loss of just a few individuals to fire can greatly affect the range and density of local PPC populations.

New roads may act as natural firebreaks and improve response times of firefighters to wildfires, thereby preventing fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak efficacy in southern California came to similar conclusions (Green 1977).

The measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.4g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this biological assessment. Under Section 9 of the Act, the taking of listed animals is specifically prohibited, regardless of land ownership status. For listed plants, these prohibitions and the protection they afford do not apply. Listed plant species are protected only from deliberate removal from Federal land. There is no protection against removal or destruction of plants by a landowner on private land under the ESA.

Although the amount of future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). Because of these growth rates and the development pressures of nearby Tucson and Sahuarita, Arizona, it is foreseeable that some lands adjacent to the proposed ROW will be developed. These developments will likely include increases in associated infrastructure such as roads, groundwater use, and commercial services, all resulting in the degradation of PPC habitat.

An undetermined level of border crossings by UDI occurs within the action area and results in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

Additionally, PPC habitat is adversely affected by continual agriculture, recreation, OHV use, grazing, and other activities on private and state land.

2.4h Effects Determination

Construction activities and increased access may affect, and are likely to adversely affect PPC within the ROW, potential PPC habitat, and seedling establishment. The adverse affects to the species will be mitigated through the purchase of mitigation bank credits.

2.5 **JAGUAR** *(Panthera onca)* (Endangered)

2.5a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Because of the large movements possible by the jaguar and historical records for the species in a variety of habitats, the action area for the jaguar considered for the proposed action includes most of western Santa Cruz and southern Pima counties.

2.5b Natural History and Distribution

Jaguars (Figure 16) are the largest species of cat now native to the Western Hemisphere. Jaguars are large muscular cats with relatively short massive limbs, a deep-chested body, and cinnamon-buff in color with many black spots. Its range in North America includes Mexico and portions of the southwestern United States (Hall 1981). A number of jaguar records are known for Arizona, New Mexico, and Texas. Additional reports exist for California and Louisiana. Records of the jaguar in Arizona and New Mexico have been attributed to the subspecies *Panthera onca arizonensis*. The type specimen of this subspecies was collected in Navajo County, Arizona, in 1924 (Goldman 1932). Nelson and Goldman (1933) described the distribution of this subspecies as the mountainous parts of eastern Arizona north to the Grand Canyon, the southern half of western New Mexico, northeastern Sonora, and, formerly, southeastern California. The records for Texas have been attributed to another subspecies *P. o. veraecrucis*. Distribution of this subspecies was described by Nelson and Goldman (1933) as the Gulf slope of eastern and southeastern Mexico from the coast region of Tabasco, north through Vera Cruz and Tamaulipas, to central Texas. Swank and Teer (1989) indicated the historical range of the jaguar included portions of Arizona, New Mexico, and Texas. These authors consider the current range to be central Mexico through Central America and into South America as far as northern Argentina.

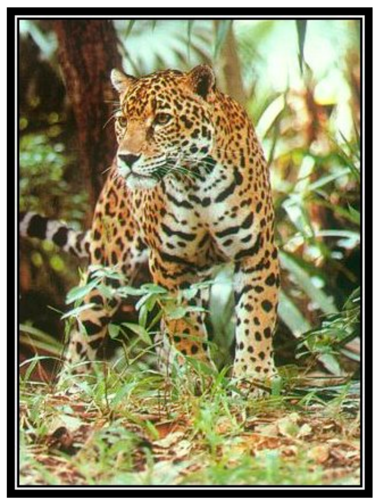

Figure 16. Jaguar.

Swank and Teer (1989) stated the United States no longer contains established breeding populations of jaguar, which probably disappeared from the United States in the 1960s. According to these authors, the jaguar prefers a warm tropical climate and is usually associated with water, and rarely found in extensive arid areas. Goldman (1932) believed the jaguar was a regular, but not abundant, resident in southeastern Arizona. Hoffmeister (1986) considered the jaguar an uncommon resident species in Arizona. He concluded that the reports of jaguars between 1885 and 1965 indicated a small but resident population once occurred in southeastern Arizona. Brown (1983a) suggested the jaguar in Arizona ranged widely throughout a variety of habitats from Sonoran desert scrub through subalpine conifer forest. Most of the records were from Madrean evergreen-woodland, shrub-invaded semidesert grassland, and along rivers.

Brown (1983a) presented an analysis suggesting there was a resident breeding population of jaguars in the southwestern United States at least into the 20th century. USFWS (1990) recognized that the jaguar continues to occur in the American southwest as an occasional wanderer from Mexico. Currently, breeding population of jaguar are unknown in the United States.

In Arizona, the gradual decline of the jaguar appeared to be concurrent with predator control associated with land settlement and the development of the cattle industry (Brown 1983a, USFWS 1990). Lange (1960) summarized the jaguar records from Arizona, and between 1885 and 1959 the reports consisted of 45 jaguars killed, six sighted, and two recorded by sign. Brown (1991) related that the accumulation of all known records indicated a minimum of 64 jaguars were killed in Arizona after 1900.

2.5c Critical Habitat
No critical habitat has been designated for this species.

2.5d Current Status Statewide
Jaguar were initially listed as endangered from the United States - Mexico border southward to include Mexico and Central and South America (37 FR 6476, 1972; 50 CFR 17.11, August 1994). As a result of a petition, the jaguar was proposed as endangered in the United States (59 FR 35674; July 13, 1994). In a Federal Register notice dated 22 July 1997, the jaguar was listed as an endangered species in the United States (62 FR 39147).

The most recent records of jaguars in the United States are from Arizona. In 1971, a jaguar was taken east of Nogales and in 1986 one was taken from the Dos Cabezas Mountains. The latter reportedly had been in the area for about a year before it was killed. AGFD (1988) cited two recent reports of jaguars in Arizona. The individuals were considered to be transients from Mexico. One report (1987) was from an undisclosed location. The other report was from 1988, when tracks were observed for several days prior to the treeing of a jaguar by hounds in the Altar Valley, Pima County. An unconfirmed report of a jaguar at the Coronado National Memorial was made in 1991. In 1993, an unconfirmed sighting of a jaguar was reported for Buenos Aires National Wildlife Refuge. In March 1996, the presence of a jaguar was confirmed through photographs made in the Peloncillo Mountains of Arizona and New Mexico (Glenn 1996). AGFD reported a jaguar sighting in the Baboquívari Mountains in 1996, and in the fall of 1997, one was reported from the Cerro Colorado Mountains of southern Arizona. A jaguar was recently documented (December 2001) in the Atascosa Mountains within about 2 mi (3 km) of the proposed action.

2.5e Environmental Baseline
The Tumacacori EMA is the location of recent reports of jaguars in the United States. This area continues to include the most likely habitat that will support the existence of jaguars in the United States. Many of the larger canyon bottoms in the Tumacacori EMA contain substantial cover and could act as travel corridors for dispersing jaguars. It is believed that all recent sightings of jaguars in Arizona are males dispersing north from

the northern most breeding population in Mexico in an effort to find unoccupied habitat (B. VanPelt, AGFD, pers. comm., 3 October 2002). Because no breeding pairs are thought to exist north of the United Sates-Mexico border, conservation of the Mexican population is vital to the future presence of jaguars in Arizona.

Under the leadership of AGFD and New Mexico Department of Game and Fish, a conservation agreement and strategy has been prepared to address the conservation of the jaguar in Arizona and New Mexico. This agreement established an interstate/intergovernmental Jaguar Conservation Team under a Memorandum of Agreement (MOA). This MOA has been signed by various state and federal cooperators and local and tribal governments with land and wildlife management responsibilities in the geographic area of concern. The Jaguar Conservation Agreement and Strategy serves as a mechanism for implementation of actions for the protection and conservation of the jaguar, while providing a template for the recovery of the species until a recovery plan is prepared and adopted.

The Conservation Agreement established procedures for reporting and evaluating jaguar sightings and compiling distribution and occurrence information, investigation of livestock depredation, evaluation of habitat suitability, development of education materials, and other activities. The Jaguar Conservation Agreement also provides for participation by interested private citizens and organizations. CNF grazing allotment permitees are participating in this process.

The December 2001 sighting mentioned earlier came from a remote camera operated under the direction of the Jaguar Conservation Team (S. Schwartz, AGFD, pers. comm., 17 September 2002). Currently, 14 remote cameras are positioned along the United States-Mexico border in an attempt to document movement of jaguars in and out of Arizona (J. Childs, Jaguar Conservation Team, pers. comm., 3 October 2002).

2.5f Effects of Proposed Action on the Jaguar

<u>Direct Effects</u>

Construction Noise and Activity

Because jaguars are primarily nocturnal, disturbance from construction activities, even in suitable dispersal habitat, is unlikely. The greatest likelihood of noise disturbance will result from the use of helicopters during early morning or late evening hours. However, because of the linear nature of the proposed action, any noise disturbance will be widely distributed and relatively short term in any location. Any jaguar within the action area will likely avoid construction sites. The use of additional remote cameras to monitor the United States-Mexico border south of the proposed action also will minimize the possibility of construction activities affecting breeding jaguars.

<u>Indirect Effects</u>

Habitat Modification and Fragmentation

Roads can reduce habitat value because of habitat fragmentation and edge effects. Some studies have shown that a few large areas of low road density, even in a landscape of high average road density, may be the best indicator of suitable habitat for large vertebrates (Rudis 1995). Because construction activities within riparian corridors or other major canyons will be minimal and widely distributed, no adverse impacts to the composition or structure of jaguar movement corridors or fragmentation of habitat is anticipated. Furthermore, access and construction roads for the proposed action commonly are spurs off existing roads and range between 500 ft (152 m) and 1,000 ft (305 m) in length, which do not isolate or separate habitat patches.

While access roads and structure site construction could degrade the habitats of jaguar prey species, effects on the prey base are difficult to quantify. The primary jaguar prey species in Arizona is deer (*Odocoileus* spp.), which have relatively large home ranges. Road-avoidance behavior (up to distances of 300 ft [90 m] to 600 ft [180 m]) is common in large mammals (Lyon 1983), including those species that may serve as prey for jaguars. Because of the linear nature of the proposed action, impacts to deer habitat will be widely distributed and relatively minor in any single area.

Increased Legal and Unauthorized Access to Jaguar Habitat
Jaguars appear to be relatively tolerant of some level of human activity (B. VanPelt, AGFD, pers. comm., 3 October 2002) and have been documented using areas that have recreational and agricultural activities occurring on a regular basis. However, increased human access to potential jaguar habitat through the use of temporary proposed construction roads could reduce the quality of the habitat. The road closure techniques outlined in the SECTION 1.4 and the RA (URS 2003) will minimize unintended uses of these roads.

Accidental Wildfire
Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, jaguars will not likely be directly impacted by wildfires; however, these wildfires could potentially alter or destroy portions of prey species habitat. While the short-term effects of wildfires may affect prey species through loss of forage from the fire, increased herbaceous production in the years following a fire may improve habitat in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape. The fire prevention measures being developed for the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.5g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal lands, the habitat with the highest potential for occupancy by jaguars occurs on USFS land in Santa Cruz County. Future federal actions on these lands will be subject to Section 7 consultation; these actions will not be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.5h Effects Determination and Incidental Take

Construction noise and activity associated with the proposed action may affect the jaguar, but it is not likely to adversely affect the species because any disturbance will be widely distributed and short term in duration.

Because the proposed action is not likely to adversely affect the jaguar, no take is anticipated.

2.6 GILA TOPMINNOW (*Poeciliopsis occidentalis occidentalis*) (Endangered)

2.6a Action Area

The action area includes all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. In streams, the action area is often much larger than the area of the proposed action because impacts in the watershed may be concentrated in the stream and actions within the stream may be carried downstream well outside of the immediate project area. The action area for the Gila topminnow is the entire Santa Cruz River watershed.

2.6b Natural History and Distribution

The Gila topminnow (Figure 17) was originally described by Baird and Girard (1853) as *Heterandria occidentalis* from a specimen collected in 1851 from the Santa Cruz River near Tucson. It was redescribed by Hubbs and Miller (1941) as *Poeciliopsis occidentalis*. As with all species in the family Poeciliidae, the Gila topminnow exhibits sexual dimorphism. Both males and females are tan to olive-bodied and usually white on the belly. Scales of the dorsum are darkly outlined and the fin rays contain melanophores, although lacking in dark spots. Dominant sexually mature males are often blackened, with some gold on the pre-dorsal midline, orange at the base of the gonopodium, and exhibits bright yellow pelvic, pectoral, and caudal fins (Minckley 1973). Females remain drab in coloration upon reaching maturity and throughout their life. All male poeciliids have a modified anal fin (gonopodium) used to fertilize the female internally.

Figure 17. Gila topminnow

Habitat requirements of *P. o. occidentalis* are broad. The species prefers shallow, warm, fairly quiet water; however, they can become acclimated to a much wider range of conditions. Both lentic habitats and lotic habitats with moderate current are easily tolerated. Temperatures from near freezing under ice to 98.6 degrees F (37 degrees C) have been reported, with a maximum tolerance of 109.4 degrees F (43 degrees C) for brief periods (Heath 1962). Gila topminnows can live in a wide range of water chemistries, with recorded pH values from 6.6 to 8.9, dissolved oxygen readings from 2.2 to 11 milligrams/liter (Meffe et al. 1983), and salinities from very dilute to sea water (Schoenherr 1974). The widespread historic distribution of Gila topminnows throughout rivers, streams, marshes, and springs of the Gila River Basin is evidence for their tolerance of these environmental extremes. One reestablished population (Mud Springs) survived for 16 years in a simple cement-watering trough before being moved.

Meffe et al. (1983) reported that topminnows can tolerate almost total loss of water by burrowing into the mud for 1-2 days. Preferred habitats contain dense mats of algae and debris, usually along stream margins or below riffles, with sandy substrates sometimes covered with organic mud and debris (Minckley 1973). Topminnows are usually found in the upper third of the water column and young show a preference for the warmest and shallowest areas (Forrest 1992). Simms and Simms (1992) found topminnows occupying pools, glides, and backwaters more frequently than marshes or areas of fast flow.

According to Schoenherr (1974), the spring-heads presently occupied by Gila topminnows are questionable as preferred habitat. Destruction of historically occupied habitats such as the marshes, sloughs, backwaters, and edgewaters of larger rivers and presence of non-native fish in such habitats that remain has undoubtedly forced Gila topminnow out of their preferred historic habitats and into the spring-heads and smaller erosive creeks we see them in today. Their tolerance of conditions in these habitats has allowed them to maintain populations with less impact from non-native fishes.

Gila topminnows are viviparous fish, meaning embryos grow and mature within the female and are born living. Eggs are fertilized internally through deposition of spermatophores (packets of sperm) into the female genital pore by the male gonopodium. Female Gila topminnow can store spermatozoa for several months, and may produce up to 10 broods after being isolated from males (Schultz 1961). Female Gila topminnows also exhibit superfetation in which 2 or more groups of embryos at different stages develop simultaneously. Females of the genus *Poeciliopsis* generally carry only 2 stages, although some *P. o. occidentalis* females have been shown to carry 3 stages for a few days when population densities are low. The mean interval between broods is 21.5 days (Schoenherr 1974). Brood size ranges from 1-31 dependent upon female standard length (SL) (Constantz 1974; Schoenherr 1974, 1977). Under optimum laboratory conditions, *Poeciliopsis* can produce 10 broods per year at intervals of 7 to 14 days (Schultz 1961). Sexual maturity can be attained as early as 2 months or as late as 11 months following birth, dependent upon the season of birth (Schultz 1961; Constantz 1976, 1979; Schoenherr 1974).

Breeding occurs primarily during January through August, but in thermally constant springs, young may be produced throughout the year (Heath 1962; Minckley 1973; Schoenherr 1974). During the peak of the breeding season up to 98 percent of mature females are pregnant (Minckley 1973). Dominant males turn black, defend territories, and court females. Smaller subordinate males do not turn black or defend territories. Instead, they take on a "sneaking" mating strategy where they attempt to mate with uncooperative females while the dominant male is busy elsewhere. Subordinate males have a longer gonopodium, which may have an adaptive benefit for this type of mating strategy (Constantz 1989). However, if the larger territorial males are removed, smaller males will become dominant, take on breeding coloration, and defend territories (Constantz 1975; Schoenherr 1977). Brood size and the onset of breeding in topminnows can be influenced by several factors including food abundance, photoperiod, temperature, predation upon the population, and female size. Increased food supply and larger female size are believed to contribute to the greater fecundity seen in topminnows from Monkey Spring canal compared with topminnows from Monkey Spring headspring (Constantz 1974, 1979; Schoenherr 1974, 1977). Sex ratios in stabilized populations nearly always favor females, varying from 1.5 to 6.3 per male (Schoenherr 1974).

Gila topminnows are opportunistic omnivorous feeders, having a gut length 1.5 to 2 times SL of the individual (Schoenherr 1974). They have weakly spatulate dentition characteristic of an omnivorous diet. Primary food items include detritus, vegetation, amphipods, ostracods, insect larvae, and rarely, other fish (Schoenherr 1974; Gerking and Plantz 1980; Meffe et al. 1983; Meffe 1984).

Gerking and Plantz (1980) noted that Gila topminnows prefer to eat large prey, but prey sizes are limited by mouth size. Schoenherr (1974) observed that individual fishes in complex habitats with several food resources present will select and focus on different items. He suggested that variation in feeding among individuals prevents over-utilization of a single resource, thus enhancing survival potential of the species.

In the United States, this species currently occurs in the Gila River drainage, Arizona, particularly in the upper Santa Cruz River, Sonoita and Cienega creeks, and the middle Gila River. The Gila topminnow is restricted to 14 natural localities in Arizona. In Mexico, the species occurs in the Río Sonora, Río de la Concepción, and Santa Cruz River but are not listed under the ESA. Gila topminnows occupy a variety of habitats, including: springs, cienegas, permanent and interrupted streams, and margins of large rivers. Habitat alteration and destruction, and introduction of predatory non-native fish, (principally western mosquitofish [*Gambusia affini*]) is the main reason for decline of the Gila topminnow.

2.6c Critical Habitat
No critical habitat has been designated for this species.

2.6d Current Status Statewide
The United States population of the Gila topminnow was federally listed as an endangered species in 1967 (USDOI 1967). The original recovery plan for Gila topminnow listed 10 extant natural populations: Monkey Spring, Cottonwood Spring, Sheehy Spring, Sharp Spring, Santa Cruz River near Lochiel, Redrock Canyon, Cienega Creek, Sonoita Creek (presumably including localities above and below Patagonia Lake), Salt Creek, and Bylas Springs (USFWS 1984). Gila topminnows were also known from Middle Spring (also known as SII or Second Spring) on the San Carlos Apache Indian Reservation (Meffe et al. 1983). Middle Spring was considered part of the Bylas Springs complex in the earlier recovery plan.

Since 1984, Gila topminnows have been discovered or rediscovered at 4 additional locations: North Fork of Ash Creek in 1985 (Jennings 1987), Fresno Canyon in 1992, Santa Cruz River north of Nogales in 1994, and Coal Mine Canyon in 1996 (Weedman and Young 1997). However, Gila topminnow were last collected from the North Fork of Ash Creek in 1985 and from Sheehy Spring in 1987. They have also been very rare or absent during recent surveys (last 5 years) of Sonoita Creek above Patagonia Lake and Santa Cruz River near Lochiel. Mosquitofish are quite common in both areas. Topminnows were extirpated from 1 of the original 10 localities, Salt Creek, by mosquitofish (Marsh and Minckley 1990), but the stream was renovated and restocked with Gila topminnows from Middle Spring. Subsequently, mosquitofish were found in the stream and it was again renovated and restocked with topminnows from Bylas Spring. Thus, there are 14 naturally occurring localities (considering Sonoita Creek above and below Patagonia Lake as 2 separate localities) currently known to support Gila topminnows in the United States.

Eleven of the naturally occurring locations currently supporting Gila topminnows are in the Santa Cruz River system: Redrock Canyon, Cottonwood Spring, Monkey Spring, upper Sonoita Creek, Fresno Canyon, Coal Mine Canyon, lower Sonoita Creek, Santa Cruz River north of Nogales, Cienega Creek, Sharp Spring, and the upper Santa Cruz River. The 2 remaining localities (Bylas Springs and Middle Spring) and Salt Creek are next to the Gila River on the San Carlos Apache Indian Reservation. Bylas Springs has been unsuccessfully poisoned twice to remove mosquitofish (Meffe et al. 1983; Brooks 1985; Marsh and Minckley 1990). Another attempt at renovation of Bylas Springs was done by USFWS Arizona Fishery Resource Office and has so far been successful. The population at Middle Spring was eliminated by lack of water during the summer of 1989, but was recently reestablished (following construction of additional pool habitat) with Gila topminnows from the original Middle Spring population held at Roper Lake State Park. Salt Creek has also been renovated and restocked with topminnows originally from Bylas Spring.

As part of past recovery actions, more than 200 Gila topminnow reintroductions or natural dispersals from reintroductions have occurred at 175 wild locations. For this count, a wild location refers to an area that does not have a mailing address, in contrast with a captive population that does (following Simons 1987). Eighteen wild populations remained in 1997, 17 of which are in historic range (Weedman and Young 1997). Seven of these populations are secure enough that they should persist into the foreseeable future. Minckley and Brooks (1985), Brooks (1985, 1986), Simons (1987), Bagley et al. (1991), Brown and Abarca (1992), and Weedman and Young (1997) describe the plight of re-established and captive populations of Gila topminnows.

Gila topminnows also have been stocked into many captive locations for propagation or conservation. Twelve captive populations were known to persist in 1997. The following publicly maintained populations are large enough to provide individuals for reintroductions, although one is known to be mixed with topminnows from more than one natural population (Arizona-Sonora Desert Museum, Boyce-Thompson Arboretum (mixed), Dexter National Fish Hatchery and Technology Center, Roper Lake State Park, Arizona State University, and Hassayampa River Preserve).

2.6e Environmental Baseline

Gila topminnow currently occupy the Santa Cruz River in its perennial reaches, as far north as Chavez Siding Road. This reach of the river was also occupied by longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus clarki*), Sonora sucker (*Catostomus insignis*), green sunfish (*Lepomis cyanellus*), and mosquitofish as recently as 1997 (USFWS 2001d). No Gila topminnows occur on the Tumacacori EMA and there are currently no plans for reintroductions in any locations (CNF 2000; D. Duncan, USFWS, pers. comm., 1 October 2002).

2.6f Effects of Proposed Action on the Gila topminnow

Direct Effects

The effects of the proposed action on this species are not anticipated to include direct effects to individual Gila topminnow because no construction will occur within occupied habitat.

Indirect Effects

Habitat Modification

Some indirect impacts to Gila topminnow habitat from erosion are possible from the construction of the proposed action. While the removal of vegetation for construction of access roads will increase surface runoff and sediment transport, and decrease infiltration of precipitation (Gifford and Hawkins 1978, Busby and Gifford 1981, Blackburn 1984, DeBano and Schmidt 1989, Belnap 1992, Belsky and Blumenthal 1997), the implementation of BMPs will help control erosion. However, unusually large precipitation events may temporarily overwhelm BMPs and result in some increase in sediment transport. Nevertheless, the distance of the proposed action from the Santa Cruz River will minimize the amount of sediments reaching Gila topminnow habitat.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Roads constructed for the proposed action also may allow the establishment or increased density of non-native grasses, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Wildfires could remove groundcover that is important in dissipating rainfall energy and reducing erosion.

However, new roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action. Measures outlined in the Invasive Species Management Plan also will minimize the introduction or spread of invasive species that may facilitate fires.

2.6g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal land, the habitat with the highest potential for occupancy by Gila topminnow occurs on private land in Santa Cruz County. Most future actions on private land will not be subject to Section 7 consultation.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand for recreational use of national forest lands.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.6h Effects Determination and Incidental Take

The transport of sediments into the Santa Cruz River may affect the Gila topminnow; however, any increase in sediments will be relatively small because of the distance of the proposed action from occupied habitat. Therefore, it is not likely to adversely affect the species.

Because the proposed action is not likely to adversely affect the species, no take of Gila topminnow is anticipated.

2.7 MEXICAN GRAY WOLF (*Canis lupus baileyi*) (Endangered)

2.7a. Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential habitat for Mexican gray wolf is found within portions of Santa Cruz County containing oak and pine-juniper savannas above 4,000 ft (1,200 m). Wolves may travel long distances during hunting expeditions, typically in an irregular circle 20 mi (34 km) to 60 mi (68 km) in diameter. The action area for the Mexican gray wolf considered for the proposed action includes all potential habitat and travel corridors in western Santa Cruz and southern Pima County.

2.7b. Natural History and Distribution

Mexican gray wolves (Figure 18) are the smallest and southernmost of the 5 subspecies of gray wolf in North America. The Mexican gray wolf is a large dog-like carnivore with a mixed brown, rust, black, gray, and white. This species has a distinct white lip line, chin, and throat. Adults weigh between 50-90 lbs (23-41 kg) (Hoffmeister 1986). The historic range was from southeastern Arizona, southwestern New Mexico, southwestern Texas, and south through the Sierra Madre of Mexico. The Mexican gray wolf is the southernmost occurring and most endangered subspecies in North America. This wolf is the last subspecies of gray wolf known to occur in the Arizona-New Mexico area. The last known naturally occurring specimen in the United States was found in New Mexico in 1970 (USFWS 2001d).

Figure 18. Mexican gray wolf.

Historically, Mexican gray wolf habitat was montane woodlands, presumably because of the favorable combination of cover, water, and prey availability. Most wolf collections came from pine, oak, and pinyon-juniper woodlands, and intervening or adjacent grasslands above 1,372 m (4,500 ft) (Brown 1983b). Wolves avoided desertscrub and semidesert grasslands, but wooded riparian corridors were probably used for travelling and hunting (Parsons 1996).

These are social animals in the dog family that live and travel in packs of 7 to 30 animals depending upon prey size and availability. Mexican gray wolves prey upon a variety of animals from mice and squirrels to deer and elk. Territory size can range from 30 (78 km^2) to 500 mi^2 (1,295 km^2) or more. Packs are led by a pair of dominant animals that control most of the breeding. Breeding season lasts from late winter to early spring, and the dominant female produces up to 6 pups for the pack. The wolves care for the pups communally.

During the late 1800s through the mid 1900s, extensive hunting, trapping, and poisoning efforts at local, state, and federal levels resulted in the extirpation of this species from the United States portion of its range. Reintroduction efforts of captive-bred wolves are under way in the Blue Range Recovery Area of eastern Arizona and New Mexico. Fourteen packs have been released to date.

2.7c Critical Habitat
No critical habitat has been designated for this species.

2.7d Current Status Statewide
Mexican gray wolves were listed as endangered by USFWS in 1976 (41 FR 17736) without critical habitat. In 1998, an experimental, non-essential population was designated for the southwest (63 FR 1763) and a reintroduction program was initiated. Eleven wolves from captive breed stock were reintroduced into the Apache National Forest in southeastern Arizona under the experimental, non-essential designation in an effort to re-establish the subspecies to a portion of its historic range. A Recovery Plan for this subspecies was completed in 1982 and revisions are currently in progress (USFWS 2001d).

Mexican gray wolf populations steadily declined in Arizona because of predator control programs and conflicts with livestock interests. Pressure to control wolves became a priority beginning in the 1920s when this subspecies was nearly eliminated from the state and prevention of wolves from entering from Mexico was undertaken. In 1921 and 1922, a reported 58 wolves were taken by trapping or poisoning in Arizona. By 1924, reported takings dropped to 29 and by 1936, to 5. After 1952, only 2 wolves were reported taken in Arizona, 1 in 1958 and another in 1960 (Hoffmeister 1986). Reports of Mexican gray wolves living in the wild in Arizona continued into the early 1970s (USFWS 1982).

Similar predator control programs in Mexico reduced populations and may have eliminated the wolf by the 1980s. Surveys conducted in Mexico in the early 1990s did not confirm Mexican gray wolf populations in the wild (Parsons 1996).

2.7e Environmental Baseline
The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consideration.

The Tumacacori EMA contains some areas of montane and riparian woodlands that may serve as dispersal corridors for Mexican gray wolves. If wolf populations exist in the mountains of Sonora, these corridors may be used as hunting and dispersal corridors. There are currently no plans to reintroduce the Mexican gray wolf into southern Arizona and, because of the distance and fragmentation of intervening habitat, it is unlikely that current experimental populations in northern Arizona could disperse into Santa Cruz County.

2.7f Effects of Proposed Action on the Mexican Gray Wolf

Direct Effects

Construction Noise and Activity

Because the only wild populations of Mexican gray wolves in Arizona occur in the Apache National Forest, disturbance from construction of the proposed action, even in suitable dispersal habitat, is highly unlikely. In the event that populations of wolves exist in Mexico and could disperse into southern Arizona, the greatest likelihood of disturbance will result from the use of helicopters during early morning or late evening hours. However, because of the linear nature of the proposed action, any noise or construction disturbance will be widely distributed and relatively minor in any single area.

Indirect Effects

Habitat Modification and Fragmentation

Roads can reduce habitat value because of habitat fragmentation and edge effects. Gray wolves (*Canis lupus*) in Wisconsin are limited to places with pack-area mean road densities of 0.7 mi/1 mi^2 (1.1 km/1 km^2) or less (Mladenoff et al. 1995). Some studies have shown that a few large areas of low road density, even in a landscape of high average road density, may be the best indicator of suitable habitat for large vertebrates (Rudis 1995). Access and construction roads for the proposed action commonly are spurs from existing roads and range between 500 ft (152 m) and 1,000 ft (305 m) in length, which do not isolate or separate habitat patches. Furthermore, construction activities within montane woodlands, riparian corridors or major canyons will be minimal and widely distributed, resulting in negligible impacts to the composition or structure of Mexican gray wolf habitat.

Increased Legal and Unauthorized Access to Mexican Gray Wolf Habitat

Gray wolves experience negative interactions with humans and roads are a key facilitator (Thiel 1985). Increased human access to potential wolf habitat through the use of temporary proposed construction roads could reduce the quality of the habitat and human interactions may increase mortality (Mech 1973). The road closure techniques outlined in the SECTION 1.4 and the RA (URS 2003) will minimize unintended uses of these roads.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, wolves will not likely be directly impacted by wildfires; however, these wildfires could potentially alter or destroy portions of prey species habitat. While the short-term effects of wildfires may affect prey species through loss of forage from the fire, increased herbaceous production in the years following a fire may improve habitat in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape. Fire prevention measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.7g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal lands, the habitat with the highest potential for occupancy by Mexican gray wolf occurs on USFS land in Santa Cruz County. Future federal actions will be subject to Section 7 consultation and will not be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand for recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area and results in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.7h Effects Determination and Incidental Take

Construction noise and activity associated with the proposed action may affect the Mexican gray wolf, but it is not likely to adversely affect the species because any disturbance will be widely distributed and short term in duration. Because the proposed action is not likely to adversely affect the Mexican gray wolf, no take is anticipated.

3.0 USFS SENSITIVE SPECIES

USFS Special status species are plant and wildlife species that are of concern because their populations are declining in size. In a letter dated 2 May 2002, AGFD listed 21 USFS Sensitive species that are known to occur within 3 mi (4.8 km) of the proposed corridor or may be expected to occur along the corridor if suitable habitat exists. The information listed in the letter was based on the AGFD Heritage Data Management System. In addition, 21 USFS Sensitive species known to occur within 5 mi (8 km) to 10 mi (16 km) of the proposed corridor have been included (AGFD letter dated 25 April 2002). AGFD species abstracts and other literature were reviewed for species' historical ranges and habitat preferences and field reconnaissance surveys were conducted along the entire corridor. However, species-specific surveys were impractical because of ongoing drought conditions in the project area, therefore the potential presence of sensitive species was assumed in all areas containing potential habitat. The 42 USFS Sensitive species that may occur on or near the proposed Central Corridor are listed in Table 3.

TABLE 3. SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Alamos Deer Vetch *Lotus alamosanus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arid Throne Fleabane *Erigeron arisolis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arizona Giant Sedge *Carex ultra*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arizona Metalmark *Calephelis rawsoni arizonensis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona. • Mitigation plantings of host species will reduce impacts.
American Peregrine Falcon *Falco peregrinus anatum*	No Impacts.	• Known occurrences and potential habitat are outside project area.
Bartram's Stonecrop *Graptopetalum bartramii*	No Impacts.	• Known populations occur outside project area.
Beardless Chinch Weed *Pectis imberbis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona. • Species is adapted to disturbances.
Broadleaf ground cherry *Physalis latiphysa*	No Impacts.	• Known populations occur outside project area.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Catalina Beardtongue *Penstemon discolor*	No Impacts.	• Known populations occur outside project area.
Cave Myotis *Myotis velifer*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Chiltepine *Capsicum annuum* var.*glabriusculum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Chihuahuan Sedge *Carex chihuahuensis*	No Impacts.	• Known populations occur outside project area.
Chiricahua Mountain Brookweed *Samolus vagans*	No Impacts.	• No construction in perennial aquatic habitats.
Five-Stripped Sparrow *Aimophila quinquestriata*	No Impacts.	• Potential habitat and know occurrences are outside project area.
Foetid Passionflower *Passiflora foetida*	No Impacts.	• Known populations occur outside project area.
Gentry Indigo Bush *Dalea tentaculoides*	No Impacts.	• Known populations occur outside project area.
Giant Spotted Whiptail *Cnemidophorus burti strictogrammus*	No Impacts.	• Known populations occur outside project area.
Large-Flowered Blue Star *Amsonia grandiflora*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Lowland Leopard Frog *Rana yavapaiensis*	No Impacts.	• Known populations occur outside project area. • No construction in perennial aquatic habitats.
Lumholtz Nightshade *Solanum lumholtzianum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Mexican Garter Snake *Thamnophis eques megalops*	No Impacts.	• No construction in perennial aquatic habitats. • Minimal impacts to riparian habitat.
Mock-Pennyroyal *Hedeoma dentatum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Nodding Blue-eyed Grass *Sisyrinchium cernuum*	No Impacts.	• Known populations occur outside project area.
Northern Gray Hawk *Asturina nitida maxima*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Distance of habitat from project area will attenuate effects. • Only small percentage of total population within project area may be impacted.
Pima Indian mallow *Abutilon parishii*	No Impacts.	• Known populations occur outside project area.
Santa Cruz Beehive Cactus *Coryphantha recurvata*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Santa Cruz Star Leaf *Choisya mollis*	No Impacts.	• Known populations occur outside project area.
Santa Cruz Striped Agave *Agave parviflora* ssp. *parviflora*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Plants occur throughout Nogales Ranger District. • Mitigation plantings of agave will reduce impacts.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Seeman Groundsel *Senecio carlomasonii*	No Impacts.	• Known populations occur outside project area.
Sonoran Noseburn *Tragia laciniata*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Southern Pocket Gopher *Thomomys umbrinus intermedius*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Superb Beardtongue *Penstemon superbus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Supine Bean *Macroptilium supinum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Pre-construction surveys will be conducted and, if necessary, mitigation measures will be coordinated with USFS personnel.
Sweet Acacia *Acacia smallii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Thurber Hoary Pea *Tephrosia thurberi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Thurber's Morning-glory *Ipomoea thurberi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Virlet Paspalum *Paspalum virletti*	No Impacts.	• Known populations occur outside project area.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Weeping Muhly *Muhlenbergia xerophila*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Western Barking Frog *Eleutherodactylus augusti cactorum*	No Impacts.	• Known populations occur outside project area.
Western Yellow-billed Cuckoo *Coccyzus americanus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Wiggins Milkweed Vine *Metastelma mexicanum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Populations within Arizona appear stable. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Wooly Fleabane *Laennecia eriophylla*	No Impacts.	• Potential habitat and know occurrences are outside project area.

3.1 PLANTS

Alamos deer vetch (*Lotus alamosanus*)
Alamos deer vetch is a perennial herb found in southern Arizona, and Sonora, Chihuahua, and Durango, Mexico. Within Arizona, this plant is found in Sycamore Canyon and the Pajarito Mountains of Santa Cruz County, and near Garden Valley in Maricopa County. This plant is considered a wetland obligate species that is restricted to stream banks in canyons at elevations ranging from 3,500 ft (1,067 m) to 5,500 ft (1,676 m) (AGFD 1999a). Within the Nogales RD, this plant occurs in the Sycamore Canyon and Peña Blanca Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

Population trends for Alamos deer vetch are unknown (AGFD 1999a). The proposed transmission line may cross potential Alamos deer vetch habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Furthermore, viable populations occur outside of the project area, including the Gooding RNA. There may be an impact to individual plants during development of the line; however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Arid throne fleabane (*Erigeron arisolis*)
Arid throne fleabane is an annual to short-lived perennial forb that occurs in Arizona, southwestern New Mexico and Sonora, Mexico. Within Arizona, this plant is found in Apache, Cochise, Pima, and Santa Cruz counties. This species is typically found on moist rocky soils in grasslands, grassy openings within oak woodlands, and roadsides at elevations between 4,200 ft (1,280 m) and 5,500 ft (1,676 m) (AGFD 2000a). On the CNF Nogales RD, it has been documented from Box Canyon and Ruby Roads (T. Newman, CNF, pers. comm., 20 August 2002).

Arid throne fleabane favors moist areas in grasslands and grassy openings in oak woodlands, areas also favored by livestock for grazing (AGFD 2000a). The proposed transmission line parallels Ruby Road, a known location for this species. Placement of the transmission line may impact individual arid throne fleabane, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Arizona giant sedge (*Carex ultra*)
Arizona giant sedge is the largest sedge found in Arizona. Its range includes southeast Arizona, extreme southwest New Mexico (Hidalgo County, Indian Springs in the Pelocillos) and Mexico (Sonora and Coahila). Within Arizona, this sedge is found in Cochise, Graham, Pinal, Yavapai, Pima (Santa Rita Mountains and the Rincon Valley), and Santa Cruz counties (Santa Rita and Atascosa mountains). Typically only 1 patch per mountain has been found. Like other sedges, this plant is associated with moist soil

near perennial wet springs and streams and undulating rocky-gravelly terrain at elevations ranging from 2,040 ft (622 m) to 6,000 ft (1,829 m) (AGFD 2000b). Within the Nogales RD, Arizona giant sedge is found in Sycamore Canyon and Mule Ridge in the Atascosa Mountains, and at Deering Spring and Big Casa Blanca Canyon in the Santa Rita Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

Small populations of this sedge are vulnerable to local disturbance of aquatic or riparian habitat (AGFD 2000b). The proposed transmission line may cross potential Arizona giant sedge habitat; however, no construction will occur in perennial aquatic habitats and construction within riparian habitats will be minimized to the greatest extent possible. There may be an impact to individual plants during development of the line; however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Bartram's stonecrop (*Graptopetalum bartramii*)
Bartram's stonecrop is a small succulent perennial found in southern Arizona and Chihuahua, Mexico (one record). In Arizona, this plant occurs in Santa Cruz County within the Patagonia, Santa Rita, and Tumacacori Mountains, in Pima County within the Baboquivari, Dragoon, and Rincon mountains, and in Cochise County within the Chiricahua Mountains. Habitat for Bartram's stonecrop consists of cracks in rocky outcrops within shrub live oak-grassland communities located on the sides of rugged canyons. This plant is usually found in heavy litter cover and shade where moisture drips from rocks at elevations ranging from 3,900 ft (1,189 m) to 6,700 ft (2,042 m) (AGFD 1997a). Bartram's stonecrop plants are found on the west side of the Nogales RD in Tres Amigos Gulch; Sycamore, Peña Blanca, Alamo, and Peñasco canyons; in the vicinity of Montana Peak and Peña Blanca Lake (T. Newman, CNF, pers. comm., 20 August 2002).

Bartram's stonecrop populations are typically small and isolated. Illegal collection of the plant is the main management issue at this time. Other factors that may affect populations include mining and mineral exploration, habitat alteration due to livestock grazing, trampling by cattle and recreationists, and road construction and maintenance. Bartram's stonecrop populations are typically small and isolated but illegal collection of the plant is the main management issue at this time. Other factors that may affect populations include mining and mineral exploration, habitat alteration due to livestock grazing, trampling by cattle and recreationists, and road construction and maintenance (AGFD 1997a). The proposed TEP transmission line does not cross known Bartram's stonecrop populations within the Nogales RD, therefore placement of the transmission line will not impact this species.

Beardless chinch weed (*Pectis imberbis*)
Beardless chinch weed is a perennial herb that is found in southern Arizona, western Chihuahua and eastern Sonora, Mexico. Within Arizona, this plant can be found in Cochise, Pima, and Santa Cruz counties (within Santa Cruz County it is found along Ruby Road in the Atascosa Mountains and in the Red Rock area of Canelo Hills). Habitat for this species consists of open areas in grassland and oak-grassland

communities. Beardless chinch weed has an extremely broad habitat range and can be found at elevations from 4,000 ft (1,219 m) to 5,000 ft (1,524 m) (AGFD 1998a).

Populations of beardless chinch weed may be susceptible to impacts from grazing and road maintenance activities but the species is adapted to disturbances and grows along road cuts (AGFD 1998a). The proposed transmission line crosses over known beardless chinch weed populations within the Nogales RD. Placement of the transmission line may impact individual beardless chinch weed, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to beardless chinch weed are not likely to result in a trend toward federal listing or loss of viability.

Broadleaf ground cherry (*Physalis latiphysa*)
Broadleaf ground cherry is an herbaceous annual found in southern Arizona. This plant can be found in the San Bernardino Valley of Cochise County, the Pinaleno Mountains of Graham County, in the vicinity of Arivaca Creek in Pima County, and the Santa Cruz River of Santa Cruz County. Habitat for the broad-leaf ground cherry consists of washes, often in the shade of shrubs and boulders, desertscrub vegetation, and grasslands at elevations ranging from 914 to 1,372 m (3,000 – 4,500 feet) (AGFD 2000c). There are no known sites for this plant in the Nogales RD. The nearest locations are northwest of Arivaca Lake and in the vicinity of Tubac on the Santa Cruz River (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of broad-leaf ground cherry (AGFD 2000c). The proposed TEP transmission line does not cross known broadleaf ground cherry populations within the Nogales RD, therefore placement of the transmission line will not impact this species.

Catalina beardtongue (*Penstemon discolor*)
Catalina beardtongue is a perennial herbaceous sub-shrub found in southern Arizona. This shrub is found in Cochise, Graham, Pinal, Pima (within the Santa Catalina Mountains), and Santa Cruz counties (within the Atascosa and Tumacacori mountains). Habitat for Catalina beardtongue consists of bare rock outcrops, barren soil outcrops, and bedrock openings in chapparal or pine-oak woodlands at elevations ranging from 4,120 ft (1,256 m) to 7,600 ft (2,316) (AGFD 1999b). On the Nogales RD, this shrub occurs in the upper end of Peck Canyon, Corral Nuevo, and the adjacent Bartalo Mountain (Cedar Canyon), typically on whitish volcanic ash (T. Newman, CNF, pers. comm., 20 August 2002).

Rock climbers threaten some populations of this plant but few other threats exist (AGFD 1999b). The proposed TEP transmission line does not cross known Catalina beardtongue populations within the Nogales RD, therefore placement of the transmission line will not impact this species.

Chiltepine (*Capsicum annuum* var.*glabriusculum*)
Chiltepine is an herbaceous to woody perennial shrub that is found in south Texas, southern New Mexico, southern Arizona, and south to tropical America. Within Arizona, a few populations of this plant are found in the Chiricahua, Tumacacori, Baboquivari, and Ajo Mountains. This plant occurs in protected, frost-free canyons in oak woodlands of slopes at less than 4,500 ft (1,372 m) elevation (typically found at elevations ranging from 3,600 ft [1,097 m] to 4,400 ft [1,341 m]). Chiltepine plants grow under nurse shrubs and usually are associated with rock ledges and outcrops. Within the Nogales RD, there are populations in the Tumacacori Mountains and Cobre Ridge area, and there are suspected populations on the west side of the RD (AGFD 1991a; T. Newman, CNF, pers. comm., 20 August 2002).

This plant is declining in some areas because of drought, overgrazing, and local over-collection of berries (AGFD 1991a). Placement of the transmission line may impact individual chiltepine plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to chiltepine are not likely to result in a trend toward federal listing or loss of viability.

Chihuahuan sedge (*Carex chihuahuensis*)
Chihuahuan sedge is a grass-like perennial plant that occurs in southeastern Arizona, New Mexico (Hidalgo County), and Mexico (Sonora and Chihuahua). Within Arizona, this plant ranges from Cochise, Graham, Gila, Pima (Santa Catalina, San Luis, and Rincon mountains), and Santa Cruz counties (Atascosa and Santa Rita mountains, and the Santa Cruz River). Chihuahuan sedge can be found in wet soils along streambeds and in shallower draws of pine-oak forests and riparian woodlands. It also is found in wet meadows, cienegas, marshy areas, and canyon bottoms from 1,100 ft (335 m) to 8,000 ft) (AGFD 1999c). Within the Nogales RD, this plant has been found near Arivaca Lake (on private land), Sycamore Canyon, and south of Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement on the population status of Chihuahuan sedge (AGFD 1999c). The proposed transmission line may cross potential Chihuahuan sedge habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. There may be an impact to individual plants during development of the line; however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Chiricahua Mountain brookweed (*Samolus vagans*)
Chiricahua Mountain brookweed is a perennial herb found in southeastern Arizona, western Chihuahua, and eastern Sonora, Mexico. This plant apparently reaches its southern limit in southern Sonora, Mexico. Within Arizona, this species is found in the Huachuca Mountains of Cochise County, the Rincon, Santa Catalina, and Santa Rita

mountains of Pima County, and the Canelo Hills and Pajarito mountains of Santa Cruz County. The Chiricahua Mountain brookweed is confined to areas with permanent water, such as springs, seeps, and in and along streams at elevations ranging from 1,219 to 2,195 m (4,000 – 7,200 ft) (AGFD 1999d). Within the Nogales RD, this plant occurs in Florida Canyon of the Santa Rita Mountains and in Sycamore Canyon of the Atascosa Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Chiricahua Mountain brookweed (AGFD 1999d). Because no construction will occur within perennial aquatic habitats, the proposed action will have no effect on the population status of the Chiricahua Mountain brookweed.

Foetid passionflower (*Passiflora foetida*)
The foetid passionflower is a herbaceous vine found in southeastern Texas and the Rio Grande Valley, southern Arizona, and southward throughout Mexico, Central and South America, and the West Indies. Within Arizona, this species is found in the Baboquivari Mountains, Arivaca, and Las Guijas Mountains of Pima County and in California Gulch and the Bartlett Mountains of Santa Cruz County. In Arizona, this plant occurs on hillsides and canyons of the Lower Sonoran zone from 1,067 to 1,707 m (3,500 – 5,600 ft) in elevation (AGFD 2000c). Within the Nogales RD, foetid passionflowers have been recorded in the California Gulch and Holden Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of foetid passionflower (AGFD 2000c). Known locations of this plant occur outside of the proposed TEP transmission line corridor, therefore the proposed TEP transmission line will have no effect on the population status of the foetid passionflower

Gentry indigo bush (*Dalea tentaculoides*)
The Gentry indigo bush is an herbaceous perennial shrub found primarily in southern Arizona, but its range may extend into Mexico. Within Arizona, this shrub is found in the Sycamore Canyon drainage of the Atascosa Mountains, in the Pajarito Mountains of Santa Cruz County, and within the Baboquivari Mountains (1930s record) and Mendoza Canyon (1965 record) of Pima County. Gentry indigo bush is typically found along canyon bottoms on cobble terraces subject to occasional flooding and seems to prefer disturbance-prone environments at elevations ranging from 1,097 to 1,341 m (3,600 – 4,400 ft) (AGFD 1998b). Historic collection records indicate that this plant may grow on rocky hillsides. Within the Nogales RD, this plant has been recorded in Sycamore Canyon, in the vicinity of Peñasco Canyon, Kaiser Canyon, and north of Manzanita Mountain (T. Newman, CNF, pers. comm., 20 August 2002).

Potential threats to Gentry indigo bush populations are cattle grazing, recreational foot traffic, and flooding events that eliminate terraces occupied by this species (AGFD 1998b). Known locations of this plant occur outside of the proposed TEP transmission line corridor, therefore the proposed TEP transmission line will have no effect on the population status of the Gentry indigo bush.

Large-flowered blue star (*Amsonia grandiflora*)
The large-flowered blue star is an herbaceous perennial that is found in northern Sonora and Durango, Mexico, and southern Arizona. Within Arizona, this plant is found in the Patagonia, Atascosa/Pajarito mountains of Santa Cruz and Pima counties. Habitat for this species consists of canyon bottoms in oak woodlands typically dominated by Emory oak and Mexican blue oak; however, site-specific qualities are inconsistent. Large-flowered blue star plants have adapted to rock fall disturbance and are typically found at elevations ranging from 1,189 to 1,372 m (3,900 4,500 ft) (AGFD 1998c). Within the west side of the Nogales RD, this plant occurs at Peña Blanca and Arivaca Lakes, Sycamore Canyon, Chiminea Canyon, California Gulch, and near Ruby (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of large-flowered blue star are rare, with only 15 to 20 populations within 2 mountain ranges as the total world distribution, but populations seem to be stable. This plant is highly susceptible to disturbance, and expanding development in the Nogales area (AGFD 1998c) may impact populations. The proposed TEP transmission line crosses near a known large-flowered blue star population in Peña Blanca Canyon, and some individual plants, comprising a small percentage of the total population, may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Lumholtz nightshade (*Solanum lumholtzianum*)
The Lumholtz nightshade is an herbaceous annual that is found in southern Arizona and northern Mexico. Within Arizona, this plant is found in the Arivaca and San Luis Mountains of Pima County and the Patagonia, Atascosa, and Santa Rita Mountains of Santa Cruz County. Lumholtz nightshade plants are typically found in washes and low ground near wet depressions and along stream banks from 914 to 1,402 m (3,000 – 4,600 ft) elevation in desert grassland plant communities. This plant is also often found in disturbed, weedy areas (AGFD 2000d). Within the Nogales RD, this nightshade is found in the vicinity of Arivaca, Ruby, California Gulch, Nogales, Cobre Ridge, and Oro Blanco Wash (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Lumholtz nightshade (AGFD 2000d). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mock-pennyroyal (*Hedeoma dentatum*)
The mock-pennyroyal is an herbaceous perennial plant found in southeastern Arizona and northern Sonora, Mexico. Within Arizona, this plant is found in the Chiricahua, Huachuca, Mule, Whetstone, and Winchester mountains of Cochise County, the Pinaleno

Mountains of Graham County, the Baboquivari, Rincon, and Santa Cruz mountains of Pima County, and the Atascosa, Mustang, Pajarito, and Santa Rita mountains of Santa Cruz County. Habitat for this plant consists of oak woodland, oak-pine forest, and pine forest. It can be found on open roadcuts, steep rocky outcrops, and gravelly slopes in wooded canyons with open to full sunlight at elevations ranging from 1,173 to 2,500 m (3,850 – 8,200 ft) (AGFD 2000e).

Populations of mock-pennyroyal seem to be restricted to a relatively small geographic area, and populations are apparently small. Because habitat for this species is widespread, placement of the transmission line may impact individual plants. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Nodding blue-eyed grass *(Sisyrinchium cernuum*)
Nodding blue-eyed grass is a perennial forb with grass-like leaves that occurs in southeastern Arizona, west Texas, and Mexico. Within Pima and Santa Cruz counties, Arizona it occurs in the Pajarito, Santa Rita, Atascosa, and Rincon mountains as well as Sycamore Canyon. This species can be found in desert grassland and pine-oak woodlands from 1,006 to 2,438 m (3,300 – 8,000 ft) in elevation along streams in partial shade and in canyon bottoms. It grows in wet soil by seeps, pools, or springs in desert scrub. It has also been found on sandy stream banks. On the Nogales RD, this plant has been found at 1,189 m (3,900 ft) in Sycamore Canyon on the west side and at 1,402 m (4,600 ft) in Big Casa Blanca Canyon in the Santa Rita Mountains (AGFD 1999e). The known location of this plant in Sycamore Canyon is within the Goodding RNA, located approximately 1.6 km (1 mi) west of the proposed ROW (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of nodding blue-eyed grass (AGFD 1999e). However, this species is not likely to be affected by the proposed placement of a transmission line within the Nogales RD. The proposed transmission line will not cross over or near known locations of this plant within the Goodding RNA. Therefore, placement of the TEP transmission line from Sahuarita to Nogales will have no impact on the nodding blue-eyed grass.

Pima Indian mallow (*Abutilon parishii*)
The Pima Indian mallow is a perennial woody-based plant with herbaceous branches. This plant is known from 84 populations in 17 mountain ranges from near the town of Bagdad in central Arizona to Nachopouli Canyon, Sonora, Mexico. Within Arizona, Pima Indian mallow are found in the Superstition Mountains of Maricopa County, the Santa Catalina, Rincon, Silverbell, and Tucson mountains of Pima County, the Mineral Hills, Superstition, Picacho, Tortolito, and Dripping Springs mountains of Pinal County, the Santa Rita and Tumacacori mountains of Santa Cruz County, and the Little Shipp Wash and Cottonwood Creek areas near Bagdad in Yavapai County. This plant has also

been identified within Sabino Canyon in Pima County. Pima Indian mallow are typically found in mesic situations in full sun within higher elevations of Sonoran desertscrub. They can be found on rocky slopes, cliff bases, lower side slopes and ledges of canyons among rocks and boulders. In riparian zones, this plant occurs on flat secondary terraces but typically not in canyon bottoms. Pima Indian mallow are often found near trails, probably because of the trails influence on the light, heat, and water on the micro-habitat. This species is found at elevations ranging from 900 to 1,440 m (3,000 to 4,800 feet) (AGFD 1997b). Within the Nogales RD, this plant occurs in the Devils Cash Box area of the Santa Rita Mountains and within Peck Canyon of the Tumacacori Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

In Arizona, few threats exist to the populations of Pima Indian mallow because this plant grows in steep areas eliminating grazing pressures, and neither light fires nor freezing temperatures cause harm to it (AGFD 1997b). The proposed transmission line will not cross over or near known locations of this plant; therefore, placement of the TEP transmission line will have no impact on the population status of the Pima Indian mallow.

Santa Cruz beehive cactus (*Coryphantha recurvata*)
The Santa Cruz beehive cactus is a succulent perennial that occurs in southern Arizona and northern Sonora (about 20 km [12.4 mi] south of the international border), Mexico. Within Arizona, this species occurs in western Santa Cruz County from Nogales and the Tumacacori Mountains west to the Atascosa/Pajarito mountains. Santa Cruz beehive cacti are found in alluvial soils of valleys and foothills in grassland and oak woodland habitats from 1,219 to 1,829 m (4,000 – 6,000 ft). These plants are either on rocky hillsides with high grass cover or in rock crevices where runoff accumulates and provides a more favorable moisture relationship than the surrounding soils (AGFD 1998d). Within the Nogales RD known plant locations have increased since 1997 (813 plant clumps in 1997, 807 plant clumps in 1998, and 175 in 1999) (T. Newman, CNF, pers. comm., 20 August 2002).

Accessible populations of the Santa Cruz beehive cactus have declined due to collection, but the status of populations beyond accessible areas is unknown (AGFD 1998d). The proposed TEP transmission line crosses over several known Santa Cruz beehive cactus populations within the Nogales RD. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz star leaf (*Choisya mollis*)
The Santa Cruz star leaf is a perennial shrub that occurs in southern Arizona within the Atascosa, Pajarito, and Tumacacori mountains of Santa Cruz County. Santa Cruz star leaf plants are found primarily within madrean evergreen woodland communities from 1,067 to 1,524 m (3,500 – 5,000 ft) in elevation. This plant is usually found in canyon bottoms and slopes, usually in the shade of oaks and other trees, or rock outcrops (AGFD

1999f). Santa Cruz star leaf plants have been found throughout the eastern portion of the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Santa Cruz star leaf are typically found in rugged and remote mountainous areas where human activity is low and the likelihood of disturbance or removal of plants is minimal. However, the species population trend is unknown and existing populations are relatively rare, have a restricted range, and are only found within specific habitats (AGFD 1999f). The proposed transmission line will not cross over or near known locations of this plant; therefore, placement of the TEP transmission line will have no impact on the Santa Cruz star leaf.

Santa Cruz striped agave (*Agave parviflora* ssp. *parviflora*)
Santa Cruz striped agave is a small perennial succulent found in southern Arizona and northern Mexico. Within Arizona, this species is found near Arivaca in Pima County, and in the Las Guijas, Pajarito, Patagonia, Santa Rita, and Atascosa mountains of Santa Cruz County. Habitat for this agave consists of rocky or gravelly slopes of middle elevation mountains, in desert grassland or oak woodlands. This plant appears to prefer soils on rounded ridge-tops where grasses and shrubs are sparse and soil is bare or nearly so (AGFD 1998e). Santa Cruz striped agave have been found throughout the Nogales RD (primarily within the Atascosa, Pajarito, San Luis, and Las Guijas mountains), and in recent years the documented number of individual plants and number of locations has increased for this area (T. Newman, CNF, pers. comm., 20 August 2002).

Some populations of Santa Cruz striped agave have declined due to illegal collection and loss of habitat due to mining and road construction. Livestock grazing has caused degradation of habitat and browsing of flower stalks (AGFD 1998e). The proposed TEP transmission line crosses areas with known populations of Santa Cruz striped agave and there may be an impact to individual plants during development of the line. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area and transplanting of agave plants in project area will minimize impacts. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Seeman groundsel (*Senecio carlomasonii*)
The seeman groundsel is a perennial herb or subshrub found in southern Arizona and Mexico (Sonora, Chihuahua, Nayarit). Within Arizona, this plant is found in the Chiricahua and Huachuca mountains of Cochise County, the Baboquivari and Santa Rita mountains of Pima County, and the Santa Rita, Pajarito, and Peña Blanca mountains of Santa Cruz County (AGFD 2000f). Within the Nogales RD, seeman groundsel have been recorded in the Peña Blanca Lake and Sycamore Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of seeman groundsel (AGFD 2000f). A potential threat to seeman groundsel habitat may be trampling by hikers. The proposed transmission line will not cross over or near known locations of this plant; therefore, placement of the TEP transmission line will have no impact on the population status of the seeman groundsel.

Sonoran noseburn (*Tragia laciniata*)
Sonoran noseburn is an herbaceous perennial that occurs in southern Arizona, Mexico (Sonora and Chihuahua), and possibly New Mexico. Within Arizona this plant can be found in Cochise County in the Huachuca Mountains and Canelo Hills, in Pima County in the Santa Rita Mountains, and in Santa Cruz County in the Atascosa Mountains (Sycamore Canyon), Patagonia Mountains, Pajarito Mountains, Canelo Hills (O'Donnell Canyon), and Santa Rita Mountains. Sonoran noseburn typically occur at elevations of 1,067 to 1,722 m (3,500 – 5,650 ft) along streams and canyon bottoms, on shaded hillsides within the upper parts of the Lower Sonoran and Upper Sonoran biotic communities, and open woodland areas (AGFD 2000g). This species has been found in canyons, along streams, and near roadways of the Nogales RD (AGFD 2000g).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Sonoran noseburn (AGFD 2000g). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Superb beardtongue (*Penstemon superbus*)
The superb beardtongue is a perennial herbaceous forb found in southeastern Arizona, New Mexico, and Mexico (Chihuahua). Within southern Arizona, this species is found in Pima County in the Santa Catalina and Santa Rita mountains, and in Santa Cruz County within the Tumacacori Mountains. This plant is generally found in rocky canyons, dry hillsides, and along washes in sandy or gravelly soils at elevations between 945 and 1,676 m (3,100 – 5,500 ft) (AGFD 2000h). Within the Nogales RD, it has been found in Rock Corral Canyon and Box Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of superb beardtongue (AGFD 2000h). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Supine bean (*Macroptilium supinum*)
The supine bean is a perennial herb that grows in colonies and produces underground fruits. The total range for this species includes Santa Cruz County, Arizona, south into Mexico, including the states of Sonoran and Nayarit. Within Arizona, this plant can be found in the Atascosa/Pajarito, San Luis, and Patagonia Mountains, and the southern

portion of the Santa Cruz River drainage in Santa Cruz County (much of this area is within the Nogales RD). Supine bean are typically found along ridge tops and gentle slopes of rolling hills in semi-desert grassland or grassy openings in oak-juniper woodlands at elevations between 1,097 and 1,494 m (3,600 – 4,900 ft) (AGFD 1999g).

There are currently an estimated 12 populations of this species in Arizona. Populations range from small (around 20 individuals) to relatively large (around 3,500 individuals). A 43% decline in a monitored population was recorded from 1989 to 1993. This decline was apparently due to low reproductive output and poor recruitment, although the reasons for these are unknown (AGFD 1999g). Possible threats to this species include degradation of habitat due to livestock grazing, off-road vehicle activity, recreation (camping and hiking), Border Patrol activities, utility corridor and road construction/maintenance, and home building (AGFD 1999g).

Because of the recent decline in monitored populations and drought conditions noted in 2002, additional surveys will be conducted prior to construction in potential supine bean habitat. If populations of this species are found in the vicinity of construction, consultation with USFS biologists will be initiated to minimize impacts. Development of the proposed TEP transmission line is likely to have an impact on this species. However, once additional surveys are completed, impacts are likely to be limited to individual plants and not whole populations. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Sweet acacia (*Acacia smallii*)
The sweet acacia is a woody perennial spiny shrub or small tree found in Texas, Arizona, and California south to Argentina. Within Arizona, this species is found in the Baboquivari Mountains of Pima County and Sycamore Canyon and Atascosa Mountains of Santa Cruz County. Sweet acacia are typically found in the lower slopes of canyons of riparian areas in desert grassland communities from elevations ranging from 1,067 to 1,219 m (3,500 – 4,000 ft) (AGFD 1992).

Population trends for the sweet acacia are unknown (AGFD 1992). The proposed TEP transmission line may cross potential sweet acacia habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Thurber hoary pea (*Tephrosia thurberi*)
The Thurber hoary pea is a perennial shrub that occurs in southern Arizona and Mexico (northern Sonora and southwestern Chihuahua). Within Arizona, this plant can be found in Cochise, Santa Cruz, and Pima counties. On the Nogales RD, Thurber hoary pea plants are found in the Santa Rita and Atascosa mountains. This species typically occurs

on rocky slopes among oaks, pines, junipers, manzanitas, open hilltops, and grasslands at elevations between 1,067 and 2,134 m (3,500 – 7,000 ft) (AGFD 1999h).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Thurber hoary pea (AGFD 1999h). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Thurber's morning-glory (*Ipomoea thurberi*)
Thurber's morning-glory are perennial herbaceous vines that are found in southern Arizona and Mexico (Chihuahua and Sonora). Within Arizona, this plant is found in the Huachuca and Mule Mountains of Cochise County, the Santa Rita Mountains of Pima County, and in the vicinity of Nogales, the Canelo Hills, and the Patagonia and Atascosa/Pajarito mountains of Santa Cruz County. Habitat in Arizona typically consists of rocky hillsides and canyon slopes in madrean evergreen woodland and semi-desert grassland communities in elevations between 1,158 and 1,570 m (3,800 – 5,150 ft) (AGFD 2000i). On the Nogales RD, this morning glory has been found in the vicinity of Peña Blanca Lake, east of Peñasco Canyon, and Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Thurber's morning-glory (AGFD 2000i). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Virlet paspalum (*Paspalum virletti*)
The virlet paspalum is a perennial grass found in southeastern Arizona and Mexico (Sonora and San Luis Potosi). Within Arizona, this grass is found in the Huachuca Mountains of Cochise County, and in the Pajarito Mountains and Sycamore Canyon of Santa Cruz County. This grass is found in sandy soils of canyon bottoms in semi-desert grassland communities and grassy areas within madrean evergreen woodland communities at elevations ranging from 1,067 to 1,737 m (3,500 – 5,700 ft) (AGFD 1999i). In the Nogales RD, the only known location for this grass is in Sycamore Canyon growing in a sandy canyon bottom (T. Newman, CNF, pers. comm., 20 August 2002).

This species is rare in Arizona, where it is known from only 2 widely separated populations. There is no information on the potential effects of land use activities, such as utility placement, on the population status of virlet paspalum (AGFD 1999i). Known locations of this plant occur outside of the proposed TEP transmission line corridor; therefore, placement of the line is not likely to impact the virlet paspalum.

Weeping muhly (Sycamore Canyon muhly) (*Muhlenbergia xerophila*)
Weeping muhly is a perennial herbaceous grass found only in southern Arizona. Populations occur in the Santa Catalina, Rincon, Santa Rita, Tumacacori, and Baboquivari mountains of Pima County, and in Sycamore Canyon within the Pajarito Mountains of Santa Cruz County. Weeping muhly most often grow in crevices of cliffs, bedrock, and other rocks along canyon bottoms. This grass is also known from rocky canyon slopes in oak, pine-oak, and riparian woodlands at elevations between 1,073 and 1,829 m (3,520 – 6,000 ft) (AGFD 1999j).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of weeping muhly (AGFD 1999j). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Wiggins milkweed vine (*Metastelma mexicanum*)
Wiggins milkweed vine is a perennial herbaceous vine with a woody base found in southeastern Arizona to southern Sonora, Mexico. Within Arizona, this vine occurs around the Nogales and Ruby areas, Sycamore Canyon area, and Patagonia Mountains of Santa Cruz County, and Baboquivari, Coyote, and Catalina mountains of Pima County. This vine is typically found on open slopes within open oak woodland on granite soils of juniper flats at elevations between 1,067 and 1,554 m (3,500 – 5,100 ft) (AGFD 2000j). Wiggins milkweed vine has been found in several locations within the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of Wiggins milkweed vine within Arizona appear to be stable. This vine depends on surrounding vegetation for microhabitat and will be affected by any disturbance to area habitat (AGFD 2000j). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Wooly fleabane (*Laennecia eriophylla*)
Wooly fleabane is a perennial herb found in southeastern Arizona and northern Mexico (Sonora and Chihuahua). In Arizona, wooly fleabane occurs in the Atascosa Mountains, Pajarito Mountains, Santa Rita Mountains, Canelo Hills, and in the vicinity of Sonoita Creek in Santa Cruz County. This species is typically found in gravelly soil of rocky slopes and ridges with dense grass cover in semi-desert grassland, dry oak woodland, and pine-oak woodland communities at elevations between 1,292 and 1,722 m (4,240 – 5,650

ft) (AGFD 1999k). There are known locations of wooly fleabane in the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Population sizes of this plant are usually very small, with typically no more than 40 plants found in any of the populations known from Arizona. Population numbers fluctuate with the amount and timing of summer rains from year to year. This species was probably more common before its habitat was altered by excessive grazing (AGFD 1999k). Known locations of this plant and potential habitat occur outside of the proposed TEP transmission line corridor; therefore, placement of the line is not likely to impact the wooly fleabane.

3.2 INVERTEBRATES

Arizona metalmark (*Calephelis rawsoni arizonensis*)
The Arizona metalmark is a small, brown butterfly with bands of blue metallic markings on the upper and underside of the body. This butterfly occurs in Arizona, and from the Animas Mountains in southwestern New Mexico southward to Sonora, Mexico. The southern limits of its range are poorly defined to date. In Arizona, this species is known from as far north as Gila County then southward through Graham, Cochise, Pima, and Santa Cruz counties in most of the mountains therein. Arizona metalmark butterflies occur mostly above the desert floor in mountain foothills. Within these mountains, it is found in riparian canyons in oak woodland or more arid regions at elevations from 716 to 1,676 m (2,350 – 5,500 ft). Canyons with standing water for a major portion of the year appear to contain populations of this species as long as *Agave* spp. are present for larvae development (AGFD 2001a). There is no information on the potential effects of land use activities, such as utility placement, on the population status of Arizona metalmark (AGFD 2001a).

Placement of the transmission line may indirectly impact individuals of this species through habitat modification, however because the species is widely distributed across southern Arizona, only a small percentage of Arizona metalmarks may be impacted. Furthermore, transplanting of agave plants also will minimize impacts. Impacts are not likely to result in a trend toward federal listing or loss of viability.

3.3 BIRDS

American peregrine falcon (*Falco peregrinus anatum*)
The American peregrine falcon subspecies is a medium-sized raptor that nests from central Alaska south to Baja California, Sonora, and the highlands of Central Mexico. Within Arizona, this raptor breeds wherever sufficient prey is available near cliffs. These raptors are rare or absent as breeders in the southwestern quarter of Arizona. Optimum habitat for peregrine falcons consists of steep, sheer cliffs overlooking woodlands, riparian areas, or other habitats supporting avian prey species in abundance. These raptors may also be found in less optimal habitat consisting of small broken cliffs in ponderosa pine forests or large sheer cliffs in very xeric areas. The presence of an open expanse is critical. American peregrine falcons can be found at elevations ranging from

122 to 2,743 m (400 – 9,000 ft) (Glinski 1998, AGFD 1998f). Peregrine falcon nests were found on Ramanote Peak and along Sycamore Canyon (CNF 2000). Both these nests are at least 1.6 km (1 mi) from the proposed ROW. In 2002, another nest was found on Castle Rock, which is within the MSO PAC and within 0.3 km (0.18 mi) of proposed structures. The seasonal restrictions in effect for MSO (SECTION 1.4) will prevent breeding season disturbance of peregrines on Castle Rock.

American peregrine falcons have been found in great numbers in Arizona as well as in areas that will have formerly been considered marginal habitat. This trend suggests that populations in Arizona may have reached levels saturating the optimal habitat available (AGFD 1998f). Placement of the proposed transmission line is not near known nesting sites for peregrine falcons. If new nest sites are encountered during construction, conservation measures will be developed in coordination with CNF biologists to prevent adverse effects. Therefore, placement of the transmission line will not impact this species.

Five-stripped sparrow (*Aimophila quinquestriata*)
The five-stripped sparrow is found in western portions of northern Sinaloa and Sonora, Mexico and the southeastern most portions of Arizona. This sparrow is primarily found in Mexico, but its range reaches into southeastern Arizona. Here, it is rarely found during breeding season, and there are only a few winter records. Five-stripped sparrow habitat is highly specialized, consisting of tall, dense shrubs on rocky, semi-desert hillsides and canyon slopes (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). Within the Nogales RD, this sparrow has been recorded within Sycamore Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of five-stripped sparrow have declined because of habitat loss, fragmentation, and degradation (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). The proposed TEP transmission line will not cross Sycamore Canyon where these sparrows have been observed. This species is not likely to be affected by the proposed placement of a transmission line within the Nogales RD.

Northern gray hawk (*Asturina nitida maxima*)
The gray hawk is a medium-sized raptor with a gray back, black tail with 2 or 3 white bands, and a finely barred gray and white chest, abdomen, and thighs (Glinski 1998). The gray hawk prefers Sonoran riparian deciduous forest and woodland plant communities and can be found along the Santa Cruz and San Pedro rivers, Sonoita Creek, and Sopori Wash. This species also has been reported from the Hassayampa and Salt rivers. This hawk species is migratory and usually arrives in Arizona in mid-March and returns south during winter months (AGFD 2000k). Gray hawks prefer cottonwood, mesquite, and hackberry woodlands with a prey base of lizards, especially the whiptail lizard *(Cnemidophorus* spp.*)*.

The current population trend for gray hawks is considered stable by the AGFD (2000k). Potential nesting habitat exists near the proposed TEP transmission line corridor in Peck

Canyon. Individual gray hawks may be impacted by noise from construction activity related to transmission line placement. However, because of the distance of the proposed action from suitable habitat in Peck Canyon, any increase in noise will be marginal. Furthermore, only a small percentage of the population may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)
The western yellow-billed cuckoo is a long and slender bird with short, dark legs that nests from southern California through the northeastern United States, south through the United States to the Florida Keys, Central America and southern Baja California, Mexico. This species winters from South America to central Argentina and Uruguay. Within Arizona, western yellow-billed cuckoo are found in southern and central Arizona and the extreme northeast portion of the state. This species is typically found in streamside areas with cottonwood, willow groves, and larger mesquite bosques (AGFD 1998g). This species has been observed in Sopori Wash and Sycamore, Peck, and Peña Blanca canyons (AGFD 1998g; CNF 2000; P. Titus, T. Furgason, SWCA, pers. comm.16 October 2002).

Populations of western yellow-billed cuckoo have been reduced; a general decline is occurring in all areas with known populations (AGFD 1998g). This species is sensitive to habitat fragmentation and degradation of riparian woodlands due to agricultural and residential development (Hughes 1999). The proposed transmission line may cross potential cuckoo habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

3.4 Reptiles and Amphibians

Giant spotted whiptail (*Cnemidophorus burti strictogrammus*)
The giant spotted whiptail is a long, slender lizard found in southeastern Arizona, extreme southwest New Mexico, and northern Sonora, Mexico. Within southeastern Arizona, this lizard is found in Cochise County; the Santa Catalina, Santa Rita, Baboquívari, and Pajarito mountains and in the vicinity of Oracle in Pima County; and in Pinal County. Giant spotted whiptail lizards inhabit mountain canyons, arroyos, and mesas in arid and semi-arid regions, entering lowland deserts along stream courses. They are found in dense shrubby vegetation, often among rocks near permanent and intermittent streams at elevations ranging from near sea level to 1,372 m (4,500 ft). Open areas of bunch grass within these riparian habitats are also occupied (AGFD 2001b).

Giant spotted whiptail populations are thought to be stable and some populations are locally abundant even though this species is limited in distribution (AGFD 2001b). Because the known populations occur outside the project area, the proposed transmission line will have no significant effect on the population status of the giant spotted whiptail.

Lowland leopard frog (*Rana yavapaiensis*)
The lowland leopard frog is found in low elevations in the drainage of the lower Colorado River and its tributaries in Nevada, California, Arizona, New Mexico, northern Sonora and extreme northeast Baja California, Mexico (probably extirpated from California and Nevada). Within Arizona, this frog has been found in the Virginia River drainage in the extreme northwestern part of the state, in the Colorado River near Yuma, and west, central, and southeast Arizona south of the Mogollon Rim. This frog frequents desert, grassland, oak, and oak-pine woodland in permanent pools of foothill streams, rivers, and permanent stock tanks. They typically stay close to water at elevations ranging from 244 to 1,676 m (800 – 5,500 ft) (AGFD 1997b). Within the Nogales RD, this frog has been recorded in Pesquiera and Alamo canyons, California Gulch, Adobe, Temporal Gulch, Big Casa Blanca, Box Canyon, and Gardner Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Lowland leopard frog populations are considered stable in central Arizona but declining in southeast Arizona, and populations have been extirpated from southwestern Arizona. Potential threats to this species are manipulation to major watercourses, water pollution, introduced species (fish, bullfrogs, and crayfish), heavy grazing, and habitat fragmentation (AGFD 1997b). Because no construction will occur within perennial aquatic habitats and known populations occur outside project area, the proposed transmission line will have no significant effect on the population status of the lowland leopard frog.

Mexican garter snake (*Thamnophis eques megalops*)
The Mexican garter snake ranges from southeastern Arizona and extreme southwestern New Mexico, southward into the highlands of western and southern Mexico, to Oaxaca. Within Arizona, this snake occurs in the southeast corner of the state from the Santa Cruz Valley east and generally south of the Gila River. Valid records (post 1980) have recorded this snake in the San Rafael and Sonoita grasslands area and from Arivaca. Mexican garter snakes are most abundant in densely vegetated desert grassland habitat surrounding cienegas, cienega-streams, stock tanks, and in or near water along streams in valley floors and generally open areas, but not in steep mountain canyon stream habitat. This snake is generally found at elevations ranging from 914 to 1,524 m (3,000 – 5,000 ft) but may reach elevations of 2,591 m (8,500 ft) (AGFD 2001c).

Populations of Mexican garter snakes are decreasing, with extirpations at several localities since 1950 as habitat has changed and introduced predators have invaded. Management concerns for this species include predation by introduced bullfrogs and predatory fishes, urbanization and lowered water tables, and habitat destruction, including that due to overgrazing (AGFD 2001c). Because no construction will occur within perennial aquatic habitats and construction within riparian habitats will be minimized, the proposed transmission line will have no significant effect on the population status of the Mexican garter snake.

Western barking frog (*Eleutherodactylus augusti cactorum*)
The western barking frog is a secretive terrestrial frog found in extreme southern Arizona, southeast New Mexico, and central Texas south to the Isthmus of Tehuantepec. In Arizona, this frog historically occurred in Pima and Santa Cruz counties within the Santa Rita and Pajarito mountains. Habitat consists of rocky hillsides of canyons in woodland vegetation at elevations between 1,158 and 2,134 m (3,800 – 7,000 ft). Permanent water is not a necessary component of western barking frog habitat. There are very few records of this species in Arizona, and none have been recorded within the Nogales RD (AGFD 1995b).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of western barking frogs (AGFD 1995b). Because known populations occur outside the project area, the proposed transmission line will have no significant effect on the population status of the western barking frog and is not likely to result in a trend toward listing or loss of viability.

3.5 MAMMALS

Cave myotis (*Myotis velifer*)
The cave myotis is a large bat found in the southwestern half of Arizona and the immediate adjacent parts of California, Nevada, New Mexico, and the northern third of Sonora, Mexico. Within Arizona, this bat is found south of the Mogollon Plateau from Lake Mohave, Burro Creek, Montezuma Well, San Carlos Apache Reservation, and the Chiricahua Mountains south to Mexico. Cave myotis have not been recorded in the extreme southwestern part of the state and are found in small numbers in southeastern Arizona in the winter. This bat typically prefers desertscrub habitats of creosote, brittlebush, paloverde, and cacti but they sometimes can be found up in pine-oak communities. Cave myotis roost in caves, tunnels, mineshafts, under bridges, and sometimes buildings within a few kilometers of a water source (AGFD 1997c).

Cave myotis colonies are vulnerable at the roost sites, especially maternity roosts, because the congregate in large numbers (AGFD 1997c). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the cave myotis.

Southern pocket gopher (*Thomomys umbrinus intermedius*)
The southern pocket gopher is a small gopher found in extreme southeastern Arizona and southwestern New Mexico, south into Mexico. Within Arizona, this gopher is found primarily in the southern most portion of the state in the oak belt of the Santa Rita, Patagonia, Atascosa, Pajarito, and Huachuca mountains. Southern pocket gophers have been found at Peña Blanca Spring in gravelly soil along a broad wash. Elsewhere, this species is generally found on rocky slopes within open oak woodlands in the lower parts of mountain ranges from 1,372 to 2,743 m (4,500 – 9,000 ft) in elevation. There has been

only 1 record for the southern pocket gopher within the Nogales RD, specifically at Peña Blanca Canyon in the Atascosa/Pajarito mountains. However, it is suspected that this species has a much wider range (AGFD 1998h).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of southern pocket gopher (AGFD 1998h). Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

4.0 BLM SENSITIVE SPECIES

Criteria for BLM Sensitive species include those that are:

1. Under status review by the USFWS, or
2. Whose numbers are declining so rapidly that Federal listing may become necessary, or
3. With typically small and widely dispersed populations,
4. Those inhabiting ecological refugia or other specialized or unique habitats.

The potential impacts to BLM Sensitive species were determined based on the habitat conditions within the BLM lands crossed by the proposed action, the life history of the species, and the proposed construction methods. Only those species that have a potential of occurring on or near the BLM parcel were evaluated. The 13 BLM Sensitive species evaluated were identified in the BLM Sensitive species list for Arizona (Instruction Memorandum No. AZ-2000-018) dated 21 April 2000 and are listed in Table 4.

TABLE 4. SUMMARY OF EFFECTS ON BUREAU OF LAND MANAGEMENT SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Balloonvine *Cardiospermum corindum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
False grama *Cathestecum erectum brevifolium*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Tumamoc globeberry *Tumamoca macdougalii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Loggerhead shrike *Lanius ludovicianus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Rufous-winged sparrow *Aimophila carpalis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

TABLE 4 (CONTINUED). SUMMARY OF EFFECTS ON BUREAU OF LAND MANAGEMENT SENSITIVE SPECIES.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Western burrowing owl *Athene curnicularia hypugea*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur throughout southwestern U.S.
Texas horned lizard *Phrynosoma cornutum*	No Impacts.	• Known populations occur outside project area.
Big free-tailed bat *Nyctinomops macrotis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
California leaf-nosed bat *Macrotus californicus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Fringed myotis *Myotis thysandodes*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Pocketed free-tailed bat *Nyctinomops femorosaccus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Spotted bat *Euderma maculatum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Underwood's mastiff bat *Eumops underwoodi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.

4.1 PLANTS

Balloonvine (*Cardiospermum corindum*)
This perennial vine is widely distributed in tropical and subtropical regions and is known from the Coyote Mountains in Pima County (Kearny and Peebles 1960). Because potential habitat for this species is widespread, placement of the transmission line may impact individual plants. However because of the linear nature of the project, only a

small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

False grama (*Cathestecum erectum* (*brevifolium*))
False grama is a perennial, drought-tolerant grass found on dry hills and plains of Southern Arizona and Northern Mexico. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Tumamoc globeberry (*Tumamoca macdougalii*)
This perennial vine occurs in shade of nurse plants along sandy washes below ~914 m (3,000 ft) in elevation. The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

4.2 BIRDS

Loggerhead shrike (*Lanius ludovicianus*)
The loggerhead shrike occurs in open country with scattered trees and shrubs, savanna, desertscrub and occasionally open woodland (AGFD 2002). In Arizona, this species usually summers throughout open parts of the state below the Transition Zone and is also periodically found along the Mexican border west of Baboquívari Mountains (Phillips et al. 1983). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Rufous-winged sparrow (*Aimophila carpalis*)
The rufous-winged sparrow is classified as a migratory bird and is a resident of eastern Pima County, including Avra Valley, and was once thought to be extirpated in Arizona due to overgrazing but was rediscovered in the Tucson Area in 1936. Rufous-winged sparrows generally use habitats characterized by scattered low shrubs and trees, which provide cover and foraging areas during mid-summer days. Many of these areas contain significant grassland components. Threats to the species include urban development, overgrazing, and exotic species, all of which result in losses of grassland communities utilized by this species (Pima County 2001). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However

because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Western burrowing owl (*Athene cunicularia hypugea*)
The Western burrowing owl inhabits heavily grazed tracts of mixed-grass prairie, particularly where there are burrows created by large rodents, such as prairie dogs and Richardson ground squirrels. Distribution extends from southern Canada through the western United States to South America. Arizona is 1 of 3 states that provide important wintering areas for this species (USGS 2003). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur throughout the southwestern United States. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

4.3 Reptiles and Amphibians

Texas horned lizard (*Phrynosoma cornutum*)
The Texas horned lizard occurs from Kansas to extreme southeastern Arizona and lives mainly in sandy areas of deserts, grasslands, prairies, and scrublands (Bartlett and Bartlett 1999) where it often inhabits abandoned animal burrows (Bockstanz 1998). Because known populations occur outside of the project area, the proposed transmission line will have no significant effect on the population status of this species.

4.4 Mammals

Big free-tailed bat (*Nyctinomops macrotis*)
Distribution of the big free-tailed bat occurs from the southwestern United States southward through the Caribbean, Central America, and into the northern part of South America. Northern populations are known to migrate to southern Arizona and Mexico in the fall, yet this species is widely scattered throughout Arizona during the spring and summer too. In Arizona, this bat has been found in pinyon-juniper, Douglas-fir, and Sonoran desertscrub habitats, but it is believed that these locations are foraging sites. Preferred roosting sites include rock crevices and fissures of mountain cliffs in rugged, rocky areas of desertscrub habitat (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the big free-tailed bat.

California leaf-nosed bat (*Macrotus californicus*)
Distribution of the California leaf-nosed bat in the United States spans southern California, southern Nevada, and southwestern Arizona and extends southward into

Mexico, to the southern tip of Baja California, northern Sinaloa, and southwestern Chihuahua. This bat lives predominantly in Sonoran and Mohave desertscrub habitats, but is occasionally found in the Chihuahuan and Great Basin deserts. Daytime roosting sites are usually mines and caves, and nighttime roosts include open buildings, cellars, bridges, porches, and mines. These bats do not hibernate or migrate; therefore, they tend to live in the same area year after year and remain active year-round (AGFD 1993, 2001d; Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the California leaf-nosed bat.

Fringed myotis (*Myotis thysandodes*)

Distribution of the fringed myotis ranges from southern British Columbia, Canada southward throughout the western United States, and down to southern Mexico. It occurs in a variety of habitats – from desertscrub to oak and pinyon woodlands to spruce-fir forests. Roosting sites include caves, mines, and buildings. These bats tend to roost in tight clusters and may change locations periodically in response to thermoregulatory needs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the fringed myotis.

Pocketed free-tailed bat (*Nyctinomops femorosaccus*)

The pocketed free-tailed bat ranges from the southwestern United States (including southern California, Arizona, and New Mexico, and the Trans-Pecos region of Texas), south into Mexico through Baja, Sonora, Durango, and Jalisco to, at least, Michoacan. This bat can be found in the arid lowlands of the desert Southwest, where it roosts in crevices and caves of rugged cliffs, slopes, and rock outcrops (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

Spotted bat (*Euderma maculatum*)

Distribution of the spotted bat ranges throughout centralwestern North America, from southcentral British Columbia down to southern Mexico. In Arizona, its habitat ranges from low desert areas in the Southwest to high desert and riparian habitats in the northwestern part of the state. This bat has also been documented in conifer forests in northern Arizona. Roosting sites are often situated in rock crevices on high cliffs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed.

Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the spotted bat.

Underwood's mastiff bat (*Eumops underwoodi*)
The range of Underwood's mastiff bat is limited, from south-central Arizona, into the arid lowlands of Sonoran and western Mexico, and into Honduras. It is believed to be a year-round resident of Arizona, ranging from the Baboquívari Mountains down to Organpipe National Monument. This bat prefers Sonoran desertscrub and mesquite/grassland plant communities. Roosting tends to occur in crevices along steep cliffs and sometimes in the cracks of buildings (AGFD 1993). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of this species.

5.0 AGFD WILDLIFE OF SPECIAL CONCERN

AGFD was consulted in regards to state listed special status species and habitats that may be affected by the proposed action. Several state listed special status species and overall wildlife habitat may be affected by the proposed action. The AGFD mission is to conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs. Continued consultation and input from AGFD will ensure that impacts of the proposed action are minimized and mitigation efforts are successful.

Listed in Table 5 are state special status species that may be found in the vicinity of the proposed action, based on AGFD's Heritage Data Management System (HDMS) (1 July 2002). Effects of the proposed action on the majority of these species will be avoided or minimized through mitigation efforts stipulated for federally listed species. However, additional mitigation is recommend for the Sonoran Desert tortoise as 5 individuals were located near the Tinaja Hills area during field surveys of the proposed ROW (HEG 2002, unpublished data).

TABLE 5. SUMMARY OF EFFECTS ON WILDLIFE OF SPECIAL CONCERN IN ARIZONA.

COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Black-bellied whistling duck *Dendrocyna autumnalis*	No Impacts.	• No construction in perennial aquatic habitats.
Crested caracara *Caracara cheriway*	No Impacts.	• Known populations occur outside project area.
Desert tortoise - Sonoran population *Gopherus agassizii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total potential habitat within project area may be impacted. • Pre-construction surveys will minimize impacts to species.
Elegant trogon *Trogon elegans*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Mexican long-tongued bat *Choeronycteris mexicana*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total potential habitat within project area may be impacted. • Mitigation plantings of agaves will reduce impacts.
Great Plains narrow-mouthed toad *Gastrophryne olivacea*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

TABLE 5 (CONTINUED). SUMMARY OF EFFECTS ON WILDLIFE OF SPECIAL CONCERN IN ARIZONA.		
COMMON NAME *Scientific Name*	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Mexican vine snake *Oxibelis aeneus*	No Impacts.	• Known occurrences are outside project area.
Osprey *Pandion haliaetus*	No Impacts	• No construction in perennial aquatic habitats.
Rose-throated becard *Pachyramphus aglaiae*	No Impacts.	• Known occurrences are outside project area.
Thick-billed kingbird *Tyrannus crassirostris*	No Impacts	• No potential habitat within project area.
Tropical Kingbird *Tyrannus melancholicus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

Black-bellied whistling duck (*Dendrocyna autumnalis*)
The black-bellied whistling duck is "goose-like" with a long neck and long pink legs. This species has a cinnamon or chestnut breast and back with a black belly and bright coral-red bill. The total range for this species is from the Gulf coast and lower Rio Grande Valley of Texas and central Arizona south through Mexico, Central America to southern Brazil. In Arizona, the range for the black-bellied whistling duck is southeastern and central Arizona. Black-bellied whistling ducks are commonly seen in the Santa Cruz Valley, particularly in ponds near and around Nogales. The habitat for this species consists of the banks of rivers, lakes, ponds, riparian areas, and stock tanks (Brown 1985).

Because of habitat loss and apparent population declines from historic levels, the black-bellied whistling duck has been placed on the AGFD Threatened Native Wildlife of Arizona List as a candidate species. This species appears to be increasing in Arizona in urban settings at man-made ponds and at sewage treatment plants. It also appears to be stable at some private ranch ponds, which tend to be isolated from hunting pressure (Corman 1994).

Because no construction will occur in perennial aquatic habitats, the proposed transmission line will have no effect on the population status of the black-bellied whistling duck.

Crested caracara (*Caracara cheriway*)
The crested caracara is a medium sized raptor with bold black and white plumage and a bright yellow-orange face and legs. The crested caracara ranges from southern Arizona

and northern Mexico to Tierra del Fuego. In the United States, it occurs only along the southern border in Texas and Arizona, and in Florida, where there is an isolated population in the south-central peninsula. In Arizona, their range extends up from San Miguel in the Baboquivari Valley north to Quijotoa, Sells, and Coyote Pass. This raptor occurs regularly on the Tohono O'odham Indian Reservation. Small groups of crested caracara are seen in Sasabe and south of the Mexican border near Sonoyta, Sonora. This raptor is found in open habitats, typically grassland, prairie, pastures, or desert with scattered taller trees, shrubs, or cacti. The crested caracara is found in areas characterized by low-profile ground vegetation and scattered tall vegetation. Specifically in Arizona, vegetation consists of saguaro, mesquite, paloverde, cholla and acacia (Morrison 1996).

Arizona populations of crested caracara on the Tohono O’odham Reservation are likely stable because few threats exist. Reports of individual, and in some cases groups, of this raptor outside of the reservation indicate that its range within Arizona is probably as extensive as it was historically. No apparent threat currently exits to Arizona populations; however, the AGFD has listed the crested caracara as a threatened native wildlife. This species is considered vulnerable if habitat conditions worsen (Morrison 1996).

Habitat surveys did not detect the presence of any bird of prey nests along the corridor. Furthermore, no know populations of this species occur within the project area. Therefore, the proposed action will have no effect on the population status of the crested caracara.

Desert tortoise (Sonoran) (*Gopherus agassizii*)
The Sonoran Desert tortoise ranges from northern Sinaloa, Mexico to southern Nevada and southwestern Utah, and from southcentral California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act. The threatened Mojave population occurs north and west of the Colorado River and the unlisted Sonoran population occurs south and east of the Colorado River. Within Arizona, the Sonoran Desert tortoise is found south and east of the Colorado River from Mojave County to the south, beyond the International Boundary and many scattered locations in between. The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desertscrub at elevations ranging from 152 to 1,615 m (500 – 5,300 ft). Burrows and shelter sites are generally below rocks and boulders, in rock crevices, under vegetation, and also in caliche caves of incised wash banks (AGFD 2001e).

Several threats to tortoise populations in the Sonoran Desert have been identified, including habitat fragmentation, habitat loss and degradation from urban and agricultural development and roads, wildfires associated with invasion of non-native grasses and forbs, illegal collection, and genetic contamination of wild populations by escaped or released captives. Although current evidence suggests that Arizona populations are stable there are substantial gaps in available data (Arizona Interagency Desert Tortoise Team 1996).

During ground surveys of the proposed transmission line corridor, 5 desert tortoise were found (HEG, unpublished data). Per recommendations of Spencer and Humphrey (1999) for any ground disturbing projects, surveys should be conducted a minimum of 48 hours prior to grading and again just prior (as it is occurring) to vegetation clearing (Desert Tortoise Council 1999). While the proposed action may have a minimal effect on the potential habitat of this species, pre-construction surveys will minimize impacts to individual tortoise and is therefore not likely to result in a trend toward listing or loss of viability.

Elegant trogon (*Trogon elegans*)
The elegant trogon is a medium sized bird with a round head, large eyes, a white band on an iridescent green breast, black face and throat, red belly and undertail coverts. The total range for this bird is from southern Arizona and New Mexico south through Mexico to southern Nicaragua to northwestern Costa Rica. In Arizona, the elegant trogon is found in sky island mountains, most commonly the Atascosa, Chiricahua, Huachuca, and Santa Rita mountains. Elegant trogons are found in riparian areas consisting of sycamore, cottonwood, and oak, and also in coniferous woodlands at elevations ranging from 1,036 to 2,073 m (3,400 – 6,800 ft) (AGFD 2001f).

Population trends for the elegant trogon are not well known. No evidence indicates population declines in any of the core canyons occupied over the past few decades. Threats to this species include degradation and loss of native riparian habitat through stream diversion, groundwater withdrawal, erosion, and overgrazing (AGFD 2001f).

Because potential habitat and known occurrences of this species are outside the project area, the proposed action will have no effect on the population status of the elegant trogan.

Great Plains narrow-mouthed toad (*Gastrophryne olivacea*)
The Great Plains narrow-mouthed toad is a small, stout toad with stubby limbs, a small pointed head with a fold of skin on the back of the head. The total range for this species is from southeastern Nebraska and Missouri south through Texas to western Mexico. Within Arizona, the Great Plains narrow-mouthed toad is found in the vicinity of Santa Cruz County, Pima County, to near Casa Grande, Arizona in Pinal County. Habitat for this species in Arizona consists of mesquite semi-desert grassland communities to oak woodland communities near riparian areas at elevations ranging from sea level to around 1,250 m (4,100 ft) (AGFD 1995c).

Population trends for the Great Plains narrow-mouthed toad are currently unknown. Populations in Arizona are at the extreme northwestern edge of the species range and distribution is limited throughout its range (AGFD 1995c). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mexican long-tongued bat (*Choeronycteris mexicana*)
The Mexican long-tongued bat has a long, slender nose with a leaf-like structure on the base of the nose. The total range for this species is from southeastern Arizona, southwestern New Mexico, and California south through Central America to Venezuela. In Arizona, the Mexican long-tongued bat is found from the Chiricahua Mountains extending as far north as the Santa Catalina Mountains and west to the Baboquivari Mountains. Habitat for this bat is typically within canyons of mixed oak-conifer forests in mountains at elevations ranging from 1,082 to 2,231 m (3,550 – 7,320 ft) (AGFD 1994). This species do not congregate in sizeable maternity or bachelor colonies like *Leptonycteris* bats do (Hoffmeister 1986). They feed on nectar and pollen, especially from paniculate agaves (AGFD 1994).

Populations of Mexican long-tongued bats in Arizona appear to be highly variable (AGFD 1994) and there is no evidence of a long-term decline or any clear trend. The limitation of riparian zones and the distribution of food plants may limit populations of this species in Arizona and loss of riparian vegetation may be a greater threat to this species than human disturbance at particular roost sites (Pima County 2001). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during construction; however, these disturbances will be isolated and will impact only a small percentage of potential habitat. Furthermore, transplanting of agave plants also will minimize impacts. Impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mexican vine snake (*Oxibelis aeneus*)
The Mexican vine snake has an elongated head, pointed snout, and is thin bodied with an ash gray to yellow-brown and tan coloring. The total range for this species is from extreme southern Arizona south to Brazil. In Arizona, this species occurs in the Tumacacori, Pajarito, and Patagonia mountains in Santa Cruz County. Habitat for the Mexican vine snake consists of brush-covered hillsides and riparian areas with sycamore, oak, walnut and wild grape trees at elevations ranging from 914 to 1,768 m (3,000 – 5,800 ft) (AGFD 1991b).

Population trends for the Mexican vine snake are currently unknown. Populations in Arizona are at the extreme northern edge of the species range and distribution is limited, with occurrences known from Sycamore Canyon (AGFD 1991b). A potential threat is the high interest by collectors for this species (AGFD 1991b). Because known occurrences of this species are outside the project area, the proposed action will have no effect on the population status of the Mexican vine snake.

Osprey (*Pandion haliaetus*)
This raptor is dark brown on its back and white on the underparts with a prominent dark eye stripe. The total range for the osprey is from Alaska to Newfoundland, along the Atlantic and Pacific coastlines, and in the Rocky Mountains south through central and South America. Within Arizona, the osprey occurs primarily in the White Mountains, along the Mogollon Rim, and along the Salt and Verde rivers. In southeastern Arizona, this raptor is an uncommon spring and fall transient, usually seen at ponds and reservoirs. Nesting habitat of the osprey consists of coniferous trees along rivers and lakes at elevations ranging from 1,829 to 2,377 m (6,000 – 7,800 ft) (AGFD 1997d).

Osprey population trends in Arizona are not well known. Only about 20 nest sites are known in the southwest, all within Arizona. This raptor is threatened by loss of nesting habitat and foraging perch sites. It is also threatened by recreational use of nesting habitat, shooting, and pesticide poisoning on wintering grounds (AGFD 1997d).

Because no construction will occur in perennial aquatic habitats, the proposed action will have no effect on the population status of the osprey.

Rose-throated becard (*Pachyramphus aglaiae*)
The rose-throated becard is a big-headed, thick billed bird that breeds in southeast Arizona, southern Texas (rare visitor along the Rio Grande), south through Mexico to Costa Rica. This species winters from northern Mexico south through to its breeding range. Within Arizona, rose-throated becards have been found breeding along Sonoita and Arivaca creeks, Sycamore Canyon (Atascosa Mountains), and Patagonia. Historically, this species nested in Guadalupe Canyon (east of Douglas) and near Tucson. Rose-throated becards typically inhabit marshes of Sonoran desertscrub communities of open to dense vegetation of shrubs, low trees, and succulents dominated by paloverde, prickly pear, and saguaro. This species also is found in the desert riparian deciduous woodland communities of marsh-woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of deciduous trees and shrubs along the margins. In Arizona, the rose-throated becard is found at elevations ranging from 1,082 to 1,228 m (3,550 – 4,030 ft) (AGFD 2001g).

Population trends for the rose-throated becard are currently unknown. Potential threats to this species include disturbance from bird watchers and degradation and loss of native riparian habitat through overgrazing, urban development, and groundwater depletion (AGFD 2001g). Because known occurrences of this species are outside the project area, the proposed action will have no effect on the population status of the rose-throated becard.

Thick-billed kingbird (*Tyrannus crassirostris*)
The thick-billed kingbird is a relatively stocky flycatcher with a large head and heavy bill. This kingbird occurs from southeastern Arizona and southwestern New Mexico south through western Mexico to western Guatemala. In Arizona, thick-billed kingbirds are most often seen around Sonoita and Arivaca creeks and in Madera and Guadalupe canyons. This species may occur in mountains of Pima, Santa Cruz and Cochise counties

where there are drainages with well-developed riparian areas. Habitat for the thick-billed kingbird consists of broad-leaved, riparian forests usually with well-developed large sycamores and cottonwoods at elevations ranging from 914 to 1,981 m (3,000 – 6,,500 ft) (Tibbitts 1991).

Present distribution of the thick-billed kingbirds in Arizona is very limited. Potential threats include human recreational activities, encroachment of human development into breeding habitat, woodcutting, grazing, and groundwater depletion (Tibbitts 1991). Because no potential habitat occurs within the project area, the proposed action will have no effect on the population status of the thick-billed kingbird.

Tropical Kingbird (*Tyrannus melancholicus*)
The tropical kingbird is a large tyrant-flycatcher with a large bill and long, slightly notched tail. The tropical kingbird ranges from southeastern Arizona through western and central Mexico to central Argentina. Breeding birds have been found in Tucson, along the Santa Cruz Valley from Green Valley south, east of Phoenix in the Salt River Valley, to the San Pedro Valley. This species also has been reported from Sopori Wash. The Tropical Kingbird inhabits open and semi-open areas with scattered trees and shrubs. Also found in urban areas and roadsides with tall human-made fixtures (Stouffer and Chesser 1998).

Tropical kingbirds seem to persist or even thrive in developed areas. No negative effects of human activities have been reported (Stouffer and Chesser 1998). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual tropical kingbirds, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts to tropical kingbirds are not likely to result in a trend toward federal listing or loss of viability.

6.0 LITERATURE CITED

Abbate, D. J., A. Ditty, W. S. Richardson, and R. Olding. 1996. Cactus ferruginous pygmy-owl surveys and nest monitoring in the Tucson Basin area, Arizona. Final Report Internal Enhancement #U95503. Arizona Game and Fish Department, Phoenix, Arizona.

______, W. S. Richardson, R. L. Wilcox, M. J. Terrio, and S. M. Belhumeur. 1999. Cactus ferruginous pygmy-owl investigations in Pima and Pinal Counties, Arizona: 1997-1998. Region V Wildlife Program. Arizona Game and Fish Department, Tucson, AZ. 83 pp.

______, _______, ______, and S. Lantz. 2000. Cactus ferruginous pygmy-owl investigations in Pima and Pinal Counties, Arizona: 1999. Region V Wildlife Program. Arizona Game and Fish Department, Tucson, AZ. 37 pp.

Aiken, C. E. H. 1937. (E.R. Warren, Ed.). Birds of the Southwest. Colorado College Publication, General Series No. 212:1-73.

Alcorn, S. M., S. E. McGregor and G. Olin. 1962. Pollination requirements of the organpipe cactus. Cactus and Succulent Journal 34(5): 135-138.

Allison, L. J., J. Rourke, and T. McCarthey. 2000. Characterizing vegetation in nesting and non-nesting plots for southwestern willow flycatchers within the same patch of continuous riparian vegetation. Page 15 *in* Abstracts of presented papers and posters, The Ecology and Conservation of the Willow Flycatcher, 24-26 October 2000, Arizona State University, Tempe, AZ.

Arizona Game and Fish Department (AGFD). 1988. Threatened native wildlife in Arizona. Arizona Game and Fish Department, Phoenix, AZ. 32 pp.

______. 1991a. Chiltepine (*Capsicum annuum* var.*glabriusculum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 1991b. Mexican vine snake (*Oxibelis aeneus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 2 pp.

______. 1992. Sweet acacia (*Acacia smallii*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1993. Arizona wildlife views – bats of Arizona. Volume 36, Number 8. 36 pp.

______. 1994. Mexican long-tongued bat (*Choeronycteris mexicana*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1995a. Western barking frog (*Eleutherodactylus augusti cactorum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1995b. Great Plains narrow-mouthed toad (*Gastrophryne olivacea*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1997a. Bartram's stonecrop (*Graptopetalum beartramii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1997b. Pima Indian mallow (*Abutilon parishii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 1997c. Lowland leopard frog (*Rana yavapaiensis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1997d. Cave myotis (*Myotis velifer*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1997e. Osprey (*Pandion haliaetus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998a. Beardless chinch weed (*Pectis imberbis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 1998b. Gentry indigo bush (*Dalea tentaculoides*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1998c. Large-flowered blue star (*Amsonia grandiflora*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 9 pp.

______. 1998d. Santa Cruz beehive cactus (*Coryphantha recurvata*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 1998e. Santa Cruz striped agave (*Agave parviflora* ssp. *parviflora*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998f. American peregrine falcon (*Falco peregrinus anatum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998g. Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1998h. Southern pocket gopher (*Thomomys umbrinus intermedius*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1999a. Alamos deer vetch (*Lotus alamosanus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999b. Catalina beardtongue (*Penstemon discolor*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999c. Chihuahuan sedge (*Carex chihuahuensis*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999d. Chiricahua Mountain brookweed (*Samolus vagans*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999e. Nodding blue-eyed grass (*Sisyrinchium cernuum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 1999f. Santa Cruz star leaf (*Choisya mollis*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999g. Supine bean (*Macroptilium supinum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999h. Thurber hoary pea (*Tephrosia thurberi*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999i. Virlet paspalum (*Paspalum virletii).* Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1999j. Weeping muhly (*Muhlenbergia xerophila*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999k. Woolly fleabane (*Laennecia eriophylla*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000a. Arid throne fleabane (*Erigeron arisolis*). Unpublished draft abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000b. Arizona giant sedge (*Carex ultra*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 2000c. Broadleaf ground cherry (*Physalis latiphysa*). Draft Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000d. Foetid passionflower (*Passiflora foetida*). Draft Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000e. Lumholtz nightshade (*Solanum lumholtzianum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000f. Mock-pennyroyal (*Hedeoma dentatum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2000g. Seeman groundsel (*Senecio carlomasonii*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2000h. Sonoran noseburn (*Tragia laciniata*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000i. Superb beardtongue (*Penstemon superbus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2000j. Thurber's morning glory (*Ipomiea thurberi*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000k. Wiggins milkweed vine (*Metastelma mexicanum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000**l**. Northern gray hawk (*Asturina nitida maxima*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 2001a. Arizona metalmark (*Calephelis rawsoni arizonensis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2001b. Giant spotted whiptail (*Cnemidophorus burti strictogrammus*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2001c. Mexican garter snake (*Thamnophis eques megalops*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2001d. California leaf-nosed bat (*Macrotus californicus*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 2001e. Sonoran Desert tortoise (*Gopherus agassizii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 2001f. Elegant trogon (*Trogon elegans*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2001h. Rose-throated becard (*Pachyramphus aglaiae*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2002. Loggerhead shrike *(Lanius ludovicianus)*. Draft unpublished animal abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

Arizona Interagency Desert Tortoise Team. 1996. Management plan for the Sonoran Desert population of the desert tortoise in Arizona.

Avian Power Line Interaction Committee (APLIC). 1996. Suggested practices for raptor protection on power lines: the state of the art in 1996. Edison Electric Institute and Raptor Research Foundation. Washington, D.C.

Bagley, B. E., D. A. Hendrickson, F. J. Abarca, and S. Hart. 1991. Status of the Sonoran topminnow *(Poeciliopsis occidentali*s) and desert pupfish *(Cyprinodon macularius*s) in Arizona. Special Report on Project E5-2, Job 9, Title VI of the Endangered Species Act. Arizona Game and Fish Department, Phoenix, AZ.

Bahre, C. J. 1991. A legacy of change. Historic human impact on vegetation in the Arizona borderlands. University of Arizona Press, Tucson, AZ.

Baird, S. F. and C. Girard. 1853. Description of new species of fishes collected by Mr. John H. Clark, on the U.S.-Mexican boundary survey, under Lt. Col. Jas. D. Graham. Proceedings of the Academy of Natural Sciences of Philadelphia 6: 387-390.

Bartlett, P. and R. Bartlett. 1999. A field guide to Texas reptiles and amphibians. Gulf Publishing Company, Houston, TX.

Belnap, J. 1992. Potential role of cryptobiotic soil crusts in semiarid rangelands. Paper presented at the Symposium on Ecology, Management, and Restoration of Intermountain Annual Rangelands, Boise, ID, May 18-22, 1992.

Belsky, A. J., and D. M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the interior west. Conservation Biology 11(2): 315-327.

Bendire, C. E. 1892. *Glaucidium phalænoides* (Daudain), Ferruginous pygmy owl. Pages 409-411 *In* Life Histories of North American Birds with special reference to their habits and eggs. Smithsonian Institute, U.S. National Museum Special Bulletin No. 1.

Bevanger, K. 1994. Bird interactions with utility structures: collision and electrocution, causes and mitigating measures. Ibis 54: 419-431.

Blackburn, W. H. 1984. Impacts of grazing intensity and specialized grazing systems on watershed characteristics and responses. Pages 927-983 *In* Developing strategies for rangeland management. National Research Council/National Academy of Sciences. Westview Press, Boulder, CO.

Bockstanz, L. 1998. Herps of Texas – lizards: Texas Horned Lizard (*Phrynosoma cornutum*). http://www.zo.utexas.edu/research/txherps/lizards/phrynosoma.cornutum.html. 22 September 1999.

Brooks, J. E. 1985. Factors affecting the success of Gila topminnow introductions on four Arizona National Forests. Report to U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico. Arizona Game and Fish Department, Phoenix, AZ.

______. 1986. Status of natural and introduced Sonoran topminnow *(Poeciliopsis o. occidentali*s) populations in Arizona through 1985. Report to U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico. Arizona Game and Fish Department, Phoenix, AZ.

Brown, D. E., C. H. Lowe, and J. F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona *In* R. R. Johnson and D. A. Jones [Eds.], Importance, preservation, and management of riparian habitats: a symposium. General Technical Report RM-43. USDA Forest Service, Denver, CO.

______. 1983a. On the status of the jaguar in the Southwest. Southwestern Naturalist 28: 459-460.

______. 1983b. The wolf in the southwest. University of Arizona Press, Tucson, AZ. 195 pp.

______. 1985. Black-bellied whistling duck. Pages 110 – 112 *In* Arizona Wetlands and Waterfowl. The University Press, Tucson, AZ.

______. 1991. Revival for El Tigre? Defenders 66(1): 27-35.

______. (Ed.). 1994. Biotic communities: southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City, UT. 342 pp.

Brown, M. and F. J. Abarca. 1992. An update status report of the Sonoran topminnow, *Poeciliopsis occidentali*s, and desert pupfish, *Cyprinodon macularius*s, in Arizona. Arizona Game and Fish Department, Phoenix.

Browning, M. R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). Western Birds 24: 241-257.

Busby, F. E. and G. F. Gifford. 1981. Effects of livestock grazing on infiltration and erosion rates measured on chained and unchained pinyon-juniper sites in southeastern Utah. Journal of Range Management 34: 400-405.

Cartron, J. E., W. S. Richardson, and G. A. Proudfoot. 2000a. The cactus ferruginous pygmy-owl: taxonomy, distribution, and natural history. Pages 5-15 *In* J. E. Cartron and D. M. Finch [Eds.], Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. Gen. Tech. Rpt. RMRS-GTR-43. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT. 68 pp.

Cartron, J. E., S. H. Soleson, S. Russell, G. A. Proudfoot, and W. S. Richardson. 2000b. The ferruginous pygmy-owl in the tropics and at the northern end of its range: habitat relationships and requirements. Pages 47-53 *In* J. E. Cartron and D. M. Finch [Eds.], Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. Gen. Tech. Rpt. RMRS-GTR-43. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT.

Cockrum, E.L. 1991. Seasonal distribution of northwestern populations of the long-nosed bat, *Leptonycteris sanborni*, Family Phyllostomidae. Anales Inst. Biol. Univ. Nac. Auton. Mexico, Ser. Zool. 62(2): 181-202.

Constantine, D.G. 1966. New bat locality records from Oaxaca, Arizona and Colorado. Journal of Mammalogy 47(1): 125-126.

______. 1998. Range extensions of ten species of bats in California. Bulletin of Southern California Academy of Science 97(2): 49-75.

Constantz, G. D. 1974. Reproductive effort in *Poeciliopsis occidentalis* (Poeciliidae). Southwestern Naturalist 19: 47-52.

______. 1975. Behavioral ecology of mating in the male Gila topminnow, *Poeciliopsis occidentalis* (Cyprinodontiformes: Poeciliidae). Ecology 56: 966-973.

______. 1976. Life history strategy of the Gila topminnow, *Poeciliopsis occidentali*s: a field evaluation of theory on the evolution of life histories. Ph.D. Dissertation, Arizona State University, Tempe.

______. 1979. Life history patterns of a livebearing fish in contrasting environments. Oecologia 40: 189-201.

______. 1989. Reproductive biology of poeciliid fishes. Pages 33-50 *In* G. K. Meffe and F. F. Snelson Jr. [Eds.], Ecology and Evolution of Livebearing Fishes (Poeciliidae). Prentice Hall, Englewood Cliffs.

Corman, T. E. 1994. Black-bellied whistling duck. Page 18 *In* Nongame Field Notes. AGFD Wildlife News, Arizona.

Coronado National Forest (CNF). 2000. FY 1999 Annual monitoring and evaluation report. Coronado National Forest report, 27 pp.

Coues. E. 1872. A new bird to the United States. American Naturalist 6: 370.

Dalton, V. M. and D. C. Dalton. 1993. Assessment of the impacts of low-level military aircraft on *Leptonycteris curasoae*, an endangered bat, at Organpipe Cactus National Monument, Arizona. Contract Nos. USAF/Luke AFB F0260492MS359 and NPS/ORPI O.M. 1443 PX866092081. Report to Organpipe Cactus National Monument and 58th Civil Eng. Sq. Luke AFB. 54 pp.

Dalton, V. M., D .C. Dalton and S. L. Schmidt. 1994. Roosting and foraging use of a proposed military training site by the long-nosed bat, *Leptonycteris curasoae*. Contract Nos. DACA65-94-M-0831 and DACA65-94-M-0753. Report to Luke Air Force Natural Resources Program. 34 pp.

DeBano, L. F. and L. J. Schmidt. 1989. Interrelationships between watershed condition and health of riparian areas of southwestern United States. Pages 45-52 *In* M. T. Billings, R. E. Gresswell, B. A. Barton, and J. L. Kershner [Eds.], Practical approaches to riparian resource management. An educational workshop. May 8-11, 1989. U.S. Bureau of Land Management, Billings, MT.

Desert Tortoise Council. 1994 (Revised 1999). Guidelines for handling desert tortoises during construction projects. Edward L LaRue, Jr. [Ed.]. Wrightwood, CA. 19 pp.

Drost, C. A. 1998. Survey of amphibians and amphibian habitat on the upper Santa Cruz River, Arizona. USGS, Biological Resources Division/Colorado Plateau Research Station, Flagstaff, AZ.

______, M. K. Sogge, and E. Paxton. 1998. Preliminary diet study of the endangered southwestern willow flycatcher. Report to U. S. Bureau of Reclamation. USGS, Biological Resources Division/Colorado Plateau Research Station, Flagstaff, AZ. 26 pp.

Fleming, T. H. 1991. Nectar corridors and the diet of migratory nectarivorous bats. Bat Research News 33: 71.

______. 1994. Lesser long-nosed bat recovery plan. U. S. Fish and Wildlife Service, Albuquerque, NM. 49 pp.

______. 1995. Lesser long-nosed bat recovery plan. U.S. Fish and Wildlife Service. Albuquerque, NM. Page 29.

Forrest, R. E. 1992. Habitat use and preference of Gila topminnow. M.S. Thesis, University of Arizona, Tucson, AZ.

Gentry, H. S. 1982. Agaves of Continental North America. University of Arizona Press, Tucson, AZ. Pages 443-447 and 538-545.

Gerking, S. D. and D. V. J. Plantz. 1980. Size-biased predation by the Gila topminnow, *Poeciliopsis occidentalis* (Baird and Girard). Hydrobiologia 72: 179-191.

Gifford, G. F. and R.H. Hawkins. 1978. Hydrologic impact of grazing on infiltration: a critical review. Water Resour. Res. 14: 305-313.

Glenn, W. 1996. Eyes of fire: encounter with a borderlands jaguar. Printing Corner Press, El Paso, TX.

Glinski, R. L. 1998. The raptors of Arizona. Arizona Game and Fish Department and University of Arizona Press, Tucson, AZ. 220 pp.

Goldman, E. A. 1932. The jaguars of North America. Proc. Biol. Soc. Washington 45: 143-146.

Green, L. R. 1977. Fuelbreaks and other fuel modifications for wildland fire control. Agric. Handb. 499. Washington, DC: U.S. Department of Agriculture, Forest Service. 79 pp.

Greenberg, C. H.; Crownover, S. H.; Gordon, D. R. 1997. Roadside soils: a corridor for invasion of xeric scrub by nonindigenous plants. Natural Areas Journal. 17(2): 99-109.

Gucinski, H.; M. J. Furniss, R. R. Ziemer, and M. H.Brookes. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 pp.

Hall, E. R. 1981. The mammals of North America. 2nd Edition. John Wiley and Sons, New York, 2: 601-1181 + 90.

Harness, R. E. and K. R. Wilson. 2000. Raptor electrocutions and outages: a review of rural utility records spanning 1986-1996. Pages 765-771 *In* R. D. Chancellor and B. U. Meyburg [Eds.], Raptors at risk. Hancock House Publishers, Blaine, WA.

Harris, L. K. and R. B. Duncan. 1998. Cactus ferruginous pygmy-owl 1998 survey of southern Arizona, final report. United States Fish and Wildlife Service grant agreement # 1448-20181-98-G915. 39 pp.

______. and ______. 1999. Pima County cactus ferruginous pygmy-owl survey, final report. Pima County Government Contract #07-26-H-125828-0499. 78 pp.

Harvey, M. J., J. S. Altenbach, and T. L. Best. 1999. Bats of the United States. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service – Asheville Field Office. 64 pp.

Hatten, J., C. Paradzick, and M. Sumner. 2000. Constructing a nest-site suitability model for the southwestern willow flycatcher in Arizona. Page 20 *In* Abstracts of presented papers and posters, The Ecology and Conservation of the Willow Flycatcher, 24-26 October 2000, Arizona State University, Tempe.

Hayward, B. and E. L. Cockrum. 1971. The natural history of the western long-nosed bat, *Leptonycteris sanborni*. Western New Mexico University, Research Science 1(2): 74-123.

Heath, W. G. 1962. Maximum temperature tolerance as a function of constant temperature acclimation in the Gila topminnow, *Poeciliopsis occidentali*s. Ph.D. Dissertation, University of Arizona, Tucson.

Hoffmeister, D. F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, AZ. 602 pp.

Howell, D. J. and B. S. Roth. 1981. Sexual reproduction in agaves: the benefits of bats; cost of semelparous advertising. Ecology 62: 3-7.

Howell, S. N. G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, NY. 851 pp.

Hubbs, C. L. and R. R. Miller. 1941. Studies of the fishes of the order Cyprinodontes. XVII – genera and species of the Colorado River system. Occasional Papers of the Museum of Zoology, University of Michigan 433: 1-9.

Hubbard, J. P. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, NM. 29 pp.

Hughes, J. M. 1999. Yellow-billed cuckoo (*Coccyzus americanus*). *In* The Birds of North America, No. 418 (A. Poole and F Gill, eds.). The Birds of North America, Inc., Philadelphia, PA. 28 pp.

Jennings, M. R. 1987. Status of the western painted turtle *(Chrysemys picta belli*i) in Arizona. Journal of the Arizona-Nevada Academy of Sciences 22: 129-133.

Johnson, R. R. and L.T. Haight. 1985. Avian use of xeroriparian ecosystems in the North American warm deserts. Pages 156-160 *In* R. R. Johnson et al., technical coordinator. Riparian ecosystems and their management: reconciling conflicting uses.

Kearney, T. H. and R. H. Peebles. 1960. Arizona flora – 2nd edition. University of California Press, Berkeley and Los Angeles, CA. 1,085 pp.

Lange, K. K. 1960. The jaguar in Arizona. Transactions of the Kansas Academy of Science 63: 96-101.

Lesh, T. D. and T. E. Corman. 1995. Cactus ferruginous pygmy-owl surveys in Arizona: 1993-1995. Nongame and Endangered Wildlife Program Technical Report 76. Arizona Game and Fish Department, Phoenix, AZ. 23 pp.

Lonsdale, W. M and A. M. Lane. 1994. Tourist vehicles as vectors of weed seeds in Kadudu National Park, northern Australia. Biological Conservation 69(3): 277-283.

Lyon, L. J. 1983. Road density models describing habitat effectiveness for elk. Journal of Forestry. 81: 592-595.

Marsh, P. C. and W. L. Minckley. 1990. Management of endangered Sonoran topminnow at Bylas Springs, Arizona. Description, critique and recommendations. Great Basin Naturalist 50(3): 265-272.

Marti, C. D. 2002. Enhancing raptor populations, a technique manual. The Peregrine Fund. Boise, ID. 77 pp.

Maynard, W. R. 1995. Summary of 1994 survey efforst in New Mexico for southwestern willow flycatcher (*Empidonax traillii extimus*). Contract #94-516-69. New Mexico Department of Game and Fish, Santa Fe, New Mexico. 48 pp.

McCarthey, T. D., C. E. Paradzick, J. W. Rourke, M. W. Sumner, and R. F. Davidson. 1998. Arizona partners in flight southwestern willow flycatcher 1997 survey and nest monitoring report. Report to the Bureau of Reclamation, Phoenix, AZ.

McGregor, S. E., S. M. Alcorn, and G. Olin. 1962. Pollination and pollinating agents of the saguaro. Ecology 43: 259-267.

McNeil, R., J. R. Rodriguez Sr., and H. Ouellet. 1985. Bird mortality at a power transmission line in northeastern Venezuela. Biological Conservation 31: 151-165.

McPherson, G. R. 1995. The role of fire in desert grasslands. Pages 130-151 *In* M. P. McClaran and T. R. Van Devender [Eds.], The Desert Grassland. University of Arizona Press, Tucson, AZ.

Mech, L. D. 1973. Wolf numbers in the Superior National Forest of Minnesota. Res. Pap. NC-97. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Experiment Station. 10 pp.

Meffe, G. K., D. A. Hendrickson, and W. L. Minckley. 1983. Factors resulting in decline of the endangered Sonoran topminnow, *Poeciliopsis occidentalis* (Antheriniformes: Poeciliidae) in the United States. Biological Conservation 25:135-159.

______. 1984. Effects of abiotic disturbance on coexistence of predator-prey fish species. Ecology 65(5): 1525-1534.

Minckley, W. L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Sims Printing Company, Inc., Phoenix, AZ. 293 pp.

______. and J. E. Brooks. 1985. Transplantations of native Arizona fishes: records through 1980. Journal of the Arizona-Nevada Academy of Sciences 20(2): 73-90.

Mladenoff, D. J., T. A. Sickley, R. G. Haight, and A. P. Wydevens. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes region. Conservation Biology 9(2): 279-294.

Monson, G. and A. R. Philips. 1981. Annotated checklist of the birds of Arizona, 2nd edition, University of Arizona Press, Tucson, AZ. 292 pp.

_____. 1987. An "almost certain" ferruginous pygmy-owl was heard along lower Aravaipa Canyon (Woods Ranch now owned by TNC) on 28 July 1987. American Birds 41:1471.

_____. 1998. Ferruginous pygmy-owl. Pages 159-161 *In* R. Glinski [Ed.]. The Raptors of Arizona. University of Arizona Press, Tucson, AZ. 220 pp.

Morrison, J. L. 1996. Crested Caracara (*Caracara plancus*) *In* The Birds of North America, No. 249 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Muiznieks, B. D., S. J. Sferra, T. E. Corman, M. K. Sogge, and T. J. Tibbitts. 1994. Arizona Partners in Flight southwestern willow flycatcher survey 1993. Draft report: Nongame and endangered wildlife program, Arizona Game and Fish Department, Phoenix, AZ. Draft of April 1994. 28 pp.

Nelson, E.W. and E.A. Goldman. 1933. Revision of the jaguars. Journal of Mammalogy 14:221-240.

New Mexico Game and Fish Department and The Fish and Wildlife Information Exchange. 2000. Five-Stripped Sparrow (*Aimophila quinquestriata*). [Web page] No archive known [Accessed 7 June 2002]. BISON. http://www.fw.vt.edu/fishex/nmex_main/species/041830.htm

Nobel, T. A. 1995. Birds and power lines: selected interaction and managment issues in the electric utility industry. M. S. Thesis, Prescott College, Prescott, AZ.

Nowak, R. M. 1994. Walker's bats of the world. Johns Hopkins University Press, Baltimore, MD. 287 pp.

Paradzick, C. E., R. F. Davidson, J. W. Rourke, M. W. Sumner, and T. D. McCarthey. 1999. Southwestern willow flycatcher 1998 survey and nest monitoring report. Nongame and Endangered Wildlife Program, Arizona Game and Fish Department, Phoenix, AZ, Technical Report 141.

______, ______, ______, ______, A. M. Wartell, and T. D. McCarthey. 2000. Southwestern willow flycatcher 1999 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 151. Arizona Game and Fish Department, Phoenix, AZ. 93 pp.

Parsons, D. R. 1996. Case study: the Mexican wolf. Pages 101-123 *In* E. A. Herrera and L. F. Huenneke [Eds.] New Mexico's Natural Heritage: Biological Diversity in the Land of Enchantment. New Mexico Journal of Science, Volume 36.

Peterson, R. T. 1990. A field guide to western birds. Third Edition. Houghton Mifflin Company, Boston, MA. 432 pp.

Phillips, A., J. Marshall, and G. Monson. 1983. The birds of Arizona. University of Arizona Press, Tucson, AZ. 212 pp.

Phillips, A. R. 1948. Geographic variation in *Epidonax traillii*. The Auk 65: 507-514.

______, J.T. Marshall Jr., and G. Monson. 1964. The Birds of Arizona. University of Arizona Press, Tucson, AZ. 220 pp.

Pima County. 2001. Priority vulnerable species: analysis and review of species proposed for coverage by the multiple-species conservation plan DRAFT. Pima County, AZ. 385 pp.

Proudfoot, G. and S. M. Beasom. 1997. Food habits of nesting ferruginous pygmy-owls in southern Texas. Wilson Bulletin 109:741-748.

______. and R. D. Slack. 2001. Comparisons of ferruginous pygmy-owl mtDNA at local and international scales. Department of Wildlife and Fisheries Sciences, Texas A & M University. A Report for Pima County. 11 pp.

Pyle, P. 1997. Identification guide to North American birds. Part I Columbidae to Ploceidae. Slate Creek Press, Bolinas, CA.

Richardson, W. S., J. E. Cartron, D. J. Krueper, L. Turner, and T. H. Skinner. 2000. The status of the cactus ferruginous pygmy-owl in Arizona: Population surveys and habitat assessment. Pages 27-39 *In:* J. E. Cartron and D. M. Finch [Eds.], Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. General Technical Report, RMRS-GTR-43, Ogden, Utah. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 68 pp.

Ridgely, R. S. and G. Tudor. 1994. The birds of South America: suboscine passerines. University of Texas Press, Austin, TX.

Rogers, G. F. and J. Steele. 1980. Sonoran desert fire ecology. Pages 15 -16 *In* M. A. Stokes and J. H. Dieterich [Tech. Coord.]. Proceedings of the fire history workshop. United States Forest Service General Technical Report RM-81.

Roller, P. S. 1996. Distribution, growth and reproduction of Pima pineapple cactus *(Coryphantha scheeri* Kuntz var. *robustispina* Schott). M. S. Thesis, University of Arizona.

Rudis, V. A. 1995. Regional forest fragmentation effects on bottomland hardwood community types and resource values. Landscape Ecology 10(5): 291-307.

San Diego Natural History Museum. 1995. *Empononax traillii extimus* in California. The willow flycatcher workshop. 17 November 1995. 66 pp.

Salazar, L. A. and A. Gonzalez-Caban. 1987. Spatial relationship of a wildfire, fuelbreaks, and recently burned areas. Western Journal of Applied Forestry 2(2): 55-58.

Schoenherr, A. A. 1974. Life history of the topminnow, *Poeciliopsis occidentalis* (Baird and Girard) in Arizona, and an analysis of its interaction with the mosquitofish *Gambusia affinis* (Baird and Girard). Ph.D. Dissertation, Arizona State University, Tempe.

______. 1977. Density dependent and density independent regulation of reproduction in the Gila topminnow, *Poeciliopsis occidentalis* (Baird and Girard). Ecology 58:438-444.

Schultz, R. J. 1961. Reproductive mechanism of unisexual and bisexual strains of the viviparous fish *Poeciliopsi*s. Evolution 15:302-325.

Sferra, S. J., R. A. Meyer, and T. E. Corman. 1995. Arizona Partners in Flight 1994 southwestern willow flycatcher survey. Final Technical Report 69. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, AZ. 46 pp.

______, T. E. Corman, C. E. Paradzick, J. W. Rourke, J. A. Spencer, and M. W. Sumner. 1997. Arizona Partners in Flight southwestern willow flycatcher survey 1993-1996 summary report. Technical Report. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, AZ. 97 pp.

Simms, J. K. and K. M. Simms. 1992. What constitutes quality habitat for Gila topminnow *(Poeciliopsis occidentali*s)? An overview of habitat parameters supporting a robust population at Cienega Creek, Pima County, AZ. Abstract. Proceedings of the Desert Fishes Council 22-23:82.

Simons, L. H. 1987. Status of the Gila topminnow *(Poeciliopsis o. occidentali*s) in the United States. Special Report on Project E-1, Title VI of the Endangered Species Act of 1973, Arizona Game and Fish Department, Phoenix.

Smith, A. B., C. E Paradzick, A. A. Woodward, P. E. T. Dockens, and T. D. McCarthey. 2002. Southwestern willow flycatcher 2001 survey and nest monitoring report. Technical Report 191. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, AZ. 63 pp.

Sogge, M. K. and T. J. Tibbitts. 1992. Southwestern willow flycatcher (*Empidonax trailli extimus*) surveys along the Colorado River in Grand Canyon National Park and Glen Canyon National Recreation Area. NPS CPSU/Northern Arizona University, Flagstaff, AZ. 43 pp.

______, ______, and S. J. Sferra. 1993. Status of the southwestern willow flycatcher along the Colorado River between Glen Canyon Dam and Lake Mead – 1993. Summary Report. National Park Service Cooperative Park Studies Unit/Northern Arizona University, U. S. Fish and Wildlife Service, and Arizona Game and Fish Department, Flagstaff, AZ. 69 pp.

______. and ______. 1994. Distribution and status of the southwestern willow flycatcher along the Colorado River in the Grand Canyon – 1994. Summary Report. National Biological Service, Colorado Plateau Research Station, Northern Arizona University, Flagstaff, AZ. 37 pp.

______, R. M. Marshall, S. J. Sferra, and T. J. Tibbitts. 1997. A southwestern willow flycatcher survey protocol and breeding ecology summary. National Park Service/Colorado Plateau Research Station, Northern Arizona University, Technical Report NRTR-97/12. 37 pp.

Soule, M. E. 1986. Conservation biology. The science of scarcity and diversity. Sinauer Association, Inc. Sinderland, MA. 584 pp.

Spencer, J. A., S. J. Sferra, T. E. Corman, J. W. Rourke, and M. W. Sumner. 1996. Arizona Partners in flight 1995 southwetern willow flycatcher survey. Technical Report 97, March 1996. Arizona Game and Fish Department, Phoenix, AZ. 69 pp.

Spencer, J. A. and D. P. Humphrey. 1999. Species of concern at the Arizona Army National Guard's Florence Military Reservation, Pinal County, AZ. Arizona Army National Guard. 32 pp.

State of Arizona. 1990. Final report and recommendations of the Governor's riparian habitat task force. Executive Order 89-16. Streams and riparian resources. October 1990. Phoenix, AZ. 28 pp.

Stiles, F. G. and A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.

Stouffer, P. C. and R. T. Chesser. 1998. Tropical Kingbird (*Tyrannus melancholicus*) *In* A. Poole and F. Gill, [Eds.], The Birds of North America, No. 358. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Stromberg, J. C., J. A. Tress, J. D. Wilkins, and S. D. Clark. 1992. Response of velvet mesquite to groundwater decline. Journal of Arid Environments 23: 45-58.

______. 1993a. Fremont cottonwood-Goodding willow riparian forests: a review of their ecology, threats, and recovery potential. Journal of the Arizona-Nevada Academy of Science 26(3): 97-110.

______. 1993b. Fremont cottonwood-Goodding willow riparian forests: a review of their ecology, threats, and recovery potential. Journal of the Arizona-Nevada Academy of Science 27(1): 111-124.

Swank, W. G. and J. G. Teer. 1989. Status of the jaguar-1987. Oryx 23: 14-21.

Tetra Tech, Inc. 2003. Draft TEP Sahuarita - Nogales transmission line Environmental Impact Statement.

Thiel, R. P. 1985. The relationship between road densities and wolf habitat suitability in Wisconsin. American Midland Naturalist 113(2): 404-407.

Thomas, P. A. 1991. Response of Succulents to Fire: A Review. International Journal of Wildland Fire 1(1): 11 – 22.

Tibbitts, T. J. 1991. Thick-billed kingbird (*Tyrannus crassirostris*). Wildlife Views, Arizona Game and Fish Department. Page 17.

Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. Western Birds 18: 137-162.

URS. 2003. Tucson Electric Power Sahuarita-Nogales transmission line project - roads analysis.

U. S. Census Bureau. 2000. Arizona state and county facts, deprived from population estimates, 2000 census of population and housing, 1990 census of population and housing, small area income and poverty estimates, county business patterns, and 1997 census of governments. http://quickfacts.census.gov/qfd/states/04/04023.html.

U.S. Department of the Interior. 1967. Native fish and wildlife. Endangered Species. Federal Register 32(48): 4001.

U.S. Fish and Wildlife Service (USFWS). 1982. Mexican Wolf Recovery Plan. USFWS, Albuquerque, NM. 103 pp.

______. 1984. Gila and Yaqui Topminnow Recovery Plan. USFWS, Albuquerque, NM.

______. 1988. Endangered and threatened wildlife and plants; determination of endangered status for two long-nosed bats. Federal Register 53(190): 38456-38460.

______. 1990. Listed cats of Texas and Arizona recovery plan (with emphasis on the ocelot). U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 131 pp.

______. 1993. Determination of endangered status for the plant Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*). Federal Register 58 (158): 49875-49880.

______. 1997a. Endangered and threatened wildlife and plants: determination of endangered status for the cactus ferruginous pygmy-owl in Arizona. Federal Register 62: 10730-10747.

______. 1997b. Final determination of critical habitat for the southwestern willow flycatcher. Federal Register 62 (140): 39129-39146.

______. 1999. Endangered and threatened wildlife and plants; Final Rule: designation of critical habitat for the cactus ferruginous pygmy-owl. Federal Registrar 64: 37419-37440.

______. 2000. Recommended guidance for private landowners concerning the cactus ferruginous pygmy-owl: and the cactus ferruginous pygmy-owl survey protocol. Federal Register 65: 14999-15000.

______. 2001a. Biological Opinion on the effects of the scour protection project on I-19 and Frontage Road bridges over Peck Canyon near Santa Cruz River confluence in Santa Cruz County, Arizona. 38 pp.

______. 2001b. Biological Opinion on the effects of the proposed construction of Madera Highlands east of Green Valley in Pima County, Arizona. 18 pp.

______. 2001c. Biological Opinion on the effects of proposed livestock grazing and management on the Montana Allotment on the Nogales Ranger District, Santa Cruz County, Arizona. 51 pp.

______. 2001d. Mexican gray wolf (*Canis lupus baileyi*). Unpublished abstract, U. S. Fish and Wildlife Service, Arizona Ecological Services. 1 page.

______. 2002a. Biological Opinion on the effects of the Thornydale Road improvement project in Pima County, AZ. 66 pp.

______. 2002b. Biological Opinion on the effects of the proposed Pueblo Oasis Development in Pima County, AZ. 60 pp.

______. 2002c. Biological Opinion on the effects of the proposed issuance of a NPDES permit for ASARCO's Mission Mine Complex in Pima County, AZ. 15 pp.

U.S. Forest Service (USFS). 1990. Soil and Water Conservation Practices Handbook, Region 3 FSH2509.22

U.S. Geological Survey (USGS). 2003. Northern Prairie Wildlife Research Center. North Dakota's federally listed endangered, threatened, and candidate species – 1995: Western burrowing owl *(Athene cunicularia hypugea*). http://www.npwrc.usgs.gov/resource/distr/others/nddanger/species/athecuni.htm. 28 March 2003.

Weedman, D. A. and K. L. Young. 1997. Status of the Gila topminnow and desert pupfish in Arizona. Arizona Game and Fish Department, Phoenix, AZ.

Wilcox, R., W. S. Richardson, and D. Abbate. 2000. Habitat selection by cactus ferruginous pygmy-owls in southern Arizona: Preliminary results. Arizona Game and Fish Department, Phoenix, AZ. 43 pp.

7.0 LIST OF ACRONYMS

ACC	Arizona Corporation Commission
ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
AOU	American Ornithologists' Union
ASLD	Arizona State Land Department
AUM	Animal Unit per Month
BA	Biological Assessment
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
CFPO	Cactus Ferruginous Pygmy Owl
Citizens	Citizens Communications
CNF	Coronado National Forest
DBH	Diameter Breast Height
DOE	Department of Energy
EMA	Ecosystem Management Area
ESA	Endangered Species Act
GPS	Global Positioning System
HDMS	Heritage Data Management System
HEG	Harris Environmental Group, Inc.
I-19	Interstate 19
LLNB	Lesser Long-nosed Bat
MOA	Memorandum of Agreement
NPDES	National Pollutant Discharge Elimination System
OHV	Off-Highway Vehicle
PPC	Pima Pineapple Cactus
RA	Roads Analysis

RD	Ranger District
RNA	Research Natural Area
ROW	Right-of-way
RU	Recovery Units
SL	Standard Length
SWFL	Southwestern Willow Flycatcher
TEP	Tucson Electric Power
UDI	Undocumented Immigrants
USDOI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USFS	United States Department of Agriculture Forest Service
YOY	Young-of-the-year

APPENDIX A

Natural Resource Agencies Correspondence.

1. U. S. Fish and Wildlife Service, dated 14 May 2002.

2. Arizona Game and Fish Department, dated 25 April 2002.

APPENDIX B

Plants documented along proposed ROW of the TEP Citizens Interconnect Project, July to October 2002.

	SCIENTIFIC NAME	COMMON NAME	FAMILY
CACTUS & SUCCULENTS			
	Agave parryi	century plant	Agavaceae
	Agave schottii	shindagger	Agavaceae
	Coryphantha scheeri var. *robustispina*	Pima pineapple cactus	Cactaceae
	Dasylirion wheeleri	sotol	Agavaceae
	Echinocereus spp.	hedgehog cactus	Cactaceae
	Echinocereus pectinatus var. *rigidissimus*	Arizona rainbow cactus	Cactaceae
	Ferocactus wislizenii	fishhook barrel cactus	Cactaceae
	Fouquieria splendens	ocotillo	Fouquieriaceae
	Mammillaria spp.	pincushion cactus	Cactaceae
	Nolina microcarpa	beargrass	Agavaceae
	Opuntia spp.	cholla	Cactaceae
	Opuntia spp.	prickly pear	Cactaceae
	Opuntia spinosior	walkingstick cactus	Cactaceae
	Yucca elata	soaptree yucca	Agavaceae
GRASSES			
	Bouteloua barbata or *B. rothrockii*	six-weeks or Rothrock grama	Poaceae
	Bothriochloa barbinodis	cane beard grass	Poaceae
	Bouteloua curtipendula	side oats grama	Poaceae
	Bouteloua gracilis	blue grama	Poaceae
	Bouteloua hirsuta	hairy grama	Poaceae
	Bouteloua parryi	Parry grama	Poaceae
	Bouteloua repens	slender grama	Poaceae
	Digitaria californica	Arizona cottontop	Poaceae
	Erioneuron pulchellum	fluffgrass	Poaceae
	Hilaria belangeri	curly mesquite	Poaceae
	Leptochloa dubia	green sprangletop	Poaceae
	Muhlenbergia emersleyi	bull grass	Poaceae
	Muhlenbergia rigens	deer grass	Poaceae
	Piptochaetium fimbriatum	pinyon rice grass	Poaceae
	Sporobolus spp.	dropseed	Poaceae
FORBS			
	Abutilon incanum	Indian mallow	Malvaceae
	Allionia incarnata	trailing windmills	Nyctaginaceae
	Ambrosia confertiflora	weakleaf burr ragweed	Asteraceae
	Amoreuxia palmatiflida	Arizona yellow show	Cochlospermaceae
	Argemone sp.	prickly poppy	Papaveraceae
	Artemisia ludoviciana		Asteraceae
	Asclepias asperula	antelope horns	Asclepiadaceae
	Asclepias nummularia	tufted milkweed	Asclepiadaceae
	Asclepias tuberosa	butterfly milkweed	Asclepiadaceae
	Aspicarpa hirtella	aspicarpa	Malpighiaceae
	Boerhaavia coccinea	red spiderling	Nyctaginaceae
	Bouchea prismatica	bouchea	Verbenaceae

	SCIENTIFIC NAME	COMMON NAME	FAMILY
FORBS (*Cont.*)			
	Bouvardia glaberrima	smooth bouvardia	Rubiaceae
	Brickellia spp.	brickellbush	Asteraceae
	Chamaecrista serpens var. *wrightii*	sensitive pea	Fabaceae
	Cheilanthes fendleri	cloak fern	Pteridaceae
	Cheilanthes spp.	claok fern	Pteridaceae
	Chenopodium fremontii	lamb's quarter	Chenopodiaceae
	Clitoria mariana	butterfly pea	Fabaceae
	Cnidosculus angustidens	mala mujer	Euphorbiaceae
	Cologania longifolia	narrowleaf tick clover	Fabaceae
	Commelina dianthifolia	western dayflower	Commelinaceae
	Cucurbita digitata	coyote gourd	Cucurbitaceae
	Datura metaloides	sacred datura	Solanaceae
	Eleocharis spp.	spikerush	Cyperaceae
	Eriogonum wrightii	buckwheat	Polygonaceae
	Eryngium heterophylla	button snakeroot	Apiaceae
	Evolvulus alsinoides		Convolvulaceae
	Evolvulus arizonicus	Arizona blue eyes	Convolvulaceae
	Galium wrightii	northern bedstraw	Rubiaceae
	Glandularia gooddingii	verbena	Verbenaceae
	Gnaphalium leucocephalum	white cudweed	Asteraceae
	Gnaphalium wrightii	cudweed	Asteraceae
	Gomphrena sp.	globe amaranth	Amarnathaceae
	Gutierrezia spp.	snakeweed	Asteraceae
	Ipomoea barbatisepala	morning glory	Convolvulaceae
	Ipomoea coccinea	scarlet creeper	Convolvulaceae
	Ipomoea hirsutula	wooly morning glory	Convolvulaceae
	Ipomoea leptotoma	bird's foot morning glory	Convolvulaceae
	Ipomoea longifolia	long leaf morning glory	Convolvulaceae
	Isocoma tenuisecta	burroweed	Asteraceae
	Jatropha macrorhiza	Arizona desert potato	Euphorbiaceae
	Kallstroemia grandiflora	Arizona caltrop	Zygophyllaceae
	Krameria parvifolia	range ratany	Krameriaceae
	Machaeranthera spp.	spiny aster	Asteraceae
	Macroptilium gibbosifolium	variableleaf bushbean	Fabaceae
	Milla biflora	Mexican star	Liliaceae
	Oenothera rosea	evening primrose	Onagraceae
	Oxalis albicans	wild oxalis	Oxalidaceae
	Penstemon linarioides	linear leaf penstemmon	Scrophulariaceae
	Phaseolus ritensus	eggleaf stringbean	Fabaceae
	Phaseolus sp.	stringbean	Fabaceae
	Portulaca suffrutescens	portulaca	Portulacaceae
	Portulaca umbraticola	portulaca	Portulacaceae
	Proboscidea sp.	unicorn plant, devil's claw	Pedaliaceae
	Salvia subincisa	sawtooth sage	Lamiaceae

	SCIENTIFIC NAME	COMMON NAME	FAMILY
FORBS (*Cont.*)			
	Schoenocrambe linearifolia	schoenocrambe	Brassicaceae
	Scirpus sp.	bulrush	Cyperaceae
	Senna covesii	desert senna	Fabaceae
	Senna hirsuta	woolly senna	Fabaceae
	Solanum douglassii	greenspot nightshade	Solanaceae
	Solanum elaeagnifolium	silverleaf nightshade	Solanaceae
	Sphaeralcea spp.	globe mallow	Malvaceae
	Tagetes sp.	marigold	Asteraceae
	Talinum angustissimum	talinum	Portulacaceae
	Talinum aurantiacum	orange fameflower	Portulacaceae
	Tetramerium hispidum	tetramerium	Acanthatceae
	Thalictrum fendleri	Fendler's meadow rue	Ranunculaceae
	Vitis arizonica	Arizona grape	Vitaceae
	Zinnia acerosa	desert zinnia	Asteraceae
TREES & SHRUBS			
	Acacia angustissima	white ball acacia	Fabaceae
	Acacia constricta	whitethorn acacia	Fabaceae
	Acacia greggii	catclaw acacia	Fabaceae
	Aloysia wrightii	oreganillo	Verbenaceae
	Arctostaphylos sp.	manzanita	Ericaceae
	Baccharis salicifolia	seep willow	Asteraceae
	Baccharis sarothroides	desert broom	Asteraceae
	Calliandra eriophylla	fairyduster	Fabaceae
	Celtis pallida	desert hackberry	Ulmaceae
	Celtis reticulata	netleaf hackberry	Ulmaceae
	Chrysothamnus teretifolius	green rabbitbrush	Asteraceae
	Dodonaea viscosa	hopbush	Sapindaceae
	Ericameria laricifolia	turpentine bush	Asteraceae
	Erythrina flabelliformis	coral bean	Fabaceae
	Eysenhardtia orthocarpa	kidney wood	Fabaceae
	Fraxinus velutina	velvet ash; Arizona ash	Oleaceae
	Gossypium thurberi	desert cotton	Malvaceae
	Guardiola platyphylla	Apache plant	Asteraceae
	Hibiscus coulteri	desert rosemallow	Malvaceae
	Indigofera spaerocarpa	Sonoran Indigo	Fabaceae
	Juglans major	Arizona walnut	Juglandaceae
	Juniperus deppeana	alligator juniper	Cupressaceae
	Lasianthaea podocephala	San Pedro daisy	Asteraceae
	Lycium spp.	wolfberry	Solanaceae
	Mimosa biuncifera	catclaw mimosa	Fabaceae
	Mimosa dysocarpa	velvet pod mimosa	Fabaceae

	SCIENTIFIC NAME	COMMON NAME	FAMILY
TREES & SHRUBS *(Cont.)*			
	Parkinsonia microphylla	yellow paloverde	Fabaceae
	Populus fremontii	Fremont cottonwood	Salicaceae
	Prosopis velutina	velvet mesquite	Fabaceae
	Q. arizonica	Arizona white oak	Fagaceae
	Q. garrya	silktassel	Fagaceae
	Quercus emoryii	Emory oak	Fagaceae
	Rhus aromatica	skunkbush	Anacardiaceae
	Rhus choriophylla	sumac	Anacardiaceae
	Salix exigua	coyote willow	Salicaceae
	Tamarix pentandra	salt cedar	Tamaricaceae
	Ziziphus obtusifolia	graythorn	Rhamnaceae

APPENDIX C

TEP-Citizen's Interconnect Project

Environmental Training Guidelines Construction Supervisors

- Stay in the designated work areas. Approved work areas, access roads, and staging areas will be clearly marked. All project activities must remain in these areas. Do not work or trespass beyond the signed or fenced restricted work areas.
- Restrict vehicle access to public roadways and designated access roads. Cross-country driving is prohibited.
- No driving or parking within 100 feet of ponds and tanks.
- Do not transfer water from one pond or tank to another or between any other bodies of water.
- No in-stream activity or disposal of construction debris or fill is allowed.
- Store topsoil and trench spoils behind sediment control structures at least 20 feet from any stream bank, including dry washes.
- Check equipment for leaks or heavy surface oil build-up before working in streams or washes.
- The use or transfer of hazardous materials will not be allowed within 100 feet of any stream or wash is prohibited.
- Do not litter. Dispose of trash in designated containers. Uncontained trash can attract wildlife and unwanted pests. Cigarette butts are considered litter, and should be extinguished and disposed of appropriately. All litter and construction debris must be removed from the job site daily.
- No pets or firearms. They are prohibited for job-site protection and protection of wildlife.
- Hunting is prohibited.
- Clearing will be limited to the minimum required to provide a safe construction area. Make sure you know the clearing limit, and if possible, leave plant root systems in place when clearing vegetation.
- It is illegal to harm, harass, pursue, hunt, shoot, wound, trap, kill capture, or collect wildlife officially listed as threatened or endangered. Violation of threatened and endangered special laws can result in penalties of up to $100,000 and/or one year in jail.
- Do not approach or feed wildlife. Keep away form their burrows and nests. Do not harm or kill any wildlife encountered.
- If animal is harmed or found harmed, contact your Construction Supervisor or the Environmental Inspector. Do not attempt to move the animal yourself.

APPENDIX D

APPENDIX D. Federally Listed, Proposed, and Candidate Species under jurisdiction of the U.S. Fish and Wildlife Service in Pima County, Arizona as of 14 August 2002, excluded from further consideration.

COMMON NAME	SCIENTIFIC NAME	STATUS	HABITAT	JUSTIFICATION
PLANTS				
Canelo Hills ladies' tresses	*Spiranthes delitescens*	Endangered	Finely grained, highly organic, saturated soils of cienegas. Potential habitat occurs in Sonora, Mexico.	No habitat present.
Huachuca water umbel	*Lilaeopsis schaffneriana* ssp. *recurva*	Endangered	An emergent aquatic plant that requires marshy wetlands.	No habitat present.
Kearney's blue star	*Amsonia kearneyana*	Endangered	Known only from the Baboquívari Mountains.	ROW is outside of known range.
Nichol's Turk's head cactus	*Echinocactus horizonthalonius* var. *nicholii*	Endangered	Dependent on limestone substrates in desert hills.	No habitat present.
FISH				
Desert pupfish	*Cyprinodon macularius*	Endangered	Shallow springs, small streams, and marshes. Tolerates saline and warm water.	No habitat present in area.
Gila chub	*Gila intermedia*	Proposed Endangered	Small streams and cienegas; prefer deeper pools with cover.	No habitat present in area.
Loach minnow	*Tiaroga cobitis*	Threatened	Requires perennial streams with swift water over cobble or gravel	No habitat present in area.
Sonoran Chub	*Gila ditaenia*	Threatened	Most commonly found in deep, permanent pools with bedrock-sand substrates and free of floating algae.	In U.S, limited to Sycamore Canyon and its tributaries.
Spikedace	*Meda fulgida*	Threatened	Requires perennial streams with swift velocities over sand and gravel.	No habitat present in area.
AMPHIBIANS				
Sonoran tiger salamander	*Ambystoma tigrinum stebbinsi*	Endangered	Stock tanks and impounded cienegas in San Rafael Valley, Huachuca Mountains at 4000-6300 ft.	ROW is outside of known range. This species is not known to occur in the Nogales RD.
Chiricahua leopard frog	*Rana chiricahuensis*	Threatened	Perennial pools, springs, stock tanks and ponds above 3,500' elevation.	No occupied habitat within ROW and no reintroductions planned.

APPENDIX D. Federally Listed, Proposed, and Candidate Species under jurisdiction of the U.S. Fish and Wildlife Service in Pima County, Arizona as of 14 August 2002, excluded from further consideration.

COMMON NAME	SCIENTIFIC NAME	STATUS	HABITAT	JUSTIFICATION
BIRDS				
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.	Winter surveys of Peña Blanca and Arivaca Lakes were conducted in 1994-1996, 1998, 2000-2002. No bald eagles have been observed.
California brown pelican	*Pelecanus occidentalis californicus*	Endangered	Coastal land and islands; species is found around many Arizona lakes and rivers.	No habitat present in area.
Masked bobwhite	*Colinus virginianus ridgewayi*	Endangered	Only known Arizona population has been reintroduced on Buenos Aires Natl. Wildl. Refuge	ROW is outside of known range.
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Montane forests and woodlands and canyon bottoms generally above 4,000-ft. elevation	No habitat within 1 mile of proposed ROW.
Mountain plover	*Charadrius montanus*	Proposed Threatened	Open arid plains, short grass prairies, and cultivated farms.	No habitat present in area.
Northern apolomado falcon	*Falco femoralis septentrionalis*	Endangered	Grassland and savannah habitats	No recent confirmed reports for Arizona.
MAMMALS				
Ocelot	*Felis pardalis*	Endangered	Prefers humid tropical & sub-tropical habitats; typically found at higher elevations.	ROW is outside of known range.
Jaguarundi	*Felis yagouaroundi tolteca*	Endangered	Deciduous forests, riparian areas, swampy grasslands, upland drysavannahs, etc.	ROW is outside of known range.
Sonoran pronghorn	*Antilocapra americana sonoriensis*	Endangered	Grassy desertscrub in northwestern Sonora and adjacent Arizona borderlands, mainly Yuma Co.	ROW is outside of known range.

STATUS DEFINITIONS: ENDANGERED SPECIES ACT

Endangered: Imminent jeopardy of extinction.
Threatened: Imminent jeopardy of becoming endangered.
Proposed: Proposed Rule has been published in Federal Register to list as Threatened or Endangered.

Appendix F

Harris Environmental Group, Inc.
Draft Biological Assessment
TEP Proposed Sahuarita-Nogales
Transmission Line Project
Crossover Corridor (HEG 2003c)

BIOLOGICAL ASSESSMENT

OF THE

TUCSON ELECTRIC POWER

SAHUARITA – NOGALES TRANSMISSION LINE

CROSSOVER CORRIDOR

DRAFT
15 MAY 2003

PREPARED FOR:
TUCSON ELECTRIC POWER
ONE SOUTH CHURCH
PO BOX 711
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TABLE OF CONTENTS

EXECUTIVE SUMMARY ... 4
1.0 PROJECT DESCRIPTION ... 7
1.1 Proposed Action ... 7
1.2 Project Location ... 10
1.3 Project Area ... 11
1.4 Conservation Measures ... 13
2.0 FEDERALLY LISTED SPECIES ... 17
2.1 Mexican spotted owl (*Strix occidentalis lucida*) (Threatened) ... 19
2.1a Action Area ... 19
2.1b Natural History and Distribution ... 19
2.1c Critical Habitat ... 20
2.1d Current Status Statewide ... 21
2.1e Environmental Baseline ... 21
2.1f Effects of Proposed Action on the MSO ... 22
2.1g Cumulative Effects ... 24
2.1h Effects Determination and Incidental Take ... 24
2.2 Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) ... 25
2.2a Action Area ... 25
2.2b Natural History and Distribution: ... 25
2.2c Critical Habitat ... 27
2.2d Current Status Statewide ... 27
2.2e Environmental Baseline ... 28
2.2f Effects of Proposed Action on the CFPO ... 29
2.2g Cumulative Effects ... 32
2.2h Effects Determination and Incidental Take ... 32
2.3 Southwestern willow flycatcher (*Empidonax traillii extimus*) (Endangered) ... 33
2.3a Action Area ... 33
2.3b Natural History and Distribution ... 33
2.3c Critical Habitat ... 34
2.3d Current Status Statewide ... 34
2.3e Environmental Baseline ... 35
2.3f Effects of Proposed Action on the SWFL ... 36
2.3g Cumulative Effects ... 37
2.3h Effects Determination and Incidental Take ... 37
2.4 Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) (Endangered) ... 38
2.4a Action Area ... 38
2.4b Natural History and Distribution ... 38
2.4c Critical Habitat ... 40
2.4d Current Status Statewide ... 40
2.4e Environmental Baseline ... 41
2.4f Effects of Proposed Action on the LLNB ... 41
2.4g Cumulative Effects ... 43
2.4h Incidental Take ... 44

2.5 Chiricahua leopard frog (*Rana chiricahuensis*) (Threatened) 45
2.5a Action Area 45
2.5b Natural History and Distribution 45
2.5c Critical Habitat 46
2.5d Current Status Statewide 46
2.5e Environmental Baseline 48
2.5f Effects of Proposed Action on the CLF 49
2.5g Cumulative Effects 50
2.5h Effects Determination and Incidental Take 50
2.6 Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) (Endangered) 51
2.6a Action Area 51
2.6b Natural History and Distribution 51
2.6c Critical Habitat 51
2.6d Current Status Statewide 51
2.6e Environmental Baseline 52
2.6f Effects of Proposed Action on the PPC 53
2.6g Cumulative Effects 54
2.6h Effects Determination 55
2.7 Jaguar (*Panthera onca*) (Endangered) 56
2.7a Action Area 56
2.7b Natural History and Distribution 56
2.7c Critical Habitat 57
2.7d Current Status Statewide 57
2.7e Environmental Baseline 57
2.7f Effects of Proposed Action on the Jaguar 58
2.6g Cumulative Effects 60
2.6h Effects Determination and Incidental Take 60
2.8 Gila Topminnow (*Poeciliopsis occidentalis occidentalis*) (Endangered) 61
2.8a Action Area 61
2.8b Natural History and Distribution 61
2.8c Critical Habitat 63
2.8d Current Status Statewide 63
2.8e Environmental Baseline 64
2.8f Effects of Proposed Action on the Gila topminnow 65
2.8g Cumulative Effects 66
2.7h Effects Determination and Incidental Take 66
2.9 Mexican Gray Wolf (*Canis lupus baileyi*) (Endangered) 67
2.9a. Action Area 67
2.9b. Natural History and Distribution 67
2.9c Critical Habitat 68
2.9d Current Status Statewide 68
2.9e Environmental Baseline 68
2.9f Effects of Proposed Action on the Mexican Gray Wolf 69
2.9g Cumulative Effects 70
2.9h Incidental Take 70
3.0 USFS SENSITVE SPECIES 71

3.1 PLANTS 35
3.2 INVERTEBRATES 49
3.3 BIRDS 49
3.4 REPTILES AND AMPHIBIANS 51
3.5 MAMMALS 53
4.0 BLM SENSITIVE SPECIES 55
4.1 PLANTS 56
4.2 BIRDS 56
4.3 REPTILES & AMPHIBIANS 57
4.4 MAMMALS 57
5.0 AGFD WILDLIFE OF SPECIAL CONCERN 59
6.0 LITERATURE CITED 66
7.0 LIST OF ACRONYMS 92
APPENDIX A 94
APPENDIX B 101
APPENDIX C 102
APPENDIX D 103

EXECUTIVE SUMMARY

Tucson Electric Power (TEP) and Citizens Communications (Citizens) are proposing to build a new, dual-circuit, 345,000-volt (345-kV) transmission line from the TEP South Substation in the vicinity of Sahuarita, Arizona to interconnect with Citizens system at a Gateway Substation that TEP will construct west of Nogales, Arizona. From the Gateway Substation, the proposed transmission line will continue south across the United States-Mexico border for approximately 60 miles (mi) (98 kilometers [km]) into the Sonoran region of Mexico, connecting with the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico) at the Santa Ana Substation. The proposed transmission line will improve Citizens' service in Nogales and allow for the transfer of blocks of electrical energy between the United States and Mexico. Southern Arizona and Sonora, Mexico have experienced rapid growth, and forecasts predict this growth will continue. Citizens' customers have already experienced outages due to limited transmission facilities into the region. TEP recognizes the need to improve transmission into the southern Arizona region and proposes to assist Citizens in meeting an Arizona Corporation Commission (ACC) mandate to improve the reliability and service of its Nogales electrical system. The ACC has ordered Citizens to improve its system by the end of 2003. The TEP Sahuarita – Nogales Transmission Line, a double-circuit 345-kV transmission line will provide the additional reliability that Citizens requires while providing additional capacity into the southern Arizona region for future needs.

This Biological Assessment (BA) was prepared to meet the requirements of Section 7 of the Endangered Species Act (ESA) of 1973, 16 U.S.C. Section 1536(a)(2). Section 7 requires all federal agencies to consult with the United States Fish and Wildlife Service (USFWS) if an action may affect listed species or their designated critical habitat. Section 7 consultation is required for any project that requires a federal permit or receives federal funding. Action is defined broadly to include funding, permitting, and other regulatory actions. All activities associated with construction of the TEP Sahuarita – Nogales Transmission Line are included in the proposed action being evaluated for this BA. Because TEP has applied for a Presidential Permit to construct the transmission line across the international border, the Department of Energy (DOE) is preparing a Draft Environmental Impact Statement (DEIS) (Tetra Tech 2003) concurrently with this document.

Federal agencies must ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat. This is accomplished through consultation with the USFWS. If such species may be present, the applicant must conduct a BA to determine if a proposed action is likely to adversely affect listed species or designated critical habitat. The USFWS will review this BA and issue a biological opinion (BO). DOE is the permitting agency for this proposed action, and therefore the lead federal agency in Section 7 consultation with the USFWS.

The proposed action crosses a variety of land jurisdictions: including private, Arizona State Land Department (ASLD), Bureau of Land Management (BLM), and United States Department of Agriculture Forest Service (USFS). Because each jurisdiction has different requirements for environmental review of the proposed action, this document is subdivided by agency. SECTION 2 addresses species that receive protection under the ESA of 1973. SECTION 3 reviews the potential effects of the proposed action on those species classified as "Sensitive" by the USFS. SECTION 4 reviews the potential effects of the proposed action on those species classified as "Sensitive" by the BLM. SECTION 5 addresses those species that are considered "Wildlife of Special Concern" by the Arizona Game and Fish Department (AGFD). Because habitats often overlap different jurisdictions, many species have classifications within each agency. In these instances, the species is evaluated under the jurisdiction which affords the highest level of protection.

We contacted federal (USFWS) and state (AGFD) natural resource agencies to request information on possible special status species (sensitive, threatened, and endangered) that may exist on or near the proposed Crossover Corridor of the TEP Sahuarita – Nogales Transmission Line from Sahuarita to Nogales, Arizona. Agency correspondence is presented in Appendix A.

SUMMARY OF DETERMINATIONS FOR FEDERALLY LISTED SPECIES

Based on contact with the USFWS, USFS, BLM, and AGFD, 9 federally listed species may be affected by the proposed action. After reviewing the current status of these species, the environmental baseline of the project area, the effects of the proposed actions on the species as well as cumulative effects, the following determinations are made for the 9 affected species:
(Table 1).

Table 1. Effects of the proposed action on federally listed species.

SPECIES	**POTENTIAL EFFECT**
Mexican spotted owl	The proposed action may affect but is not likely to adversely affect this species
Cactus ferruginous pygmy-owl	The proposed action may affect and is likely to adversely affect this species.
Southwestern willow flycatcher	The proposed action may affect but is not likely to adversely affect this species.
Lesser long-nosed bat	The proposed action may affect and is likely to adversely affect this species
Chiricahua leopard frog	The proposed action may affect but is not likely to adversely affect this species
Pima pineapple cactus	The proposed action may affect and is likely to adversely affect this species.
Jaguar	The proposed action may affect but is not likely to adversely affect this species.

Table 1 continued. Effects of the proposed action on federally listed species.

SPECIES	POTENTIAL EFFECT
Gila topminnow	The proposed action may affect but is not likely to adversely affect this species.
Mexican gray wolf	The proposed action may affect but is not likely to adversely affect this species.

1.0 PROJECT DESCRIPTION

1.1 PROPOSED ACTION

The proposed TEP Crossover Corridor Sahuarita – Nogales Transmission Line will consist of twelve transmission line wires, or conductors, and two neutral ground wires that will provide lightning protection and fiber optic communication, on a single set of support structures. The transmission line will originate at TEP's existing South Substation, in the vicinity of Sahuarita, Arizona, and interconnect with Citizens system at a Gateway Substation that TEP will construct west of Nogales, Arizona. The double-circuit transmission line will continue from the Gateway Substation south to cross the United States-Mexico border and extend approximately 60 mi (98 km) into the Sonoran region of Mexico, connecting with the Comisión Federal de Electricidad (CFE, the national electric utility of Mexico) at the Santa Ana Substation. Figure 1 shows the overall proposed project location.

The South Substation in Sahuarita will be upgraded and expanded to provide interconnection between a new TEP 345-kV transmission line and the new Gateway Substation west of Nogales. The South Substation will be expanded by approximately 1.3 acres (0.53 ha) to add a switching device that will connect to the proposed transmission line, with a 100 ft (30 m) expansion of the existing fence line for the addition of the second 345-kV circuit. The new Gateway Substation will include a 345-kV to 115-kV power transformer to provide power to the local area. The new Gateway Substation will be constructed within a developed industrial park north of Mariposa Road (State Route 189), approximately 0.5 mi (0.8 km) east of the Coronado National Forest (CNF) boundary (Northeast ¼ of Section 12, Township 24 South, Range 13 East). The TEP portion of the site (the area that will be graded) is approximately 18 acres (7.3 ha) and is within the City of Nogales, Arizona. TEP has purchased the substation site and preliminary construction activities have been completed. TEP is flexible in the placement of a fiber-optic regeneration site, but it will likely be located in the area of Township 18 South, Range 12 East, approximately 10 mi (16 km) southwest of Sahuarita on private land. The fiber optic regeneration site will consist of an approximate 0.5-acre (0.2-ha) fenced yard, containing a 10 ft (3 m) by 20 ft (6 m) concrete pad with an equipment house. The cleared area for the equipment house will be approximately 20 ft (6 m) by 30 ft (9 m). There will be three 3-acre (1.2-ha) construction staging areas (located near the South and Gateway Substations and the Interstate 19 [I-19]/Arivaca Road interchange) and an 80 acre (32 ha) temporary laydown yard (also near the I-19/Arivaca Road interchange) used during construction of the proposed line.

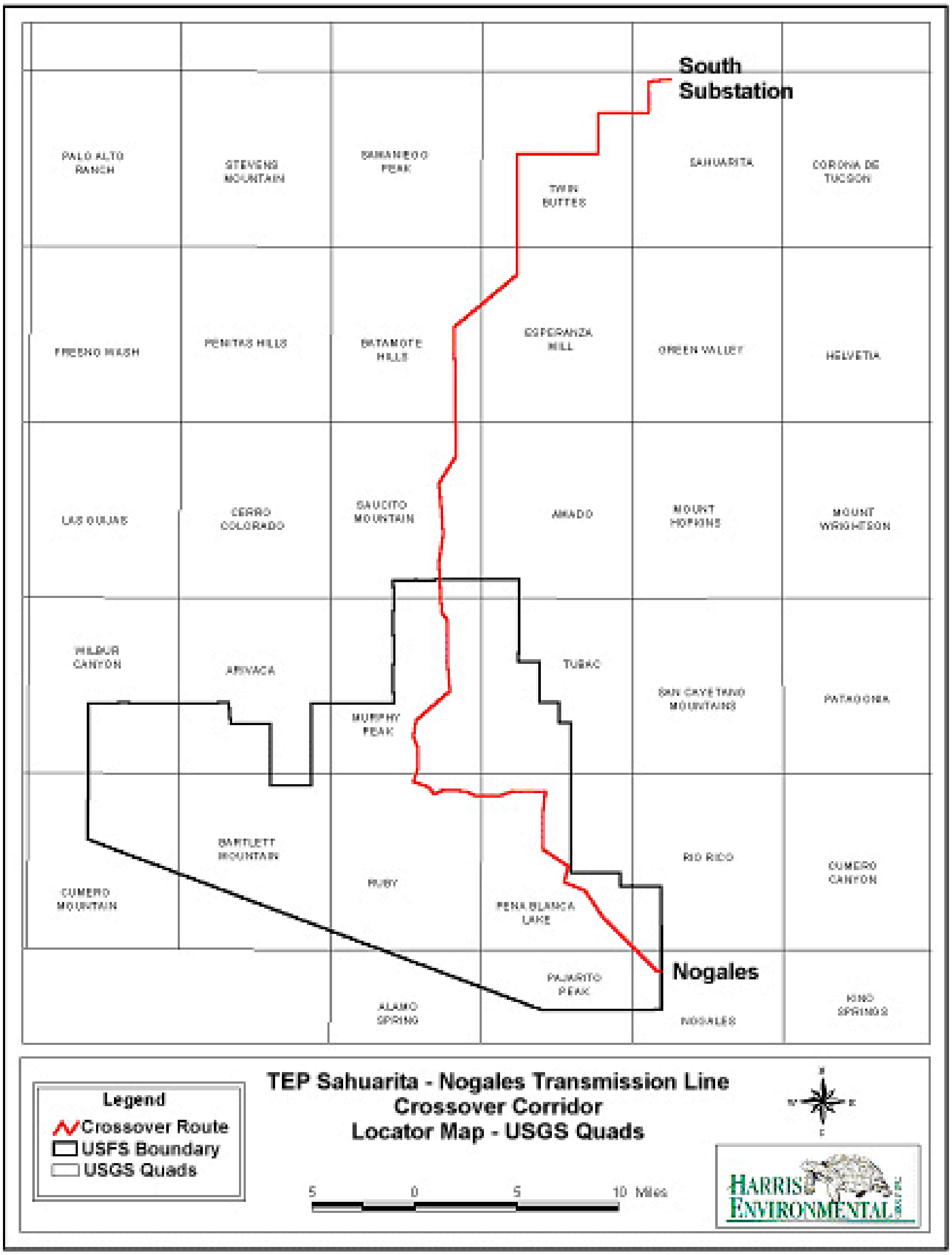
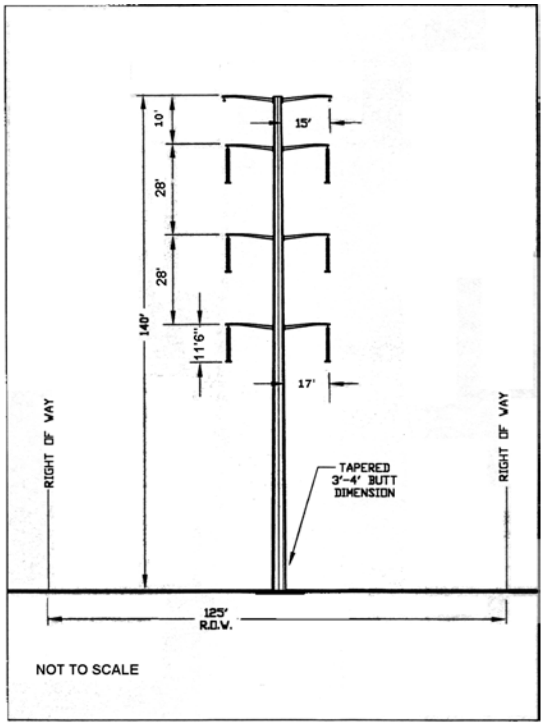


Figure 1. Map of the TEP Sahuarita – Nogales Transmission Line Crossover Corridor.

The primary support structures to be used for the transmission line are self-weathering steel single structures, or monostructures (Figure 2). Dulled, galvanized steel lattice towers (Figure 3) will be used in locations where their use will minimize overall environmental impacts, in accordance with Arizona Corporation Commission (ACC) Decision No. 64356 (ACC 2001).



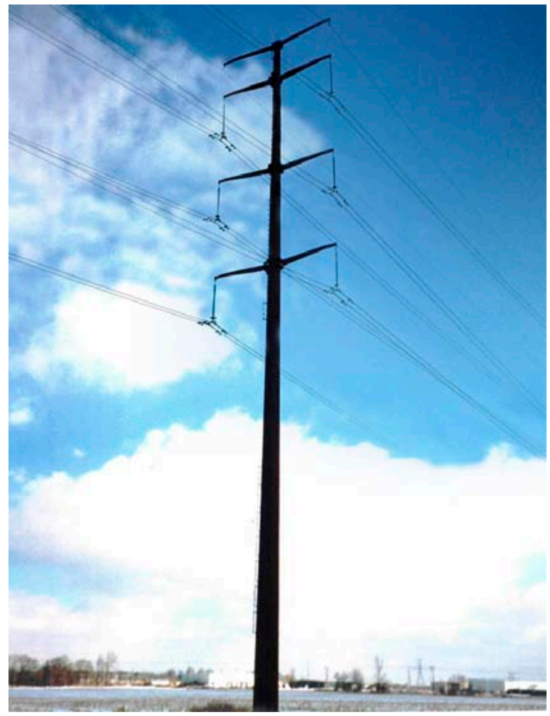


Figure 2. Monopole Transmission Line Structure Drawing and Photo.

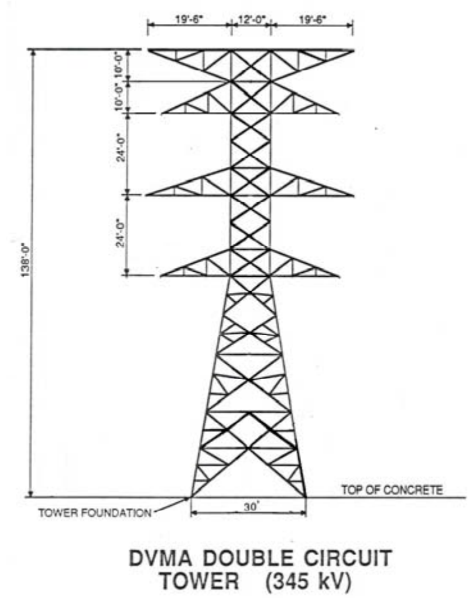


Figure 3. Lattice Tower Transmission Line Structure Drawing and Photo.

1.2 PROJECT LOCATION

The Crossover Corridor extends for approximately 65.2 mi (105 km), from the South Substation to the United States-Mexico border including 17 mi (27 km) along the EPNG gas line right-of-way (ROW). The length of the Crossover Corridor is 29.3 mi (47.2 km) within the CNF and 1.25 mi (2.01 km) on BLM land. The Crossover Corridor would require approximately 448 support structures, including approximately 196 within the CNF and 9 on BLM land.

The Crossover Corridor exits the TEP South Substation located within the incorporated area of the Town of Sahuarita and proceeds westerly for approximately 1.0 mi (1.6 km) before turning south for 1.5 mi (2.4 km). The corridor turns west across I-19 and continues through Pima County to the southwest, crossing approximately 1.25 mi (2.01 km) of federal land managed by BLM parallel to two existing TEP transmission lines (138-kV and 345-kV). The corridor turns south to parallel the EPNG gas line ROW for approximately 5.8 mi (9.3 km) and passes just east of the existing TEP Cyprus Sierrita Substation.

The Crossover Corridor continues past the Cyprus Sierrita Substation to the southwest, then turns south and enters Santa Cruz County after 6.3 mi (10 km). The corridor enters the CNF 6.0 mi (9.7 km) south of the Santa Cruz County line. The corridor passes south along the west side of the Tumacacori and Atascosa mountains. The corridor turns east through Peck Canyon for approximately 7 mi (11.3 km). At the point where Peck Canyon meets the EPNG gas line ROW, the corridor turns south parralleling the gas line. The Central Corridor continues through the CNF, paralleling the EPNG pipeline ROW to the southeast for several miles to the forest boundary. The proposed corridor exits CNF onto private land and proceeds 0.5 mi (0.8 km) east to the Gateway Substation. From the Gateway Substation, the proposed corridor returns to the west through private land and then turns south to parallel the CNF boundary. The proposed corridor meets the United States-Mexico border approximately 3,300 ft (1,006 m) west of Arizona State Highway 189 in Nogales, Arizona.

TEP will use existing access roads where feasible. Approximately 20.7 mi (33.3 km) of temporary new roads will be built for construction of the corridor on CNF (URS 2003a); spur roads off existing access roads adjacent to TEP transmission lines will provide project access on BLM land. Transmission line tensioning, pulling, and fiber-optic splicing sites will also disturb land. The total new temporary area of disturbance on CNF during construction of the corridor will be approximately 238 acres (96.3 ha) (URS 2003a). Following construction, TEP will close new roads, construction areas, and existing roads not required for project maintenance in accordance with agreements with land owners or managers (e.g., BLM or USFS). On USFS land, TEP will close existing road mileage equal to that required for project maintenance, to avoid impacting the current road density. The maintenance access required by TEP will be limited to roads to selected structures, rather than a single cleared ROW leading to the United States-Mexico border. On the CNF transmission line tensioning and pulling sites, fiber-optic splicing sites, and construction yard areas will be obliterated within six months of the project becoming fully operational (URS 2003a).

1.3 Project Area

The project area includes the location where all construction and associated activities will occur along the ROW. Action areas are locations affected directly or indirectly by these activities and often include sites outside the immediate area of construction. Action areas are unique for each listed species and are outlined in SECTION 2.0 of this document.

Between Sahuarita and Nogales, the proposed action crosses four distinct biotic communities, or biomes (Brown 1994). A complete list of plant species documented during field surveys in 2002 is presented in Appendix B.

Figure 4. Sonoran desertscrub.

The northern end of the corridor contains vegetation characteristic of the Sonoran desertscrub biome (Figure 4). This biome is typically represented by saguaro (*Carnegiea gigantea*), cholla and prickly pear (*Opuntia* spp.) cacti, ocotillo (*Fouquieria splendens*), mesquite, (*Prosopis velutina*), acacia (*Acacia* spp.) paloverde (*Parkinsonia* spp.), creosote (*Larrea tridentata*), triangle-leaf bursage (*Ambrosia deltoidea*), and brittlebush (*Encelia farinosa*).

Vegetation south of the ASARCO mine transitions into the semidesert grassland biome (Figure 5). This area is dominated by grama (*Bouteloua* spp.), lovegrass (*Eragrostis* spp.), and three-awn (*Aristida* spp.) grasses, with low shrubs such as mesquite and acacia locally co-dominant. Agave (*Agave* spp.) and yucca (*Yucca* spp.) are also common in this biome. These grasslands are transected by desert riparian scrub dominated by mesquite and netleaf hackberry (*Celtis reticulata*).

Figure 5. Semidesert grassland.

Figure 6. Madrean oak woodland.

The higher elevations (above 3,500 ft [1,067 m]) of the project area are within the madrean oak woodland biome (Figure 6). Representative plants of this biome within the project area include Mexican blue oak (*Quercus oblongifolia*) and emory oak (*Q. emoryi*) trees, side-oats grama (*B. curtipendula*), hairy grama (*B. hirsuta*), and fluffgrass (*Erioneuron pulchellum*).

The 4th biome represented within the project area is the Sonoran deciduous riparian forest (Figure 7), which is located south of Arivaca Road in Sopori Wash and Peck Canyon. The high water table in these areas supports stands of cottonwood (*Populus fremontii*), ash (*Fraxinus pennsylvanica* ssp. *velutina*), sycamore (*Platanus wrightii*), walnut (*Juglans major*), netleaf hackberry, and willow (*Salix* spp.) trees.

Figure 7. Sonoran deciduous riparian forest.

The IRA within Peck Canyon encompasses 21,363 ha (52,788 ac) and was established by a Record of Decision on January 12, 2001 on the Roadless Area Conservation Final EIS.

Figure 8. Area burned in Walker fire.

Between 12 June and 22 June 2002, the Walker Fire, a human-caused fire, burned 16,369 ac (6,624 ha) of land along the United States-Mexico border approximately 1mi (1.6 km) west of the southern end of the Crossover Corridor. Portions of the Walker fire were very hot, especially near the international border and the upper slopes of ridges, while other areas, like Walker Canyon, burned relatively cool (T. Newman, CNF, pers. comm., 26 November 2002). While vegetation has begun to recover in some areas, other areas are highly susceptible to erosion due to reduced groundcover (Figure 8).

1.4 CONSERVATION MEASURES

PROJECT-WIDE CONSERVATION MEASURES

1. Environmental Training - All construction supervisors will be required to attend environmental training, which will outline their obligation to obey applicable laws and regulations regarding wildlife and habitats (Appendix C).

2. Erosion Control Measures - TEP is in consultation with CNF regarding development of Best Management Practices (BMPs) for minimizing proposed project impacts on geologic, soil, and water resources on national forest land, in accordance with the USFS "Soil and Water Conservation Practices Handbook" (USFS 1990). Specific BMPs will be identified after coordination with Arizona Department of Environmental Quality (ADEQ) and before implementation of the project, for the entire length of the selected corridor.

3. Fire Prevention Plan - A Fire Prevention Plan is under development to minimize the risk of accidental wildfire. All construction activities will adhere to this plan and fire suppression equipment will be available to all work crews. On CNF lands, the Fire Prevention Plan will comply with Forest Service Manual 5100.

4. Hazardous Material Spill Response Plan - A Hazardous Material Spill Response Plan is under development which will describe the measures and practices to prevent, control, cleanup, and report spills of fuels, lubricants, and other hazardous substances during construction operations. This plan will ensure that no hazardous materials are stored, dispensed, or transferred in streams, watercourses, or dry washes, and vehicles are regularly inspected and maintained to prevent leaks.

5. Invasive Species Control - An Invasive Species Management Plan in accordance with Executive Order 13112 is under development in coordination with CNF, ASLD, and BLM to identify problem areas and mitigation measures.

6. Road Closure/Obliteration - TEP has committed to obliterate and permanently close 1 mi (1.6 km) of existing road on CNF (to be identified by CNF) for every 1 mi (1.6 km) of proposed road used in the construction, operation, or long-term maintenance of the proposed action. TEP will monitor road closures during regularly scheduled inspection flights and/or ground inspections, and repair or replace road-closure structures as necessary following construction. Furthermore, TEP will cooperate with landowners on all ongoing road closure maintenance.

   The following selective criteria and techniques for closing roads are taken from Section 1.3.2 of the Roads Analysis (URS 2003) and applies to access roads on CNF. Administrative roads will be closed to the general public but made available to TEP and its assigned contractors for the evaluation, maintenance, or upgrading of existing facilities.

Closure methods for administrative roads will include the following:

a. Placement of heavy pipe posts with an attached, locked chain entrance on the road.

b. Placement of heavy pipe posts with an attached, locked gate in a manner that blocks entrance on the road.

c. Placement of a pipe barricade across the roadbed, locked in place in multiple locations in concrete sleeves.

The following methods may be used for the long-term closure of transmission line access roads used during construction and those roads required to be closed by the CNF. These roads may be reopened for emergency repair of transmission facilities, but will not be used intermittently as with administrative roads. Techniques include:

a. Placement of boulders or other natural impediments across the road.

b. Placement of a berm or trench across the the road.

c. Rip, obliterate, and reseed/revegetate portions of roadbed as needed. This effort could be applied to the initial visual portion of roadway (e.g., first 100 ft [30 m]) to effectively obscure the roadway. This could be accomplished by transplanting native species of medium and large vegetation from the general area and reseeding with native grasses. By obscuring visible portions of roadway, future vehicular travel could be more effectively discouraged than by placing berms or other unnatural impediments to an otherwise visually inviting roadway.

7. Additional mitigation measures are outlined in Table 2.2-2 of the DEIS (Tetra Tech 2003).

SPECIES-SPECIFIC CONSERVATION MEASURES

Mexican spotted owl (MSO)

1. Breeding season restriction – no construction activity will occur between Structures #297 and #312 of Segment 8 from 1 March to 31 August.

2. No trees over 9 in diameter breast height (DBH) in MSO habitat will be removed.

Cactus ferruginous pygmy-owl (CFPO)

1. Protocol surveys – 2 consecutive years of protocol surveys must be conducted before construction activities can begin within 1,312 ft (400 m) of designated habitat. If a CFPO is detected, USFWS has determined that certain continued construction activities will not harm or harass a CFPO as defined by ESA regulations. In areas where two consecutive years of protocol surveys cannot be completed, construction will occur outside of the breeding season.

Four zones are described (Zone I through Zone IV) that are based upon the distance of construction activity from a known nest or activity center. Certain levels of construction can occur within each zone without resulting in harm or harassment of the species. Situations that do not comply with the restrictions provided for each zone will require USFWS authorization before construction continues. Specific development restrictions that apply to each of the four zones are described in the sections below:

<u>Zone I: 0 to 328 ft (100 m) from the CFPO Activity Center</u>

1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

2. Construction-related activities may continue on land that has been cleared of vegetation provided that they do not exceed the level and/or intensity of activity that was occurring during the period of time that the territory was established.

3. Activities that will be more intense or cause more noise disturbance than was occurring during the period of time that the territory was established cannot proceed without authorization from USFWS and relevant land management agencies.

<u>Zone II: 328 ft (100 m) to 1,312 ft(400 m) from the CFPO Activity Center</u>

1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

2. No restrictions on the nature or type of construction activity (excluding the clearing of vegetation) from 1 August through 31 January of the following calendar year.

3. Construction activities during the breeding season (1 February to 31 July) cannot exceed the levels or intensity of activities that occurred at the time the territory was established.

<u>Zone III: 1,312 ft (400 m) to 1,969 ft (600 m) from the CFPO Activity Center</u>

1. No additional clearing of vegetation will be permitted without authorization from USFWS and relevant land management agencies.

2. No restrictions on the levels or intensity of construction activity (excluding the clearing of vegetation) at any time of the year.

<u>Zone IV: Greater than 1,969 ft (600 m) from the CFPO Activity Center</u>

1. No restrictions – any activity consistent with the project description provided to USFWS (as amended by supplemental reports) is allowed. For the purposes of this consultation, USFWS assumes that all construction or construction-related activities referred to under each zone description will be limited to those described in the project description in this BA.

2. All saguaros within construction areas will be transplanted or mitigated with minimum 6.5 ft (2 m) specimens. Within riparian desertscrub and deciduous riparian areas, tree and shrub removal will be minimized to the greatest extent possible.

Southwestern willow flycatcher (SWFL)

1. All damaged deciduous riparian vegetation will be mitigated with pole plantings of willow or cottonwood at a 2:1 ratio by species.

Lesser long-nosed bat (LLNB)

1. Agave within construction areas will be transplanted or replaced with similar age and size class individuals.

Chiricahua leopard frog (CLF)

1. Surveys for CLF will be conducted within Peck Canyon in the year immediately prior to construction for this species. If CLF are detected, consultation with USFWS will be reinitiated.

Pima pineapple cactus (PPC)

1. Purchase of credits in a USFWS-approved conservation bank for PPC at a ratio to be determined in consultation with USFWS.

Jaguar

1. Five remote cameras will be donated to the Jaguar Conservation Team to assist with monitoring of jaguar movements across the Arizona-Mexico border. These 5 cameras will all be placed within the Tumacacori EMA under permit from the CNF. If a female jaguar or cubs are documented by the Jaguar Management Team within the Tumacacori EMA, consultation with USFWS will be reinitiated.

2.0 FEDERALLY LISTED SPECIES

Special status species are plant and wildlife species that are of concern because their populations are either in jeopardy of extinction or are declining in number. The AGFD and USFWS were contacted concerning information on possible threatened and endangered species that may exist on or near the proposed action.

In a letter dated 14 May 2002, the USFWS listed 18 Endangered species, 7 Threatened species, and 2 Proposed species that occur in Pima and Santa Cruz Counties, Arizona (Table 2). Agency correspondence is presented in Appendix C. Species included in the USFWS correspondence, but excluded from evaluation are addressed in Appendix D.

Meetings with USFWS and USFS personnel were held on 9 April, 13 May, 3 December 2002, and 28 March 2003 to discuss the potential effects of the proposed action on special status species. BLM personnel also attended the 3 December 2002 meeting. Additional meetings were held with USFWS on 30 May, 6 November, 10 December 2002, and 19 March 2003, and with AGFD on 19 April 2002.

Table 2. Federally listed species that may occur near the proposed action.

SPECIES	STATUS	*DRAFT* DETERMINATION
Canelo Hills ladies' tresses	Endangered	No Effect
Cactus ferruginous pygmy-owl	Endangered	May affect, likely to adversely affect
Desert pupfish	Endangered	No Effect
Gila topminnow	Endangered	May affect, not likely to adversely affect
Huachuca water umbel	Endangered	No Effect
Jaguar	Endangered	May affect, not likely to adversely affect
Jaguarundi	Endangered	No Effect
Kearney’s blue star	Endangered	No Effect
Lesser long-nosed bat	Endangered	May affect, likely to adversely affect
Masked bobwhite	Endangered	No Effect
Mexican gray wolf	Endangered	May affect, not likely to adversely affect
Nichols turk's head cactus	Endangered	No Effect
Northern aplomado falcon	Endangered	No Effect
Ocelot	Endangered	No Effect
Pima pineapple cactus	Endangered	May affect, likely to adversely affect
Sonoran pronghorn	Endangered	No Effect
Sonoran tiger salamander	Endangered	No Effect
Southwestern willow flycatcher	Endangered	May affect, not likely to adversely affect
Bald eagle	Threatened	No Effect
California brown pelican	Threatened	No Effect
Chiricahua leopard frog	Threatened	May affect, not likely to adversely affect
Loach minnow	Threatened	No Effect
Mexican spotted owl	Threatened	May affect, not likely to adversely affect
Sonora chub	Threatened	No Effect
Spikedace	Threatened	No Effect
Mountain plover	Proposed	No Effect
Gila chub	Proposed	No Effect

2.1 MEXICAN SPOTTED OWL (*Strix occidentalis lucida*) (Threatened)

2.1a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. The action area for the MSO includes those areas of MSO habitat that may be directly impacted by construction as well as protected activity centers (PAC) within 1 mi (1.6 km) of the proposed action that may be subject to noise disturbance during construction. The entire action area for this species is within the Tumacacori EMA.

2.1b Natural History and Distribution

The MSO is one of three subspecies of spotted owl currently recognized by the American Ornithologists' Union in their most recent treatise on subspecies (A.O.U. 1957). However, Dickerman (1997), in a recent taxonomic review of *S. o. lucida*, has identified three subspecies throughout the species' range, including resurrecting the use of *S. o. huachucae* as the subspecies in the southwestern United States and northern Mexico. Although this new revision is probably valid, the currently accepted taxonomy was followed. The MSO (Figure 9) is a medium-sized owl with a round head lacking ear tufts; light brown to dark brown plumage, and dark eyes. It has white spots on the head and nape, and white mottling on the breast and abdomen; thus, the name spotted owl (Pyle 1997). All three subspecies of spotted owl inhabit mountainous, forested regions of western North America.

Figure 9. Mexican spotted owl.

A detailed account of the spotted owl, inclusive of the three currently recognized subspecies, is given by Gutiérrez et al. (1995). Ganey (1998) presents a synthesis of what is presently known about the MSO, particularly in Arizona. The MSO Recovery Plan (USFWS 1995a) and technical supporting chapters on distribution and abundance (Ward et al. 1995), population biology (White et al. 1995), landscape analysis and metapopulation structure (Keitt et al. 1995), habitat relationships (Ganey and Dick 1995), and prey ecology (Ward and Block 1995) also are important summary documents. The following brief species account was obtained from these and other more current references.

The MSO is widely but patchily distributed in forested mountains and canyons from southern Utah and central Colorado, south into Arizona, New Mexico, extreme western Texas, and into Mexico to near Mexico City (McDonald et al. 1991, Gutiérrez et al. 1995, Ward et al. 1995, Dickerman 1997). The MSO nests, roosts, forages, and disperses in a variety of habitats in Arizona from about 3,770 ft (1,236 m) to 9,600 ft (3,150 m). Nest and roost habitats include forests and woodlands that are structurally complex, unevenly aged and multistoried, with mature or old-growth stands containing trees older than 200 years with a high (>70 percent) canopy closure, including many snags and fallen logs (Ganey and Dick 1995). According to Ganey (1998), they appear to be most common in mature and old growth forests in steep canyons, but also are found in canyons that include prominent cliffs with little forested habitat. The MSO preys on small mammals, birds, reptiles, and insects, with woodrats (*Neotoma* spp.) and white-footed mice (*Peromyscus* spp.) constituting the bulk of its diet by biomass (Ward and Block 1995, Ganey et al. 1992, Reichenbacher and Duncan 1992).

Adult MSO are considered to have a relatively high survival rate, with an estimated probability of adult survival rate of 0.8 to 0.9 from one year to the next (White et al. 1995). Juveniles on the other hand, have a much lower survival probability rate, ranging from 0.06 to 0.29 (Ganey et al. 1998, White et al. 1995). There is a great deal of spatial and temporal variation in reproductive output, but one estimate places the general reproductive rate at 1.001 fledglings per pair (White et al. 1995). Typical of *K*-selected species (Ricklefs 1990), the MSO is long-lived with low reproductive output and generally maintains population densities near carrying capacity. The high survival rate of *K*-selected species enables MSO to maintain stable populations over time despite variable recruitment rates (White et al. 1995).

In 1993, the MSO was federally listed as a threatened species by the USFWS. The listing was based primarily on historical and ongoing habitat alteration due to timber management practices, specifically the use of even-aged silviculture, the threat of these practices continuing as prescribed in National Forest Plans, and the threat of additional habitat loss from catastrophic wildfire (USFWS 1993a).

The primary administrator of lands supporting MSO in the United States is the USFS. According to the recovery plan, 91 percent of MSO known to exist in the United States between 1990 and 1993 occurred on land administered by USFS (USFWS 1995a). The majority of known MSO have been found within Region 3 of the USFS, which includes 11 National Forests in New Mexico and Arizona. USFS Regions 2 and 4, including two National Forests in Colorado and three in Utah, support fewer MSO.

2.1c Critical Habitat

Critical habitat was designated for the MSO in 1995 (USFWS 1995b). However, it was revoked by court order in 1998 for failing to complete the National Environmental Policy Act process (USFWS 1998a). USFWS (USFWS 2000a) again proposed to designate 13.5 million acres (5.6 million ha), mostly on USFS land, as critical habitat for the species in 2000. The final rule published in the Federal Register on 1 February 2001 designated approximately 4.6 million acres (1.9 million ha) in Arizona, Colorado, New Mexico, and Utah on federal land outside of the USFS system (USFWS 2001a). The reason given for not designating critical habitat on USFS land was that current Forest Plans conform to management guidelines outlined in the recovery plan, which have undergone consultation with the USFWS, whereas other federal agencies have yet to formally adopt these guidelines. On 13 January 2003, a federal judge stated that the USFWS final rule designating critical habitat for the MSO violated the ESA. Subsequent court orders have mandated the USFWS to again propose critical habitat within nine months (13 October 2003) and publish a final designation within 15 months (13 June 2004). If any part of the area designated as critical habitat could be impacted by the proposed action, the DOE and USFWS will include that habitat in their formal Section 7 consultation.

While the proposed action does not pass through currently designated critical habitat, it does pass through areas previously proposed as critical habitat. If the newly proposed critical habitat is similar to that originally proposed in 2000, the ROW may cross areas that will eventually be designated as critical habitat. However, the areas the ROW passes through do not contain constituent elements required for MSO habitat (see SECTION 2.1e below), and no adverse modification to any such designated habitat is likely.

2.1d Current Status Statewide

In Arizona, MSO have been documented throughout much of the state except for the arid southwestern portion. The greatest concentration of owls occurs along the Mogollon Rim from the White Mountains region to the peaks near Flagstaff and Williams (Ward et al. 1995, Ganey 1998). The majority of owls are located on federal lands managed by the USFS (USFWS 1995a).

There are three Recovery Units (RU) identified in Arizona. From north to south they are the Colorado Plateau, Upper Gila Mountains, and Basin and Range-West. No current estimate of the number of MSO within its entire range is available, but between 1990 and 1993, 103 MSO sites were recorded during planned surveys and incidental observations in the Basin and Range-West RU in Arizona (USFWS 1995a).

2.1e Environmental Baseline

The proposed action occurs in the Basin and Range - West RU. Within this RU, MSO are mainly associated with steep, rocky canyons containing cliffs and stands of oak, Mexican pine, and broad-leaved riparian vegetation (Ganey and Balda 1989). Most MSO habitat in this RU occurs on the CNF.

The proposed action passes through the Tumacacori EMA of the CNF, which currently contains five PACs. The majority of the EMA crossed by the proposed action is madrean evergreen woodland; however, much of it lacks the features typically associated with MSO habitat. Range condition in areas crossed by the proposed action is moderately high with a stable or unknown trend. Native grasses dominate groundcover throughout the action area, but some non-native species, such as Lehmann’s lovegrass (*Eragrostis lehmanniana*), tree of heaven (*Ailanthus altissima*), and salt cedar (*Tamarix* spp.) occur within the EMA (USFS 2002). Lehmann’s lovegrass was seeded in many areas to prevent erosion (Cox et. al. 1984) but has extended in range far beyond the seeded areas (Cox and Ruyle 1986).

Livestock stocking rates for the allotments within the Tumacacori EMA range from 1,320 Animal Unit Months (AUM) in the Peña Blanca Allotment to 2,400 AUMs in the Bear Valley Allotment. Allotment Management Plans for Bear Valley and Sardinia Allotments are currently being revised.

The proposed action passes within 0.56 mi (0.9 km) of the Pine Canyon PAC (#0502017), which lies south of Peck Canyon. The following MSO survey information was provided by CNF. PAC #0502017 was last informally monitored in 1998, with no information on MSO pair occupancy or no surveys since then. CNF personnel have received reports of MSO calling in Sycamore Canyon north of Ruby Road in 2001, which is within 1.1 mi (1.75 km) of the southern end of the Pine Canyon PAC.

2.1f Effects of Proposed Action on the MSO

<u>Direct Effects</u>

Vehicle and Powerline Collisions

Because MSO are primarily nocturnal and likely will not be active during daylight when construction occurs, the probability of MSO collisions with construction related vehicles is extremely low. To minimize the risk of powerline collisions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested practices for raptor protection on powerlines: the state of the art in 1996" (APLIC 1996). While there is always some risk of a MSO collision with powerlines, raptors have lower rates of collision with powerlines than passerine birds (McNeil et al. 1985). This reduced collision rate may be due to visual acuity, maneuverability, and non-flocking tendencies (Nobel 1995). The risk of bird collisions with towers has been associated with birds being attracted to red lights used for aircraft avoidance (Kerlinger 2000). The towers used in the proposed action will not contain any lighting. No guy wires will be used in the construction of the proposed action, further reducing the potential for collisions.

Electrocution

Because power structures and towers are attractive perching and nesting sites for some raptor species, significant raptor mortality from electrocution has been reported in North America (Harness and Wilson 2000). Electrocution occurs when a bird simultaneously touches two phase conductors or a conductor and a ground wire (Bevanger 1994). Most electrocutions occur on distribution lines (34-kV or less) rather than on transmission lines (69-kV or more), primarily because clearances between wires on distribution lines are less and distribution lines have an array of uninsulated, structure-mounted equipment (Marti 2002). To minimize the risk of raptor electrocutions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996" (APLIC 1996). Furthermore, on the structures to be used in the proposed action, the distance between the power lines is at least 18 ft (5.5 m). Because the average wingspan of an adult MSO is 3.3 ft (1 m), there is no foreseeable risk of electrocution.

Construction Noise and Activity

Human activity within breeding and nesting territories may affect some raptors by altering home range movements (Anderson et al. 1990) and causing nest abandonment (Postovit and Postovit 1987). Disturbance from construction activities may discourage MSO from foraging or nesting in suitable habitat. The greatest noise disturbance will result from the use of helicopters during installation of transmission lines; however, Delaney et al. (1999) found that MSO were disturbed more by ground-based disturbance, such as chain saws, than by helicopter overflights. Ground-based disturbance could result from heavy machinery or large groups of construction personnel working near MSO habitat.

To prevent the disturbance of breeding MSOs, no construction activities will occur within 1 mi (1.6 km) of the Pine Canyon PAC during the breeding season (1 March to 31 August), as outlined in the conservation measures (SECTION 1.4). Construction during the non-breeding season will be short term in duration.

<u>Indirect Effects</u>

Habitat Modification and Fragmentation

Because no construction will occur within a MSO PAC, no modification or fragmentation of MSO habitat is anticipated.

Increased Legal and Unauthorized Access to MSO Habitat

Incidental encounters between MSO and non-motorized recreationists are relatively insignificant in most cases (USFWS 1995a). Most MSO appear to be relatively undisturbed by small groups (< 12 people) passing nearby (USFWS 1995a) as long as the disturbance is not for an extended period of time. The potential for hikers to disturb MSOs is greatest where hiking is concentrated in narrow canyon bottoms occupied by nesting or roosting MSOs. Noise from recreationists using off-highway vehicles (OHV) on closed access roads are much more likely to disturb MSOs, especially if their activity occurs over an extended period of time in occupied MSO habitat. Increased access to MSO habitat may subject the species to poaching or other harassment.

The road closure techniques outlined in the RA (URS 2003) should minimize unintended use of temporary construction roads but probably will not prevent it entirely. However, because only a small segment of a construction road will occur within a PAC, and forest service roads already exist within the PAC, no significant increase in unauthorized vehicular access by recreationists into occupied MSO habitat is anticipated.

Accidental Wildfire

Because of their mobility, MSO will not likely be directly impacted by wildfires. However, fire suppression efforts over the past century have created a situation that may encourage catastrophic, large-scale fires. Efforts to limit such fires are of great importance to MSO conservation. Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). The short-term effects of wildfires may affect MSO prey species through direct mortality from the fire or habitat destruction. Herbaceous plant species that serve as cover and forage for small mammals could be drastically reduced. However, because of reduced groundcover, predation upon surviving small mammals by MSO may actually increase in the short term. Furthermore, increased herbaceous production in the years following a fire may improve habitat for small mammals.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak efficacy in southern California came to similar conclusions (Green 1977).

If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of down woody material, which is capable of carrying wildfires across the landscape. Furthermore, the measures being developed for the Fire Prevention Plan will minimize the risk of wildfire associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). The short lengths of new access roads, their distance from MSO habitat, as well as the measures outlined in the Invasive Species Management Plan, will minimize the introduction or spread of invasive species into MSO habitat.

2.1g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Because the action area for this species lies entirely on USFS land, all activities are managed according to the MSO recovery plan guidelines, and future actions will be subject to the consultation requirements established under Section 7, and are not considered cumulative to the proposed action.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the MSO action area, an increase in population in Nogales, and other regional population centers may translate into an increased demand for outdoor recreation, and therefore more recreational use of USFS land.

An undetermined level of border crossings by undocumented immigrants (UDI) occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.1h Effects Determination and Incidental Take

Construction noise and activities may affect non-breeding MSO but is not likely to adversely affect the species, because construction will occur during a non-critical life stage and will be short term in duration.

Because the proposed action is not likely to adversely affect the MSO, no take is anticipated.

2.2 CACTUS FERRUGINOUS PYGMY-OWL (*GLAUCIDIUM BRASILIANUM CACTORUM*) (Endangered)

2.2a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. The action area for the CFPO includes those areas of habitat below 4,000 ft (1,219 m) that may be directly impacted by construction as well as potential nesting sites within 1,312 ft (400 m) of the proposed action (USFWS 2000) that may be subject to noise disturbance during construction. In addition, an 7.08 mi (11.4 km) buffer area surrounding the project area is included in the action area because juvenile CFPO have been documented traveling up to 7.08 mi (11.4 km) during dispersal (M. Wrigley, USFWS, pers. comm., May 2001).

2.2b Natural History and Distribution:

USFWS listed CFPO in Arizona on 10 March 1997 (USFWS 1997a) as endangered. Listing was based on historical and current evidence that suggested a significant population decline of this subspecies had occurred in Arizona. USFWS considered the loss and alteration of habitat as the primary threat to the remaining population. A recovery plan for the species is currently in development by the CFPO recovery team.

CFPO (Figure 10) are small brown birds, with a cream-colored belly streaked with paler brown (Pyle 1997). The *cactorum* race; however, is described as "a well-marked, pale grayish extreme for the species" (Phillips et al. 1964). The call for this mostly diurnal owl is heard chiefly near dawn and dusk. The best field identification features are its small size, eyespots on the nape of the neck, and long reddish-barred tail, which is often nervously wagged or twitched (Monson 1998).

Figure 10. Cactus ferruginous pygmy-owl.

Originally CFPO were described as a separate subspecies based on specimens from Arizona and Sonora, Mexico. CFPO were first documented in the United States from a collection by Lieutenant Charles E. Bendire on 24 January 1872 in the "heavy mesquite thickets along Creek" near the present day site of historic Camp Lowell, Tucson (Coues 1872, Bendire 1892).

Very little is known about the life history of CFPO in Arizona (Cartron et al. 2000a). Little or no literature currently exists concerning life history variables such as longevity, age distribution, and recruitment. Current studies undertaken by AGFD, USFWS, and The University of Arizona are examining these variables.

The diet of CFPO is not well understood, but they are believed to be prey generalists (Cartron et al. 2000a). Observations, stomach content analysis, and records of Texas pygmy-owls suggest that these owls have a diverse diet that includes mammals, birds, reptiles, and insects (Proudfoot and Beasom 1997).

CFPO nest in cavities of larger trees (typically defined as a tree with a trunk at least 6 in [15 cm] diameter at breast height [DBH]) or large columnar cactus. Cavities may be naturally formed (e.g. knotholes) or excavated by woodpeckers. CFPO do not construct their own nest holes. All currently known CFPO nest sites in Arizona are in woodpecker excavated cavities in saguaros. Historically, the species also has been documented nesting in cottonwood, paloverde, and mesquite trees in Arizona.

Nesting activity for this owl species in Arizona begins in late winter to early spring (Lesh and Corman 1995, Abbate et al. 1996). Little is known about its courtship flight behavior. Egg laying begins by late April with three to four eggs typically laid. It is uncertain if only one brood is hatched per year. Nestlings have been observed through the end of July. During nesting, the male brings food to the female and young (Glinski 1998).

Historically, CFPO occurred from the lowlands of central Arizona, south through western Mexico to the states of Colima and Michoacan, and from southern Texas south through the Mexican states of Tamaulipas and Nuevo Leon. In Arizona, the species was documented as far north as New River and Cave Creek in northern Maricopa County (Harris and Duncan 1999). Elsewhere in Maricopa County, the species has been found near the Yuma County line along the Gila River at Agua Caliente, along the Salt River at Phoenix, and near the Verde River confluence. The eastern most verifiable record was along the Gila River at Old Fort Goodwin, located approximately 2 mi (1.2 km) southwest of present day Geronimo, Graham County, Arizona (Aiken 1937). In the southeastern part of the state, the species has been documented in recent times near Dudleyville along the lower San Pedro River between 1985 and 1987 (Harris and Duncan 1999), and probably also along lower Aravaipa Creek in 1987 (Monson 1987). Other localities in south central Arizona include historical records in Pinal County near Sacaton and Blackwater on the Gila River Indian Reservation, and at Casa Grande (Harris and Duncan 1999). Near the Mexican border, the species has been found in Santa Cruz County near Patagonia and in Sycamore Canyon west of Nogales. A likely accidental sighting was documented once on 10 April 1955 in eastern Yuma County near the Mexican border at Cabeza Prieta Tanks on the Cabeza Prieta National Wildlife Refuge (Monson and Phillips 1981, Harris and Duncan 1998).

Surveys conducted by University of Arizona biologists in Sonora, Mexico found 280 CFPO during the 2000 survey season. CFPO within Sonora, Mexico and Arizona may have been the same population prior to agricultural expansion within the last 75 years. However, due to isolation, the genetic connection of the Arizona population to owls in the nearby state of Sonora, Mexico may be tenuous (USFWS 2002a).

CFPO have been documented in several habitat types in the northern portion of its range in Arizona and adjacent Mexico. In Arizona, these include streamside Sonoran riparian deciduous forest and woodland associations and Sonoran desertscrub. CFPO also inhabit Sinaloan deciduous forest and thornscrub in Mexico (not discussed here). The streamside associations include such species as cottonwood, ash, netleaf hackberry, willows, velvet mesquite, and others. The Sonoran desertscrub associations are composed of relatively dense saguaro cactus stands associated with short trees such as paloverde, mesquite, and ironwood (*Olneya tesota*), and an open understory of triangle-leaf bursage, creosote, and various other cacti and shrubs. Throughout its range, CFPO occur at low elevations, generally below 4,000 ft (1,219 m).

CFPO found in Sonoran desertscrub habitats are typically associated with structurally diverse stands of desert riparian scrub with saguaros along washes (Wilcox et al. 2000). Such habitat is often referred to as xeroriparian vegetation (Johnson and Haight 1985). These washes have no permanent water flow. Instead, flow is intermittent and based on seasonal rainfall as well as strength and duration of individual storms. Desert riparian scrub vegetation is easily recognizable by the presence of a linear assemblage of trees and shrubs that grow along the wash. Density is higher and taller than the sparse desertscrub vegetation that typically exists in the adjacent uplands. Before listing the species as endangered, all known CFPO were documented in such Sonoran desertscrub habitat (Lesh and Corman 1995, Abbate et al. 1996).

At the northern periphery of the subspecies range in southern Arizona, CFPO distribution and preferred habitat is not well understood. It is believed CFPO require the cover of denser wooded areas with understory thickets, like riparian habitat, for nesting, foraging, and predator avoidance (Abbate et al. 2000). Riparian habitat also is known for its high density and diversity of animal species that constitute the prey base of CFPO.

A significant decline in the Arizona population has occurred over the past several decades (USFWS 1997a, Richardson et al. 2000). Loss or modification of habitat from woodcutting, agriculture, groundwater pumping, and related human activities has presumably contributed to the population decline (USFWS 1997a).

2.2c Critical Habitat

On 12 July 1999, USFWS designated approximately 731,712 acres (296,113 ha) of critical habitat supporting riverine, riparian, and upland vegetation in seven critical habitat units, located in Pima, Cochise, Pinal, and Maricopa counties of Arizona (USFWS 1999). However, on 21 September 2001, the U.S. District Court for the State of Arizona vacated this final rule designating critical habitat for CFPO, and remanded its designation back to the USFWS for further consideration. On 27 November 2002, USFWS proposed designating 1.2 million acres (485,000 ha) of critical habitat for CFPO in southern Arizona (Federal Register Vol. 67, No 229:71031-71064). The proposed action does not enter any areas proposed as critical habitat.

2.2d Current Status Statewide

USFWS determined that CFPO in Arizona were endangered because of the following factors (USFWS 1997a):

- present or threatened destruction, modification, or curtailment of its habitat or range;
- inadequacy of existing regulatory mechanisms;

- other natural and manmade factors, which include low genetic viability.

Surveys conducted statewide during the 2002 season confirmed a total of 18 adult CFPO and three nests in Arizona. Similar to the previous four years, there was greater than 50 percent fledgling mortality documented in 2002, with only one juvenile confirmed surviving dispersal (S. Richardson, USFWS, pers. comm., 3 December 2002).

One of most urgent threats to CFPO in Arizona is thought to be the loss and fragmentation of habitat (USFWS 1997a, Abbate et al. 1999). The complete removal of vegetation and natural features required for many large-scale and high-density developments directly and indirectly impacts CFPO survival and recovery (Abbate et al. 1999). In recent decades, CFPO riparian habitat has continually been modified and destroyed by agricultural development, woodcutting, urban expansion, and general watershed degradation (Phillips et al. 1964, Brown et al. 1977, State of Arizona 1990, Bahre 1991, Stromberg et al. 1992, Stromberg 1993a and 1993b). Sonoran desertscrub has been affected to varying degrees by urban and agricultural development, woodcutting, and livestock grazing (Bahre 1991). Pumping of groundwater and the diversion and channelization of natural watercourses are also likely to have reduced CFPO habitat.

Proudfoot and Slack (2001) found that CFPO in northwestern Tucson may be isolated from other populations in Arizona and Mexico. Low genetic variability can lead to a reduction in reproductive success and environmental adaptability. In 1998 and 1999, two cases of sibling CFPO pairing and breeding were documented (Abbate et al. 1999). In both cases, young were fledged from the nesting attempts. These unusual pairings may have resulted from extremely low numbers of available mates within dispersal range, and/or from barriers (including fragmentation of habitat) that have influenced dispersal and limited the movement of young owls (Abbate et al. 1999).

Soule (1986) notes that very small populations are in extreme jeopardy due to their susceptibility to a variety of factors, including variations in birth and death rates that can result in extinction. In small populations such as with CFPO, each individual is important for its contribution to the genetic variability of that population.

2.2e Environmental Baseline

CFPO habitat north of Sahuarita Road consists of Sonoran desertscrub with relatively high species diversity and structural diversity, including scattered saguaro cacti containing potential nesting cavities. This area is within Survey Zone 1 (USFWS 2000) and has the highest potential for occupancy of the entire action area. Land status in this area is a mixture of private and state land. The Mission Mine Complex also is located within this section of the proposed action and grazing occurs on much of the state lands in the area.

CFPO habitat south of Sahuarita Road consists primarily of semi-desert grassland dominated by mesquite and acacia trees, mixed-cacti, ocotillo, yucca, and grasses, including non-native Lehmann's lovegrass (*Eragrostis lehmanniana*). The area is primarily undeveloped, but does contain some existing electrical distribution lines and associated roads (Figure 11) as well as low density housing developments. These grasslands are transected by desert riparian scrub dominated by mesquite and netleaf hackberry trees. Some areas of deciduous riparian forests are also found south of Arivaca Road in Sopori Wash and Peck Canyon. Land jurisdictions in this area include private, state, BLM, and USFS.

Figure 11. Example of existing disturbance within the corridor.

CFPO surveys were conducted by Harris Environmental Group, Inc. (HEG) biologists in 2001 and 2002 (data previously submitted to USFWS) in accordance with the approved protocol (USFWS 2000). Surveys were conducted in Sonoran desertscrub habitat where saguaros were present and in desert riparian scrub and deciduous riparian habitats that contained large trees (over 6 in [15.2 cm] DBH). No surveys have been conducted in deciduous riparian habitat within Sopori Wash and Peck Canyon. Surveys were conducted at 142 call points in 2001 and 140 in 2002. No CFPOs were detected during either survey year.

The only historical records of CFPO within the Nogales Ranger District (RD) of the CNF are in Sycamore Canyon (CNF 2000) and a dispersing juvenile in the Jarillas Alloment. USFS surveys in Sycamore Canyon in 1997 and 1998 did not locate CFPO. Additionally, USFS personnel surveyed 2,300 acres (930 ha) in 1999 with negative results and conducted 58 habitat assessments for CFPO habitat (CNF 2000). The habitat assessments identified four areas that ranked high enough to warrant CFPO surveys. No CFPO have been detected during surveys of these four areas (T. Newman, CNF, pers. comm., 9 October 2002).

2.2f Effects of Proposed Action on the CFPO

<u>Direct Effects</u>

Vehicle and Powerline Collisions

CFPO collisions with windows and fences have been documented in the Tucson area (USFWS 2002a), and observations of low flying CFPO across roadways indicate vehicle collisions are a realistic hazard (Abbate et al. 1999). While CFPO may be active during daylight, no CFPO have been detected within the action area, therefore, CFPO collisions with construction related vehicles are unlikely.

There is a small risk of a CFPO collision with power lines, however, raptors have lower rates of collision with power lines than passerine birds (McNeil et al. 1985). This reduced collision rate may be due to the visual acuity, maneuverability, and non-flocking tendencies (Nobel 1995). To minimize the risk of powerline collisions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested

Practices for Raptor Protection on Power Lines: the State of the Art in 1996" (APLIC 1996).

Electrocution

Because power structures and towers are attractive perching and nesting sites for some raptor species, significant raptor mortality from electrocution has been reported in North America (Harness and Wilson 2000). Electrocution occurs when a bird simultaneously touches two phase conductors or a conductor and a ground wire (Bevanger 1994). Most electrocutions occur on distribution lines (34-kV or less) rather than on transmission lines (69-kV or more), primarily because clearances between wires on distribution lines are less and distribution lines have an array of uninsulated, structure-mounted equipment (Marti 2002). To minimize the risk of raptor electrocutions, TEP will construct the proposed transmission line following the guidelines outlined in "Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996" (APLIC 1996). Furthermore, on the structures to be used in the proposed action, the distance between the power lines is at least 18 ft (5.5 m). Because the average wingspan of an adult CFPO is 15 in (38 cm), there is no foreseeable risk of electrocution.

Construction Noise and Activity

Although no CFPO have been detected in the project area, short term noise disturbance and human activity associated with construction may discourage CFPO from using habitat within and adjacent to the proposed ROW. Human activity near nest sites at critical periods of the nesting cycle may cause CFPO to abandon their nests (USFWS 2002a). While CFPO may tolerate low level noise disturbances, such as those in low density residential areas (Cartron et al. 2000b), they will probably not tolerate noise levels associated with construction activities in close proximity to a nest. The greatest likelihood of noise disturbance will result from the use of helicopters during the installation of the transmission lines, but also could result from the presence of heavy machinery or large groups of construction personnel. If CFPO are not detected during the two consecutive years of protocol surveys, the potential for direct impacts to this species is minimal.

<u>Indirect Effects</u>

Habitat Modification and Fragmentation

The proposed action will result in the disturbance of areas that could provide potential nesting, foraging, and dispersal habitat for CFPO. Because many access roads will be closed and restored and all disturbed areas will be reseeded, this disturbance will be temporary. The proposed action could potentially result in temporary disturbance to habitat from access roads and structure installations in the following amounts: 33.99 acres (13.76 ha) in Sonoran desertscrub, 46.10 acres (18.66 ha) in desert riparian scrub, and 3.12 acres (1.27 ha) in deciduous riparian.

While all large saguaros within construction sites will be transplanted, construction could temporarily degrade CFPO habitat by removing vegetation that provides forage and shelter. Elimination of groundcover plant species, rodent burrows, and native soils, as well as loss of trees and shrubs, may impact local reptile and bird populations that are important to the pygmy-owl diet. Loss of complex vegetation structure increases energy demands on owls that must forage at greater distances and risk exposure to a variety of hazards (Abbate et al. 1999). Because of the linear nature of the proposed action, these impacts will be widely distributed and relatively minor in any single area.

Increased Legal and Unauthorized Access to CFPO Habitat

Although CFPO have not been detected in the project area, recreationists may access potential CFPO habitat using temporary construction roads associated with the proposed action. While hikers and other non-motorized recreationists will create minimal disturbance, noise from Off Highway Vehicle (OHV) users are much more likely to disturb CFPO, especially if the activity occurs over an extended period of time in or near a CFPO nesting territory. Increased access to CFPO habitat may subject the species to poaching or other harassment. While TEP will prevent unauthorized access to the ROW across private land, closure of the ROW on public land, particularly state land, is not feasible. Therefore, some increase in access to potential CFPO habitat is anticipated.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, CFPO will not likely be directly impacted by wildfires. However, wildfires may destroy columnar cacti and trees that provide nesting cavities as well as affect CFPO prey species through direct mortality from the fire or habitat destruction. Herbaceous plant species that serve as cover and forage for small mammals could be drastically reduced. Because of reduced groundcover, predation upon surviving small mammals by CFPO may actually increase in the short term. Furthermore, increased herbaceous production in the years following a fire may improve habitat for small mammals in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977).

The measures outlined in the Fire Prevention Plan will minimize the risk of wildfire associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.2g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this biological assessment. While the action area for this species crosses private, state, and federal lands, the habitat with the highest potential for occupancy by CFPO occurs on state and private lands in Pima County. Future federal actions on these lands will be subject to Section 7 consultation. These actions will not be considered cumulative.

Although the amount of future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). Because of the growth rate and the development pressures from nearby Tucson and Sahuarita, it is foreseeable that land adjacent to the proposed ROW will be developed. These developments will likely include increases in associated infrastructure such as roads, groundwater use, and commercial services, all resulting in the degradation of CFPO habitat.

An undetermined level of border crossings by UDI occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase. Additionally, agriculture, recreation, OHV use, grazing, and other activities continue to occur on private and state land and adversely affect CFPO and their habitats.

2.2h Effects Determination and Incidental Take

While CFPO are not currently known to occupy the action area, the disturbance of potential habitat from construction activities and increased access may affect, and are likely to adversely affect, this species.

Take of CFPO is not anticipated because construction activities during breeding season will only occur following protocol surveys and the Conservation Measures outlined in SECTION 1.4 will minimize disturbance to potential habitat and prevent disturbance to nesting CFPO within the action area should any be detected in the future.

2.3 SOUTHWESTERN WILLOW FLYCATCHER *(Empidonax traillii extimus)* (Endangered)

2.3a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential migratory habitat for the SWFL includes those areas of Sopori Wash with dense riparian habitat similar to that described by Sogge et al. (1997) that may be directly or indirectly impacted by construction. The action area for this consists of the Sopori Wash both within the proposed ROW as well as the surrounding Sopori Wash watershed.

2.3b Natural History and Distribution

SWFL (Figure 12) are small passerine bird (Order Passeriformes; Family Tyrannidae) measuring approximately 5.75 in (14.6 cm) in length from the tip of the bill to the tip of the tail and weighing only 0.4 ounces (11.34 grams). This species has a grayish-green back and wings, whitish throat, light gray-olive breast, and pale yellowish belly. Two white wingbars are visible (juveniles have buffy wingbars). The eye ring is faint or absent. The upper mandible is dark and the lower is light yellow grading to black at the tip. SWFL are riparian obligate species, nesting along rivers, streams, and other wetlands where dense growths of willow, seepwillow (*Baccharis* sp.), buttonbush (*Cephalanthus* sp.), boxelder (*Acer negundo*), saltcedar (*Tamarix* spp.), carrizo (*Phragmites australis*) or other plants are present, often with a scattered overstory of cottonwood and/or willow.

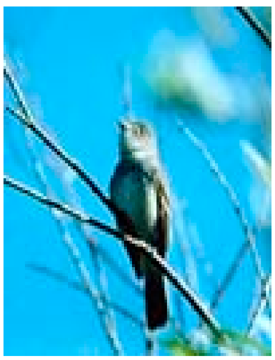


Figure 12. Southwestern willow flycatcher.

One of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993), SWFL are neotropical migratory species that breed in the southwestern U.S. from approximately 15 May to 1 September. This species migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical range of SWFL included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987).

SWFL breed in dense riparian habitats from sea level in California to just over 7,000 ft (2,134 m) in Arizona and southwestern Colorado. Historic egg/nest collections and species descriptions throughout SWFL range describe the widespread use of willow for nesting (Phillips 1948, Phillips et al. 1964, Hubbard 1987, Unitt 1987, San Diego Natural History Museum 1995). Currently, SWFL primarily use Geyer willow (*Salix geyeriana*), Goodding willow (*Salix gooddingii*), boxelder, saltcedar, Russian olive (*Elaeagnus angustifolio*), and live oak (*Quercus agrifolia*) for nesting. Other plant species less commonly used for nesting include: buttonbush, black twinberry (*Lonicera involucrata*), cottonwood, white alder (*Alnus rhombifolia*), blackberry (*Rubus ursinus*), carrizo, and stinging nettle (*Urtica* spp.). Nesting SWFL exhibit a strong preference for dense vegetation at the nest site, but high variation and density of vegetation at the patch scale (Hatten et al. 2000). Nesting sites are typically close to the edge of the vegetation patch and close to water (Allison et al. 2000). Based on the diversity of plant species composition and complexity of habitat structure, four basic nesting habitat types can be described for SWFL: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge et al.1997).

Open water, cienegas, marshy seeps, or saturated soil are typically in the vicinity of SWFL territories and nests; SWFL sometimes nest in areas where nesting substrates are in standing water (Maynard 1995, Sferra et al. 1995, 1997). Hydrological conditions at a particular site can vary remarkably in the arid southwest within a season and between years. At some locations, particularly during drier years, water or saturated soil is only present early in the breeding season (i.e., May and part of June). However, the total absence of water or visibly saturated soil has been documented at several sites where the river channel has been modified (e.g. creation of pilot channels), where modification of subsurface flows has occurred (e.g. agricultural runoff), or as a result of changes in river channel configuration after flood events (Spencer et al. 1996). Throughout their range, SWFL arrive on breeding grounds in late April and May (Sogge and Tibbitts 1992, Sogge et al. 1993, Sogge and Tibbitts 1994, Muiznieks et al. 1994, Maynard 1995, Sferra et al. 1995, 1997). Nesting begins in late May and early June, and young fledge from late June typically through mid August, but as late as early September.

SWFL are insectivores, foraging in dense shrub and tree vegetation along rivers, streams, and other wetlands. Flying insects are the most important SWFL prey item; however, they will also glean larvae of non-flying insects from vegetation (Drost et al. 1998). Drost et al. (1998) found that the major prey items of SWFL (in Arizona and Colorado), consisted of true flies (Diptera); ants, bees, and wasps (Hymenoptera), and true bugs (Hemiptera). Other insect prey taxa include leafhoppers (Homoptera: Cicadellidae), dragonflies and damselflies (Odonata); and caterpillars (Lepidoptera larvae). Non-insect prey include spiders (Araneae), sowbugs (Isopoda), and fragments of plant material.

2.3c Critical Habitat

Critical habitat for SWFL was originally designated on 22 July 1997 (USFWS 1997b), but on 11 May 2001, the 10th Circuit Court of Appeals set aside the critical habitat designation and instructed USFWS to issue a new designation in compliance with the court ruling. USFWS is currently soliciting information regarding areas important for the conservation of this species in order to re-propose critical habitat.

2.3d Current Status Statewide

The following status of SWFL in Arizona was summarized from Smith et al. (2002). In 2001, 177 sites covering approximately 139 mi (225 km) of riparian habitat were surveyed for SWFL in Arizona. Sites range from 98 ft (30 m) to 8,802 ft (2,683 m) in elevation and 98.5 ft (30 m) to 10 mi (16.1 km) in length. The mean site length was 1 mi (1.6 km). Fifty-two of the 177 sites were not surveyed according to protocol. This was due to time or funding limitations or because unsuitable SWFL habitat was found during the first survey. Of the 177 sites, 20 had not been previously surveyed. Most new survey sites were located along the Colorado River (n = 9) and Gila River (n = 4). Six hundred thirty-five resident SWFL were documented within 346 territories at 46 sites. AGFD personnel and statewide cooperators recorded 311 pairs.

SWFL were documented along 11 drainages. The greatest concentrations of SWFL were found at Roosevelt Lake (40 percent) and the Winkelman Study Area (35 percent). Resident SWFL were detected at five sites that had been surveyed at least once in previous years. Resident SWFL were documented in two drainages (Virgin River and Cienega Creek) for the first time since protocol surveys began. No historical occurrence record exists for SWFL along the Virgin River and SWFL have not been reported at Cienega Creek since 1964. These colonizations yield evidence of habitat restoration potential in these drainages that can aid in recovery of the SWFL.

2.3e Environmental Baseline

The section of Sopori Wash crossed by the proposed action supports a mixed riparian assemblage with mature but discontinuous Fremont cottonwood, netleaf hackberry along the banks, and a midstory of large mesquite (Figure 13) (HEG Field Notes, C. Hisler, AGFD, pers. comm., 18 July 2002). Understory density is relatively low. Uplands surrounding Sopori Wash are characterized by semidesert grasslands and appear to be subject to grazing.

Figure 13. Riparian habitat in Sopori Wash

This reach of Sopori Wash is ephemeral and water is probably present only for short periods of time following precipitation events. Because of the patchy habitat and lack of surface water, this area would likely be used only by migratory SWFL.

The perennial areas within Peck Canyon support small clusters of ash, walnut, and netleaf hackberry, but the density of understory vegetation necessary for SWFL is generally

lacking (Figure 14). Semidesert grasslands that are subject to grazing characterize the uplands surrounding Peck Canyon. Because of the lack of habitat structure, this area likely would not function as SWFL habitat.

The nearest recent (1999) reports of SWFL are from the Santa Cruz River between Tubac and Rio Rico, approximately 6-12 mi (10-20 km) away (McCarthey et al. 1998, Paradzick et al. 1999, Paradzick et al. 2000). All of these reports were of migrant SWFL.

Figure 14. Riparian vegetation in Peck Canyon.

2.3f Effects of Proposed Action on the SWFL

<u>Direct Effects</u>
Because the proposed action does not impact suitable breeding habitat, no direct impacts to SWFL are anticipated.

<u>Indirect Effects</u>
Habitat Modification and Fragmentation
Indirect impacts to SWFL may result from modifications to potential migratory habitat from the installation of three structures and associated construction within the Sopori Wash floodplain. Roads in Sopori Wash will be limited to a width of 12 ft (4 m), which when combined with structure installation sites, will result in the disturbance of 2.58 acres (1.04 ha) of SWFL habitat. Because disturbed cottonwood and willow specimens will be mitigated at a 2:1 ratio and riparian vegetation can recover quickly following minimal disturbance, any adverse effects to SWFL habitat will be temporary.

Increased Legal and Unauthorized Access to SWFL Habitat
This section of Sopori Wash is on a private ranch, therefore, unauthorized recreational access to Sopori Wash via temporary construction roads associated with the proposed action will be minimized. Therefore, no disturbance of SWFL or habitat modification from increased access is anticipated.

Accidental Wildfire
Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). However, because new roads in this area would not be open to the public, increased risk of wildfire because of increased access will be negligible. The measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.3g Cumulative Effects

Cumulative effects include the effects of future state, local or private actions that are reasonably certain to occur in the action area considered in this biological assessment. Most land within the action area consists primarily of ASLD lands with blocks of private parcels on either side of Arivaca Road. Federal actions would on these lands be subject to Section 7 consultation; these actions would not be considered cumulative.

Although the amount of planned private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Pima County grew by 26.5 percent and Santa Cruz County by 29.3 percent (U.S. Census Bureau 2000). Because of these growth rates and the trend of rural development to occur in areas with some existing infrastructure, it is foreseeable that the private ranches adjacent to Arivaca Road could be sold and subdivided for residential homes and ranchettes. Any substantial population increase in the area also could increase demands for access to recreational land, increase groundwater pumping, and foster the development of commercial services. These impacts to the watershed could degrade the value of habitat within Sopori Wash preventing its use by a variety of species.

An undetermined level of border crossings by UDI occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase into the foreseeable future.

2.3h Effects Determination and Incidental Take

The disturbance of potential migratory habitat may affect the SWFL, but it is not likely to adversely affect the species because the disturbance will be relatively small in area and temporary.

Because the proposed action is not likely to adversely affect the species, no take of SWFL is anticipated.

2.4 LESSER LONG-NOSED BAT *(Leptonycteris curasoae yerbabuenae)* (Endangered)

2.4a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential roosting habitat for LLNB occurs in the Tumacacori and Atascosa/Pajarito mountains, and foraging habitat occurs through those portions of the proposed ROW that contain agave and saguaro cacti. Because LLNB have been documented foraging up to 40 mi (64 km) from roost sites, the action area for the LLNB consists of all potential foraging and roosting habitat within a 40 mi (64 km) buffer surrounding the proposed action.

2.4b Natural History and Distribution

LLNB (formerly Sanborn's long-nosed bat) are one of three members of American leaf-nosed bats (Family Phyllostomidae) in Arizona (Hoffmeister 1986). LLNB (Figure 15) is one of the larger Arizona bats, gray to reddish brown in color. This bat has an erect triangular flap of skin (nose leaf) at the end of a long slender nose. LLNB can be distinguished from *Macrotus* by a much longer nose, greatly reduce tail membrane, and smaller ears; and from *Choeronycteris,* which has a shorter tail, larger tail membrane, and longer, narrower nose than LLNB.

Figure 15. Lesser long-nosed bat.

LLNB occur from the southern United States to northern South America, including several islands and the adjacent mainland of Venezuela and Colombia. LLNB are found between 4 degrees to 32 degrees N latitude in semiarid to arid conditions (Nowak 1994). This bat is typically associated with their primary food source, flower nectar and fruit of columnar cacti, and flower nectar of certain agave species. Because of the seasonal nature of their food source, they must migrate to follow flowering and fruiting plants. In addition to food availability, there must be suitable roosting within commuting distance of the food source. Currently, the longest known commute distance is about 48 km (30 mi).

The primary range of this bat lies in Mexico and Central America. Occurrences in Arizona probably represent range expansion. Prior to the 1930s, there are no records of LLNB in Arizona (Cockrum 1991). Colossal Cave and the Old Mammon Mine are the most northern sites known to house colonies of these bats. However, these sites support colonies of about 5,000 individuals, versus sites in Mexico, which are as large as 150,000 individuals.

LLNB have a bi-seasonal occurrence in Arizona. The maternity season, when bats migrate to southwestern Arizona, represents a United States population of about 30,000 individuals. The other is the fall agave flowering season, located in southeastern Arizona, which attracts about 70,000 bats. Each of these areas contains three known primary roosts and some number of secondary/transient or night roosts (sheltering ten to a few hundred individuals/site).

With the exception of a small bachelor roost located in the Chiricahua Mountains, all remaining records represent small numbers (usually single individuals) at hummingbird feeders, caught in mist nets, or chance findings in residential areas. Constantine (1966) reported two immature females from Maricopa County, one in Phoenix on 30 August 1963 and the other in Glendale on 16 September 1963. The Glendale specimen was found dead. The other was hanging on a screen door (not a normal place) indicating something was likely wrong with that bat. He also reported two males from southern California: one was taken alive on 3 October 1993 outside a home in Yucaipa, the other was taken on 18 October 1996 from the outside of a building in Oceanside (Constantine 1998). LLNB also have been reported from the Aravaipa Canyon area (Cockrum 1991). Hoffmeister (1986) has a record in the Santa Catalina Mountains, but Cockrum (1991) states it was probably a transcription error because the nectar-feeding bats found there belong to the genus *Choeronycteris*. However, Cockrum (1991) does report LLNB from the Santa Catalina Mountains but only once in a mist net set in Sabino Canyon (a female in June).

The diet of LLNB in Arizona consists primarily of the nectar, pollen, and ripe fruit of columnar cacti (particularly saguaro) and agave (e.g., *Agave chrysantha, A. deserti, A. palmeri,* and *A. parryi*). LLNB have been demonstrated to be a significant pollinator of saguaros, organpipe cacti (*Stenocereus thurberi*), and agaves (Howell and Roth 1981, Alcorn et al. 1962, and McGregor et al. 1962). Generally, LLNB in Arizona forage after dusk to nearly dawn during the months of May through September. In a single night, LLNB will forage well away from their daytime roost sites. In Sonora, Mexico, bats feed on the mainland by night at Bahia Kino and roost by day on Isla Tiburon, 15 to 20 mi (24 to 32 km) away. The closest sizable densities of columnar cacti to LLNB roosts in the Sierra Pinacate, Sonora, Mexico, are found in Organpipe Cactus National Monument in Arizona, about 25 to 30 mi (40 to 48 km) away (Fleming 1991).

In Arizona, females arrive in late March and early April, then migrate northward through Mexico along a “nectar corridor” provided by columnar cacti such as saguaro and organpipe (Fleming 1991). Female LLNB usually arrive in Arizona pregnant and congregate in traditional maternity roosts at lower elevations, feeding primarily on saguaro nectar (Cockrum 1991). Adult males arrive later in the summer and, along with dispersing members of the maternity roosts, usually roost at higher elevations, especially within proximity to significant stands of flowering agave.

LLNB are gregarious and form large maternity colonies that number in the thousands (Hayward and Cockrum 1971, Hoffmeister 1986). All four of the verified LLNB maternity roosts in the United States are found in Arizona (Cockrum 1991). The largest and most important of the four is found in a mine located in Organpipe Cactus National

Monument. About 15,000 LLNB use this mine as a maternity roost. Young are typically born between mid-May and early June (Cockrum 1991, Hayward and Cockrum 1971).

While in the roost during the day, LLNB engage in various activities such as flying, suckling of young, grooming, resting, and interacting with neighbors. LLNB are particularly active during the day and any disturbance, such as aircraft or other human activities, may cause an expenditure of extra energy (Dalton and Dalton 1993, Dalton et al. 1994). Female LLNB gathered in large maternity colonies are particularly vulnerable to disturbances. Maternity colonies are more sensitive because of the vulnerability of nonvolant young, whose recruitment into the population is essential to maintain a viable population.

2.4c Critical Habitat
No critical habitat has been designated for LLNB.

2.4d Current Status Statewide
USFWS listed LLNB as endangered throughout its range in the southwestern United States and Mexico on 30 September 1988 (USFWS 1988). Loss of roost and foraging habitat, as well as direct take of individual bats during animal control programs (particularly in Mexico) have contributed to the current endangered status of the species. All available information on the species through 1994 was summarized in the Lesser Long-nosed Bat Recovery Plan approved in 1997 (Fleming 1994). The Plan indicates that the species is not in danger of extinction in Arizona or Mexico. The species still warrants some protection, as it is vulnerable to human disturbance at roost sites because of its gregarious behavior. There also is particular concern for the protection of forage plants from disturbance or destruction near roost sites.

The primary threats to LLNB populations are agave harvesting and human disturbance of roosting and maternity colonies. Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial to LLNB (Fleming 1995). The USFWS determined that the LLNB was endangered because of the following factors (USFWS 1988):

- A long term decline in population,
- Reports of absence from previously occupied sites
- Decline in the pollination of certain agaves.

Known major roost sites include 16 large roosts in Arizona and Mexico (Fleming 1995). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known from Arizona and Mexico. Disturbance of these roosts, or removal of the food plants associated with them, could lead to the loss of the roosts. Limited numbers of maternity roosts may be the critical factor in the survival of this species.

2.4e Environmental Baseline

LLNB roosts are not known within the proposed corridor, but field surveys did locate small caves and crevices nearby that could serve as LLNB day roosts (HEG 2002, unpublished data). Furthermore, unsurveyed caves, mineshafts, and adits, which may provide suitable roost sites, occur within the Tumacacori-Atascosa mountains. The two closest known LLNB roost sites are the Cave of the Bells in the Santa Rita Mountains, approximately 32 km (20 mi) to the west, and a cave in the Patagonia Mountains, approximately 56 km (35 mi) to the west. Both of these roost sites are within the known flight distance to the proposed action and may utilize the proposed corridor for foraging.

Saguaro cacti occur within the proposed corridor north of Duval Mine Road and agaves are present in varying densities south of Arivaca Road. While the exact densities of agaves and saguaro cacti were not determined for this BA, CNF estimates that Palmer's agave is widely scattered over 1 million acres (400,000 ha) at densities of 10 to 200 per acre, generally between the elevations of 3,000 ft (914 m) and 6,000 ft (1,829 m) (USFWS 2002b).

The northern portion of the proposed action is primarily undeveloped but does contain some existing electrical distribution lines as well as low density housing developments near Sahuarita Road. The Mission Mine Complex also is located within this section of the project area and the proposed action passes through the Tumacacori EMA of the CNF. Range condition in areas crossed by the proposed action is moderately high with a stable or unknown trend. While agaves have persisted in areas grazed for more that 100 years, mortality through direct herbivory and trampling is known to occur. There is a forest-wide study to determine the effects of livestock grazing on agaves currently underway (USFWS 2001b). Livestock stocking rates for the allotments within the Tumacacori EMA range from 1,320 AUMs in the Peña Blanca Allotment to 2400 AUMs in the Bear Valley Allotment. Allotment Management Plans for Bear Valley and Sardinia Allotments are currently being revised.

2.4f Effects of Proposed Action on the LLNB

<u>Direct Effects</u>

Construction Noise and Activity

Although LLNB roosts have not been detected within the proposed corridor, short term noise disturbance and human activity associated with construction activities may disturb LLNB if they are present in undetected roosts adjacent to the proposed corridor. The greatest likelihood of noise disturbance will result from the use of helicopters during the installation, but could also result from the presence of heavy machinery or large groups of construction personnel in close proximity to an undetected roost. The consequences of disturbance to small numbers of LLNB in day roost will be less serious than disturbance of large aggregations of bats at one location.

Indirect Effects

Habitat Modification

Indirect effects to LLNB may result from the potential reduction in forage resources (agaves and saguaro cacti) during construction of temporary access roads or the installation of transmission structures. Because agaves and saguaro cacti are unevenlydistributed and the nectar provided by them are seasonally and geographically separated, the loss of significant numbers of either species may alter LLNB foraging patterns and roost selection within the action area. Even if the loss of a high density patch of flowering agaves does not cause the abandonment of a roost, bat survivorship may be reduced through increased foraging flight distances, related energy expenditures, and increased exposure to predators. Because of the linear nature of the proposed action, however, these impacts will be widely distributed and relatively minor in any single area.

Although all agave and saguaro disturbed as a result of the proposed action will be transplanted immediately outside of the construction zone, the long term survival and future flowering of these specimens is uncertain. Agaves are typically easy to cultivate in warm climates with well drained soils (Gentry 1982), but no long term studies of agave transplant survival have been conducted. Transplantation of saguaro is a common practice within southern Arizona, but preliminary results from a 10 year study indicate that smaller saguaros (<16 ft [5 m] tall) are more successfully transplanted than larger saguaros (HEG, unpublished data).

Even in areas where no agave or saguaro presently exist, dormant seeds may be present in the soil. Construction activities associated with the proposed action may compact soil and alter water infiltration, which may prohibit seed germination.

Increased Legal and Unauthorized Access to LLNB Habitat

Because LLNB are sensitive to human disturbance, (to the point of temporarily abandoning a day roost after a single human intrusion) increased human access to roost sites could negatively impact LLNB. The presence of new roads on state land will not likely result in disturbance to undetected roosts because few sites in this area support the rock outcropings, caves, and mine shafts necessary for LLNB roosts. The greatest potential for undetected roosts occurs on CNF land. The road closures on CNF land outlined in SECTION 1.4 and in the RA (URS 2003) will minimize the probability of increased human access and disturbance of LLNB in undetected roosts in these areas.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human caused ignitions in some areas (Gucinski et al. 2001). Agaves in desert grasslands have evolved with fire, but unnaturally high fire frequency and intensity can lead to the decline or elimination of agave populations. Furthermore, agave mortality from fire may affect the abundance and distribution of blooming agaves for a number of years, especially if there is high mortality within certain age and size classes.

New roads also may act as firebreaks and improve the response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of supplying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in LLNB habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.4g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. The action area for this species crosses private, state, and federal land. Future federal actions on USFS land will be subject to Section 7 consultation but these actions will not be considered cumulative. Because the action area for this species includes a 40 mi (64 km) buffer, some of the future planned actions on private and state land in southern Pima County and much of Santa Cruz County may be considered cumulative.

Although the amount of this future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). In the same time period, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000).

An undetermined level of border crossings by UDI occurs within the action area resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase. Additionally, agriculture, recreation, OHV use, grazing, and other activities continue to occur on private and state land that adversely affect LLNB and their habitats.

2.4h Incidental Take

The potential disturbance of LLNB in undetected roosts from construction noise and potential mortality of transplanted forage species may affect, and is likely to adversely affect, this species.

No take of LLNB is anticipated as a result of the proposed action for the following reasons. First, noise disturbance will likely impact small numbers of individuals and will be short term in duration, and secondly, changes in agave and saguaro distribution will not be significant in any single location.

2.5 CHIRICAHUA LEOPARD FROG (*Rana Chiricahuensis)* (Threatened)

2.5a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. The action area for the CLF consists of all cienegas, pools, livestock tanks, and streams at elevations above 3,200 ft (975 m) in the Tumacacori and Atascosa/Pajarito mountains. The action area also includes the entire watersheds of these aquatic systems and lies almost entirely on CNF land. That portion of the action area not on CNF land is a considerable distance downstream of the proposed action.

2.5b Natural History and Distribution

CLF (Figure 16) are distinguished from other members of the leopard frog (*Rana pipiens*) complex by a combination of characters, including a distinctive pattern on the rear of the thigh consisting of small, raised, cream-colored spots or tubercles on a dark background, dorsolateral folds that were interrupted and deflected medially, stocky body proportions, relatively rough skin on the back and sides, and often green coloration on the head and back (Platz and Mecham 1979). The species also has a distinctive call consisting of a relatively long snore of one to two seconds in duration (Davidson 1996, Platz and Mecham 1979).

Figure 16. Chiricahua leopard frog.

CLF are riparian habitat generalists, occupying springs, cienegas, canals, small creeks, mainstem rivers, lakes and livestock tanks at elevations of 3,281 ft (1,000 m) to 8,890 ft (2,710 m). These frogs are found in central and southeastern Arizona; west-central and southwestern New Mexico; and in Mexico, northern Sonora, and the Sierra Madre Occidental of Chihuahua, northern Durango and northern Sinaloa (Platz and Mecham 1984, Degenhardt et al.1996, Sredl et al. 1997). Adult CLF are the most aquatic of all Arizona leopard frogs, requiring aquatic habitats for larval forms and semi-aquatic habitats for adult forms. CLF may breed anytime, but breeding in late spring and early summer is most common. Eggs are oviposited in shallow water attached to vegetation, or on bottom substrate. Tadpoles can metamorphose in as few as three months, but may overwinter and metamorphose the following spring. Because time from hatching to metamorphosis is shorter in warm water than cold water, water permanency is probably more important at higher elevations.

Heterogeneous habitat is important for leopard frog populations; shallow water with emergent vegetation is important for breeding and deeper water provides escape cover for adults. In Arizona, slightly more than half of known historic localities are natural lotic systems, a little less than half are stock tanks, and the remainder are lakes and reservoirs (Sredl et al. 1997). Sixty-three percent of extant populations in Arizona occupy stock tanks (Sredl and Saylor 1998). Although stock tanks provide refugia for frog populations and are important for this species in many areas, such tanks support only small populations and these habitats are very dynamic. Tanks often dry out during drought, and flooding may destroy downstream impoundments or cause siltation, either of which may result in loss of aquatic communities and extirpation of frog populations. Periodic maintenance to remove silt from tanks also may cause a temporary loss of habitat and mortality of frogs.

CLF are rarely found in aquatic sites inhabited by non-native fish, bullfrogs (*Rana catesbiana*), and/or crayfish (*Oronectes virilis*). However, in complex systems or large aquatic sites, CLF may coexist with low densities of non-native predators (Bloomquist et al. 2002).

Where the species is extant, sometimes several small populations are found in close proximity, suggesting metapopulations are important for preventing regional extirpation (Sredl et al. 1997). Disruption of metapopulation dynamics is likely an important factor in regional loss of populations (Sredl et al. 1997, Sredl and Howland 1994). CLF populations are often small and their habitats are dynamic, resulting in a relatively low probability of long-term population persistence. However, if populations are relatively close together and numerous, extirpated sites can be recolonized.

The range of the species is divided into two parts, including: (1) a southern group of populations (the majority of the range) located in mountains and valleys south of the Gila River in southeastern Arizona, extreme southwestern New Mexico, and Mexico; and (2) northern montane populations in west central New Mexico and along the Mogollon Rim in central and eastern Arizona (Platz and Mecham 1979). Historical records exist for Pima, Santa Cruz, Cochise, Graham, Apache, Greenlee, Gila, Coconino, Navajo, and Yavapai counties in Arizona, and Catron, Grant, Hidalgo, Luna, Soccoro, and Sierra counties in New Mexico (Sredl et al. 1997, Degenhardt et al. 1996). The distribution of the CLF in Mexico is unclear. The species has been reported from northern Sonora, Chihuahua, and Durango (Hillis et al. 1983, Platz and Mecham 1979, 1984) and, more recently, from Aguascalientes. However, Webb and Baker (1984) concluded that frogs from southern Chihuahua were not CLF. The taxonomic status of *chiricahuensis*-like frogs in Mexico from southern Chihuahua to Aguascalientes is unclear and in this region another leopard frog, *Rana montezumae,* may be mistaken for the CLF.

Recent evidence suggests a chytridiomycete skin fungi is responsible for observed declines of frogs, toads, and salamanders in portions of Central America (Panama and Costa Rica), South America (Atlantic coast of Brazil, Ecuador, and Uruguay), Australia (eastern and western states), New Zealand (South Island), Europe (Spain and Germany), Africa (South Africa, "western Africa", and Kenya), Mexico (Sonora), and the United States (8 states) (Speare and Berger 2000, Longcore et al. 1999, Berger et al. 1998). Ninety-four species of amphibians have been diagnosed as infected with the chytrid *Batrachochytrium dendrobatidis*. In Arizona, chytrid infections have been reported from four populations of CLF, as well as populations of Rio Grande leopard frog (*Rana berlandieri*), Plains leopard frog (*Rana blairi*), lowland leopard frog (*Rana yavapaiensis*), Tarahumara frog (*Rana tarahumarae*), canyon treefrog (*Hyla arenicolor*), and Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) (Davidson et al. 2000, Sredl and Caldwell 2000, Morell 1999). The disease was recently reported from a metapopulation of CLF from New Mexico; that metapopulation may have been extirpated.

The role of the fungi in the population dynamics of CLF is undefined; however, it may well prove to be an important contributing factor in observed population decline. Rapid death of recently metamorphosed frogs in stock tank populations of CLF in New Mexico was attributed to post-metamorphic death syndrome (Declining Amphibian Populations Task Force 1993). Hale and May (1983) and Hale and Jarchow (1988) believed toxic airborne emissions from copper smelters killed Tarahumara frogs and CLF in Arizona and Sonora. However, in both cases, symptoms of moribund frogs matched those of chytridiomycosis. Chytrids were recently found in a specimen of Tarahumara frog collected during a die off in 1974 in Arizona. This earliest record for chytridiomycosis corresponds to the first observed mass die-offs of ranid frogs in Arizona (USFWS 2002c).

2.5c Critical Habitat
No critical habitat has been designated for this species.

2.5d Current Status Statewide
USFWS listed this species as threatened throughout its range in the southwestern United States and in Mexico on 13 June 2002 (USFWS 2002c). Potential threats to the species include disease, predation and possibly competition by non-native organisms, including fishes in the family Centrarchidae (*Micropterus* spp., *Lepomis* spp.), bullfrogs, tiger salamanders (*Ambystoma tigrinum stebbinsi*), crayfish, and several other species of fishes, including, in particular, catfishes (*Ictalurus* spp. and *Pylodictus oliveris*) and trout (*Oncorhynchus* spp. (=*Salmo*) and *Salvelinus* spp.) (USFWS 2002c). For instance, in the Chiricahua region of southeastern Arizona, Rosen et al. (1996a) found that almost all perennial waters investigated that lacked introduced predatory vertebrates supported CLF. All waters, except three that supported introduced vertebrate predators, lacked CLF.

Human factors affecting the species include modification or destruction of habitat through water dams, water diversions, groundwater pumping, introduction of non-native organisms, woodcutting, mining, contaminants, urban and agricultural development, road construction, overgrazing and altered fire regimes. Additional human factors include over-collection for commercial and scientific purposes.

In Arizona, the species is extant in seven of eight major drainages of historical occurrence (Salt, Verde, Gila, San Pedro, Santa Cruz, Yaqui/Bavispe, and Magdalena river drainages), but appears to be extirpated from the Little Colorado River drainage on the northern edge of the range. Within the extant drainages, the species was not found recently in some major tributaries and/or from river mainstems. For instance, the species was not reported from 1995 to the present from the following drainages or river mainstems where it historically occurred: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek.

USFWS reports that CLF were observed at 87 sites in Arizona from 1994 to 2001, including 21 northern sites and 66 southern sites (USFWS 2002c). Many of these sites have not been revisited in recent years; however, evidence suggests some populations have been extirpated in the Galiuro and Chiricahua mountains. In 2000, the species was also documented for the first time in the Baboquivari Mountains, Pima County, Arizona (USFWS 2002c).

Intensive and extensive surveys were conducted by AGFD in Arizona from 1990 to 1997 (Sredl et al. 1997). Included were 656 surveys for ranid frogs within the range of the CLF in southeastern Arizona. Rosen et al. (1994, 1996a, 1996b), Hale (1992), Wood (1991), Clarkson and Rorabaugh (1989), and others have also extensively surveyed wetlands in southeastern Arizona. It is unlikely that many additional populations will be found there. A greater potential exists for locating frogs at additional sites in the northern region of Arizona, as several new populations have been discovered on the Coconino National Forest in 2000 and 2001 (USFWS 2002c).

The latest information for Arizona (USFWS 2002c) indicates the species is extant in all major drainages in Arizona and New Mexico where it occurred historically. However, it has not been found recently in many rivers, valleys, and mountains ranges, including the following in Arizona: White River, East Clear Creek, West Clear Creek, Silver Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, Sonoita Creek, Pinaleno Mountains, Peloncillo Mountains, Sulphur Springs Valley, and Huachuca Mountains. In many of these regions CLF were not found for a decade or more despite repeated surveys.

2.5e Environmental Baseline

The action area for this species lies within the Tumacacori EMA of the CNF. Within this EMA, CLF are present in Sycamore Canyon, Peña Blanca Spring, Hank & Yank Tank, and Bear Valley Tank (J. Rorabaugh, USFWS, pers. comm., 1 Oct. 2002). The population in Sycamore Canyon is probably a source of immigrants to other suitable areas within the EMA (USFWS 2001b). Sycamore Canyon also is the only aquatic habitat within the EMA confirmed to contain the chytrid fungus (J. Rorabaugh, USFWS, pers. comm., 1 Oct. 2002). While there are 17 historical records of CLF in the Pajarito/Atascosa Mountains (USFWS 2001b), there are currently no plans for reintroducing CLF into any aquatic habitats in CNF (J. Rorabaugh, USFWS, pers. comm., 1 Oct. 2002). .

Watershed condition is a function of percent ground cover present to dissipate rain and prevent excess erosion. The Crossover Corridor approaches within 1,312 ft (400 m) of Red Spring and within 2 mi (3.2 km) of a total of 4 mapped springs (URS 2002). In addition to stock tanks scattered throughout the Tumacacori EMA, a number of perennial pools occur within Peck Canyon, however, the function (i.e. percent ground cover present to dissipate rain and prevent excess erosion) of the Peck Canyon watershed is unsatisfactory.

Protocol surveys were not conducted for CLF along the proposed ROW in 2002 because of fire closures and permit issues. Protocol surveys for CLF will be conducted in Peck Canyon in the year prior to construction. If CLF are documented, consultation with USFWS will be reinitiated.

2.5f Effects of Proposed Action on the CLF

Direct Effects

There are no recent records of CLF within the vicinity of the Crossover Corridor and no reintroductions are planned, therefore, no direct effects to CLF are anticipated.

Indirect Effects

Habitat Modification

Some modifications to perennial pools within Peck Canyon may occur as a result of increased erosion and while no reintroductions of CLF into this area are planned, vehicle traffic in the stream bottom may change the stream morphology precluding natural recolonization by the species. BMPs will minimize erosion into aquatic systems along this proposed ROW.

Transport of Disease Agents

Sycamore Canyon, 2.5 mi (4.2 km) from the proposed action, is the only aquatic habitat within the EMA confirmed to contain the chytrid fungus, therefore, increase in the risk of disease transport is unlikely.

Increased Legal and Unauthorized Access to CLF Habitat

Recreationists may access potential CLF habitat by use of roads constructed for the proposed action, even after the roads have been closed and revegetated. Unmanaged OHVs may damage riparian vegetation, increase siltation in pools, compact soils, and disturb water in stream channels. Increased human access to these aquatic habitats also may lead to the introduction of non-native predators to streams and stock tanks. The absence of CLF reintroduction plans, the long-term monitoring, and maintenance of road closures will minimize the probability of unauthorized access and thereby minimize any adverse effects associated with such access.

Accidental Wildfire

There is a minimal risk from accidental wildfire associated with the proposed action. Any fire would have to spread a significant distance before impacting occupied CLF habitat. Numerous roads that could serve as firebreaks and afford firefighting accessibility occur between the proposed action and CLF habitat. Furthermore, the measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.5g Cumulative Effects

Cumulative effects include the effects of future state, local or private actions that are reasonably certain to occur in the action area considered in this BA. The action area for this species crosses private, state, and federal land. Future federal actions on USFS land would be subject to Section 7 consultation but these actions would not be considered cumulative. Because the action area for this species includes the entire watersheds of the aquatic habitats on the CNF, some of the future planned actions on private and state land in Santa Cruz County may be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite being downstream of occupied and potential CLF habitat, an increase in regional population translates into an increased demand for outdoor recreation, and therefore more recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and competition at water sources. These border crossings are likely to continue or increase into the foreseeable future.

2.5h Effects Determination and Incidental Take

The transport of sediment into potential habitat and changes in stream morphology may affect CLF, but are not likely to adversely affect the species because any impacts would be attenuated over the time it would take the species to naturally recolonize the area.

Because the proposed action is not likely to adversely affect the species, no take of CLF is anticipated.

2.6 PIMA PINEAPPLE CACTUS *(Coryphantha scheeri* var. *robustispina)* (Endangered)

2.6a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential habitat for the PPC includes those areas of the proposed ROW from the TEP South Substation to an elevation of 4,600 ft (1,402 m) in the foothills of the Tumacacori Mountains.

2.6b Natural History and Distribution

PPC (Figure 17) are small, round cacti with finger-like projections. Adult cacti range in size from 1.8 in (4.6 cm) to 18 in (46 cm) in height. At the tip of each projection or tubercle is a rosette of 10 to 15 straw-colored spines with one central hooked spine. Plants can be single or multi-stemmed and produce bright yellow flowers after summer rains (Roller 1996).

Figure 17. Pima pineapple cactus.

Populations of PPC are known to occur south of Tucson, in Pima and Santa Cruz counties, Arizona and in adjacent northern Sonora, Mexico. It is distributed at low densities within the Altar and Santa Cruz Valleys, as well as in low lying areas connecting these valleys.

PPC populations are generally found in open patches within semidesert grassland and Sonoran desertscrub plant communities (Brown 1994). They are typically found on flat alluvial bajadas that are comprised of granitic material and are most abundant within the ecotone between the grassland and desertscrub biomes (Roller 1996). This plant is found at elevations between 2,362 (720 m) and 4,593 ft (1,400 m). Typically, PPC are not found in washes or riparian areas.

2.6c Critical Habitat

No critical habitat has been designated for this species.

2.6d Current Status Statewide

USFWS listed PPC as endangered throughout its range on 25 October 1993 (58 FR 49875). Habitat loss and degradation, habitat modification and fragmentation, limited geographic distribution, the rarity fo this plant species, illegal collection, and difficulties in protecting areas large enough to maintain functioning populations, all are factors that contribute to the current endangered status of this species. Due to the limited information on PPC population distributions under current habitat conditions, it is difficult to determine the current status of the plant statewide. USFWS has insufficient data to determine if the majority of populations of PPC can be sustained under current reduced and fragmented conditions. PPC densities vary throughout its range with the highest densities occurring south of Tucson through the Santa Cruz Valley (to Amado and surrounding developed parts of Green Valley and Sahuarita, and parts of the San Xavier District of the Tohono O'odham Nation). Continued urbanization, farm and crop development, mine expansion, and invasion of non-native species are primary threats to PPC populations. Overgrazing by livestock, illegal plant collection, and fire-related interactions involving non-native Lehmann's lovegrass also may have negative impacts on PPC (USFWS 1993).

2.6e Environmental Baseline

The environmental baseline for the PPC evaluates the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat and ecosystem within the action area. Based on monitoring results, the status of the PPC appears to have been recently affected by threats that completely alter or considerably modify more than one-third of the species surveyed habitat and have caused the elimination of nearly 60 percent of documented locations (USFWS 2001c). Dispersed, patchy clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to negatively impact PPC habitat.

The Crossover Corridor is primarily undeveloped but contains some existing electrical distribution lines and associated roads and is in close proximity to low density housing developments, and the Mission Mine Complex. A majority of the corridor also parallels the previously disturbed EPNG gas line. While portions of the existing EPNG gas line access road appear relatively unused and support early successional plants, other areas are severely eroded and virtually impassable by motor vehicles.

Surveys for PPC were conducted using an approved survey protocol (Roller 1996) by establishing a belt transect across identified potential habitat with each surveyor covering a 16.4 to 23 ft (5 to 7 m) swath. One survey pass of the entire corridor was conducted with more intensive area searches around confirmed PPC locations. Surveys on state, private, and BLM land covered a 200 ft (61 m) wide area centered on the proposed structure alignment. On the CNF, the coverage was expanded to 750 ft (229 m) wide. All detected PPC locations were recorded using a Global Positioning System (GPS) unit. To determine the extent of proposed disturbance to PPC habitat, recent aerial photography was used to eliminate areas not suitable for PPC, including slopes over 15 percent, high clay or bedrock soils, washes, and previously distrubed areas such as roads, buildings, mining disturbance, etc. During surveys conducted between July 2002 and March 2003, 78 PPC were detected within the 125 ft (38.1 m) ROW between the TEP South Substation and the CNF boundary (HEG 2003, unpublished data). Based on the acreage surveyed, the density of PPC within this area is approximately 0.13 PPC/acre (0.32 PPC/ha).

2.6f Effects of Proposed Action on the PPC

Direct Effects

Because the precise locations of structures and access roads can be modified to avoid sensitive resources, the proposed action will not result in the loss of any individual PPC. All known individual PPC near construction areas and along main access routes will be clearly marked and protected to avoid impacts.

Indirect Effects

Modification of Habitat

The construction of new access roads and the installation of structures will alter PPC seed sources in unoccupied, but potential PPC habitat. Construction vehicles will compact soil, changing water infiltration rates, and road construction will dramatically alter soil structure and seed source depth. Areas around structure sites and many access roads will be temporary and will regenerate as potential PPC habitat in the future. Recent observations indicate that PPC may readily establish in recently disturbed habitats (USFWS 2002c), but these areas must be allowed to recover for years or possibly decades.

Detailed analysis of impacts to habitat for this species is ongoing. To mitigate for the potential loss of PPC habitat, TEP will purchase credits in a USFWS-approved conservation bank for PPC at a ratio determined in consultation with the USFWS.

Indirect Effects

Increased Legal and Unauthorized Access to PPC Habitat

Much of the proposed corridor through PPC habitat parallels existing electrical distribution lines with existing utility access roads. Some new access roads, however, will be constructed, potentially resulting in unintended access into previously undisturbed PPC habitat (especially by OHV users). Off-road travel could directly impact additional PPC or impede seedling establishment through changes in soil characteristics. Where possible, TEP will review the potential for closure of roads on private land to limit unauthorized access to the ROW.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). It is widely regarded that most succulent species are negatively impacted by fire and are not fire adapted (Rogers and Steele 1980, McLaughlin and Bowers 1982). Plants die by direct heating of the fire or later through indirect fire effects such as grazing of spineless plants, post-fire increase in plant tissue temperature, or the introduction of disease or infestation into weakened plants (Thomas 1991). The sparse distribution of this species across the landscape can mean that loss of just a few individuals to fire can greatly affect the range and density of local PPC populations.

New roads may act as natural firebreaks and improve response times of firefighters to wildfires, thereby preventing fires from gaining in size and intensity. A study in southern

California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak efficacy in southern California came to similar conclusions (Green 1977).

The measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species
Roads may be the first point of entry for invasive species into a new landscape and may serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move away from the roadside into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires. An increased risk of fire in CFPO habitats could be detrimental to the species because it would eliminate essential features, such as saguaros and desert tree species, which are not fire adapted. Fire stimulates Lehmann's lovegrass, which in turn stimulates more fire, the result is an increase in the fire return interval at the expense of native plant species (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.6g Cumulative Effects
Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this biological assessment. Under Section 9 of the Act, the taking of listed animals is specifically prohibited, regardless of land ownership status. For listed plants, these prohibitions and the protection they afford do not apply. Listed plant species are protected only from deliberate removal from Federal land. There is no protection against removal or destruction of plants by a landowner on private land under the ESA.

Although the amount of future private development within the action area is unknown, many rural areas of Arizona are experiencing substantial growth. Pima County grew by 26.5 percent between 1990 and 2000 (U.S. Census Bureau 2000). Because of these growth rates and the development pressures of nearby Tucson and Sahuarita, Arizona, it is foreseeable that some lands adjacent to the proposed ROW will be developed. These developments will likely include increases in associated infrastructure such as roads, groundwater use, and commercial services, all resulting in the degradation of PPC habitat.

An undetermined level of border crossings by UDI occurs within the action area and results in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase into the foreseeable future. Additionally, PPC habitat is adversely affected by continual agriculture, recreation, OHV use, grazing, and other activities on private and state land.

2.6h Effects Determination

Construction activities and increased access may affect, and are likely to adversely affect PPC within the ROW, potential PPC habitat, and seedling establishment. The adverse affects to the species will be mitigated through the purchase of mitigation bank credits.

2.7 JAGUAR *(PANTHERA ONCA)* (ENDANGERED)

2.7a Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Because of the large movements possible by the jaguar and historical records for the species in a variety of habitats, the action area for the jaguar considered for the proposed action includes most of western Santa Cruz and southern Pima counties.

2.7b Natural History and Distribution

Jaguars (Figure 18) are the largest species of cat now native to the Western Hemisphere. Jaguars are large muscular cats with relatively short massive limbs, a deep-chested body, and cinnamon-buff in color with many black spots. Its range in North America includes Mexico and portions of the southwestern United States (Hall 1981). A number of jaguar records are known for Arizona, New Mexico, and Texas. Additional reports exist for California and Louisiana. Records of the jaguar in Arizona and New Mexico have been attributed to the subspecies *Panthera onca arizonensis*. The type specimen of this subspecies was collected in Navajo County, Arizona, in 1924 (Goldman 1932). Nelson and Goldman (1933) described the distribution of this subspecies as the mountainous parts of eastern Arizona north to the Grand Canyon, the southern half of western New Mexico, northeastern Sonora, and, formerly, southeastern California. The records for Texas have been attributed to another subspecies *P. o. veraecrucis*. Distribution of this subspecies was described by Nelson and Goldman (1933) as the Gulf slope of eastern and southeastern Mexico from the coast region of Tabasco, north through Vera Cruz and Tamaulipas, to central Texas. Swank and Teer (1989) indicated the historical range of the jaguar included portions of Arizona, New Mexico, and Texas. These authors consider the current range to be central Mexico through Central America and into South America as far as northern Argentina.

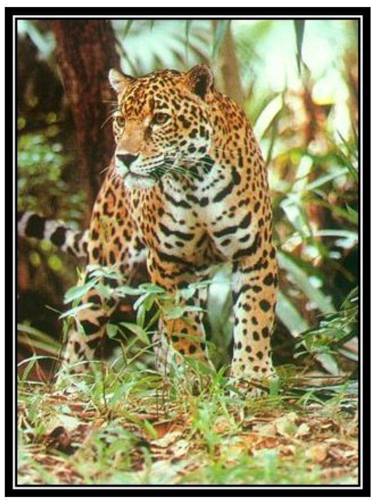


Figure 18. Jaguar.

Swank and Teer (1989) stated the United States no longer contains established breeding populations of jaguar, which probably disappeared from the United States in the 1960s. According to these authors, the jaguar prefers a warm tropical climate and is usually associated with water, and rarely found in extensive arid areas. Goldman (1932) believed the jaguar was a regular, but not abundant, resident in southeastern Arizona. Hoffmeister (1986) considered the jaguar an uncommon resident species in Arizona. He concluded that the reports of jaguars between 1885 and 1965 indicated a small but resident population once occurred in southeastern Arizona. Brown (1983a) suggested the jaguar in Arizona ranged widely throughout a variety of habitats from Sonoran desert scrub through subalpine conifer forest. Most of the records were from Madrean evergreen-woodland, shrub-invaded semidesert grassland, and along rivers.

Brown (1983a) presented an analysis suggesting there was a resident breeding population of jaguars in the southwestern United States at least into the 20th century. USFWS (1990) recognized that the jaguar continues to occur in the American southwest as an occasional wanderer from Mexico. Currently, breeding population of jaguar are unknown in the United States.

In Arizona, the gradual decline of the jaguar appeared to be concurrent with predator control associated with land settlement and the development of the cattle industry (Brown 1983a, USFWS 1990). Lange (1960) summarized the jaguar records from Arizona, and between 1885 and 1959 the reports consisted of 45 jaguars killed, six sighted, and two recorded by sign. Brown (1991) related that the accumulation of all known records indicated a minimum of 64 jaguars were killed in Arizona after 1900.

2.7c Critical Habitat
No critical habitat has been designated for this species.

2.7d Current Status Statewide
Jaguar were initially listed as endangered from the United States - Mexico border southward to include Mexico and Central and South America (37 FR 6476, 1972; 50 CFR 17.11, August 1994). As a result of a petition, the jaguar was proposed as endangered in the United States (59 FR 35674; July 13, 1994). In a Federal Register notice dated 22 July 1997, the jaguar was listed as an endangered species in the United States (62 FR 39147).

The most recent records of jaguars in the United States are from Arizona. In 1971, a jaguar was taken east of Nogales and in 1986 one was taken from the Dos Cabezas Mountains. The latter reportedly had been in the area for about a year before it was killed. AGFD (1988) cited two recent reports of jaguars in Arizona. The individuals were considered to be transients from Mexico. One report (1987) was from an undisclosed location. The other report was from 1988, when tracks were observed for several days prior to the treeing of a jaguar by hounds in the Altar Valley, Pima County. An unconfirmed report of a jaguar at the Coronado National Memorial was made in 1991. In 1993, an unconfirmed sighting of a jaguar was reported for Buenos Aires National Wildlife Refuge. In March 1996, the presence of a jaguar was confirmed through photographs made in the Peloncillo Mountains of Arizona and New Mexico (Glenn 1996). AGFD reported a jaguar sighting in the Baboquívari Mountains in 1996, and in the fall of 1997, one was reported from the Cerro Colorado Mountains of southern Arizona. A jaguar was recently documented (December 2001) in the Atascosa Mountains within about 2 mi (3 km) of the proposed action.

2.7e Environmental Baseline
The Tumacacori EMA is the location of recent reports of jaguars in the United States. This area continues to include the most likely habitat that will support the existence of jaguars in the United States. Many of the larger canyon bottoms in the Tumacacori EMA contain substantial cover and could act as travel corridors for dispersing jaguars. It is believed that all recent sightings of jaguars in Arizona are males dispersing north from

the northern most breeding population in Mexico in an effort to find unoccupied habitat (B. VanPelt, AGFD, pers. comm., 3 October 2002). Because no breeding pairs are thought to exist north of the United Sates-Mexico border, conservation of the Mexican population is vital to the future presence of jaguars in Arizona.

Under the leadership of AGFD and New Mexico Department of Game and Fish, a conservation agreement and strategy has been prepared to address the conservation of the jaguar in Arizona and New Mexico. This agreement established an interstate/intergovernmental Jaguar Conservation Team under a Memorandum of Agreement (MOA). This MOA has been signed by various state and federal cooperators and local and tribal governments with land and wildlife management responsibilities in the geographic area of concern. The Jaguar Conservation Agreement and Strategy serves as a mechanism for implementation of actions for the protection and conservation of the jaguar, while providing a template for the recovery of the species until a recovery plan is prepared and adopted.

The Conservation Agreement established procedures for reporting and evaluating jaguar sightings and compiling distribution and occurrence information, investigation of livestock depredation, evaluation of habitat suitability, development of education materials, and other activities. The Jaguar Conservation Agreement also provides for participation by interested private citizens and organizations. CNF grazing allotment permitees are participating in this process.

The December 2001 sighting mentioned earlier came from a remote camera operated under the direction of the Jaguar Conservation Team (S. Schwartz, AGFD, pers. comm., 17 September 2002). Currently, 14 remote cameras are positioned along the United States-Mexico border in an attempt to document movement of jaguars in and out of Arizona (J. Childs, Jaguar Conservation Team, pers. comm., 3 October 2002).

2.7f Effects of Proposed Action on the Jaguar

Direct Effects

Construction Noise and Activity

Because jaguars are primarily nocturnal, disturbance from construction activities, even in suitable dispersal habitat, is unlikely. The greatest likelihood of noise disturbance will result from the use of helicopters during early morning or late evening hours. However, because of the linear nature of the proposed action, any noise disturbance will be widely distributed and relatively short term in any location. Any jaguar within the action area will likely avoid construction sites. The use of additional remote cameras to monitor the United States-Mexico border south of the proposed action also will minimize the possibility of construction activities affecting breeding jaguars.

Indirect Effects

Habitat Modification and Fragmentation

Roads can reduce habitat value because of habitat fragmentation and edge effects. Some studies have shown that a few large areas of low road density, even in a landscape of high average road density, may be the best indicator of suitable habitat for large vertebrates (Rudis 1995). Because construction activities within riparian corridors or other major canyons will be minimal and widely distributed, no adverse impacts to the composition or structure of jaguar movement corridors or fragmentation of habitat is anticipated. Furthermore, access and construction roads for the proposed action commonly are spurs off existing roads and range between 500 ft (152 m) and 1,000 ft (305 m) in length, which do not isolate or separate habitat patches.

While access roads and structure site construction could degrade the habitats of jaguar prey species, effects on the prey base are difficult to quantify. The primary jaguar prey species in Arizona is deer (*Odocoileus* spp.), which have relatively large home ranges. Road-avoidance behavior (up to distances of 300 ft [90 m] to 600 ft [180 m]) is common in large mammals (Lyon 1983), including those species that may serve as prey for jaguars. Because of the linear nature of the proposed action, impacts to deer habitat will be widely distributed and relatively minor in any single area.

Increased Legal and Unauthorized Access to Jaguar Habitat
Jaguars appear to be relatively tolerant of some level of human activity (B. VanPelt, AGFD, pers. comm., 3 October 2002) and have been documented using areas that have recreational and agricultural activities occurring on a regular basis. However, increased human access to potential jaguar habitat through the use of temporary proposed construction roads could reduce the quality of the habitat. The road closure techniques outlined in the SECTION 1.4 and the RA (URS 2003) will minimize unintended uses of these roads.

Accidental Wildfire
Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, jaguars will not likely be directly impacted by wildfires; however, these wildfires could potentially alter or destroy portions of prey species habitat. While the short-term effects of wildfires may affect prey species through loss of forage from the fire, increased herbaceous production in the years following a fire may improve habitat in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape. The fire prevention measures being developed for the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.6g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal lands, the habitat with the highest potential for occupancy by jaguars occurs on USFS land in Santa Cruz County. Future federal actions on these lands will be subject to Section 7 consultation; these actions will not be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.6h Effects Determination and Incidental Take

Construction noise and activity associated with the proposed action may affect the jaguar, but it is not likely to adversely affect the species because any disturbance will be widely distributed and short term in duration.

Because the proposed action is not likely to adversely affect the jaguar, no take is anticipated.

2.8 GILA TOPMINNOW *(Poeciliopsis occidentalis occidentalis)* (Endangered)

2.8a Action Area

The action area includes all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. In streams, the action area is often much larger than the area of the proposed action because impacts in the watershed may be concentrated in the stream and actions within the stream may be carried downstream well outside of the immediate project area. The action area for the Gila topminnow is the entire Santa Cruz River watershed.

2.8b Natural History and Distribution

The Gila topminnow (Figure 19) was originally described by Baird and Girard (1853) as *Heterandria occidentalis* from a specimen collected in 1851 from the Santa Cruz River near Tucson. It was redescribed by Hubbs and Miller (1941) as *Poeciliopsis occidentalis*. As with all species in the family Poeciliidae, the Gila topminnow exhibits sexual dimorphism. Both males and females are tan to olive-bodied and usually white on the belly. Scales of the dorsum are darkly outlined and the fin rays contain melanophores, although lacking in dark spots. Dominant sexually mature males are often blackened, with some gold on the pre-dorsal midline, orange at the base of the gonopodium, and exhibits bright yellow pelvic, pectoral, and caudal fins (Minckley 1973). Females remain drab in coloration upon reaching maturity and throughout their life. All male poeciliids have a modified anal fin (gonopodium) used to fertilize the female internally.

Figure 19. Gila topminnow

Habitat requirements of *P. o. occidentalis* are broad. The species prefers shallow, warm, fairly quiet water; however, they can become acclimated to a much wider range of conditions. Both lentic habitats and lotic habitats with moderate current are easily tolerated. Temperatures from near freezing under ice to 98.6 degrees F (37 degrees C) have been reported, with a maximum tolerance of 109.4 degrees F (43 degrees C) for brief periods (Heath 1962). Gila topminnows can live in a wide range of water chemistries, with recorded pH values from 6.6 to 8.9, dissolved oxygen readings from 2.2 to 11 milligrams/liter (Meffe et al. 1983), and salinities from very dilute to sea water (Schoenherr 1974). The widespread historic distribution of Gila topminnows throughout rivers, streams, marshes, and springs of the Gila River Basin is evidence for their tolerance of these environmental extremes. One reestablished population (Mud Springs) survived for 16 years in a simple cement-watering trough before being moved.

Meffe et al. (1983) reported that topminnows can tolerate almost total loss of water by burrowing into the mud for 1-2 days. Preferred habitats contain dense mats of algae and debris, usually along stream margins or below riffles, with sandy substrates sometimes covered with organic mud and debris (Minckley 1973). Topminnows are usually found in the upper third of the water column and young show a preference for the warmest and shallowest areas (Forrest 1992). Simms and Simms (1992) found topminnows occupying pools, glides, and backwaters more frequently than marshes or areas of fast flow.

According to Schoenherr (1974), the spring-heads presently occupied by Gila topminnows are questionable as preferred habitat. Destruction of historically occupied habitats such as the marshes, sloughs, backwaters, and edgewaters of larger rivers and presence of non-native fish in such habitats that remain has undoubtedly forced Gila topminnow out of their preferred historic habitats and into the spring-heads and smaller erosive creeks we see them in today. Their tolerance of conditions in these habitats has allowed them to maintain populations with less impact from non-native fishes.

Gila topminnows are viviparous fish, meaning embryos grow and mature within the female and are born living. Eggs are fertilized internally through deposition of spermatophores (packets of sperm) into the female genital pore by the male gonopodium. Female Gila topminnow can store spermatozoa for several months, and may produce up to 10 broods after being isolated from males (Schultz 1961). Female Gila topminnows also exhibit superfetation in which 2 or more groups of embryos at different stages develop simultaneously. Females of the genus *Poeciliopsis* generally carry only 2 stages, although some *P. o. occidentalis* females have been shown to carry 3 stages for a few days when population densities are low. The mean interval between broods is 21.5 days (Schoenherr 1974). Brood size ranges from 1-31 dependent upon female standard length (SL) (Constantz 1974; Schoenherr 1974, 1977). Under optimum laboratory conditions, *Poeciliopsis* can produce 10 broods per year at intervals of 7 to 14 days (Schultz 1961). Sexual maturity can be attained as early as 2 months or as late as 11 months following birth, dependent upon the season of birth (Schultz 1961; Constantz 1976, 1979; Schoenherr 1974).

Breeding occurs primarily during January through August, but in thermally constant springs, young may be produced throughout the year (Heath 1962; Minckley 1973; Schoenherr 1974). During the peak of the breeding season up to 98 percent of mature females are pregnant (Minckley 1973). Dominant males turn black, defend territories, and court females. Smaller subordinate males do not turn black or defend territories. Instead, they take on a "sneaking" mating strategy where they attempt to mate with uncooperative females while the dominant male is busy elsewhere. Subordinate males have a longer gonopodium, which may have an adaptive benefit for this type of mating strategy (Constantz 1989). However, if the larger territorial males are removed, smaller males will become dominant, take on breeding coloration, and defend territories (Constantz 1975; Schoenherr 1977). Brood size and the onset of breeding in topminnows can be influenced by several factors including food abundance, photoperiod, temperature, predation upon the population, and female size. Increased food supply and larger female size are believed to contribute to the greater fecundity seen in topminnows from Monkey Spring canal compared with topminnows from Monkey Spring headspring (Constantz 1974, 1979; Schoenherr 1974, 1977). Sex ratios in stabilized populations nearly always favor females, varying from 1.5 to 6.3 per male (Schoenherr 1974).

Gila topminnows are opportunistic omnivorous feeders, having a gut length 1.5 to 2 times SL of the individual (Schoenherr 1974). They have weakly spatulate dentition characteristic of an omnivorous diet. Primary food items include detritus, vegetation, amphipods, ostracods, insect larvae, and rarely, other fish (Schoenherr 1974; Gerking and Plantz 1980; Meffe et al. 1983; Meffe 1984).

Gerking and Plantz (1980) noted that Gila topminnows prefer to eat large prey, but prey sizes are limited by mouth size. Schoenherr (1974) observed that individual fishes in complex habitats with several food resources present will select and focus on different items. He suggested that variation in feeding among individuals prevents over-utilization of a single resource, thus enhancing survival potential of the species.

In the United States, this species currently occurs in the Gila River drainage, Arizona, particularly in the upper Santa Cruz River, Sonoita and Cienega creeks, and the middle Gila River. The Gila topminnow is restricted to 14 natural localities in Arizona. In Mexico, the species occurs in the Río Sonora, Río de la Concepción, and Santa Cruz River but are not listed under the ESA. Gila topminnows occupy a variety of habitats, including: springs, cienegas, permanent and interrupted streams, and margins of large rivers. Habitat alteration and destruction, and introduction of predatory non-native fish, (principally western mosquitofish [*Gambusia affini*]) is the main reason for decline of the Gila topminnow.

2.8c Critical Habitat
No critical habitat has been designated for this species.

2.8d Current Status Statewide
The United States population of the Gila topminnow was federally listed as an endangered species in 1967 (USDOI 1967). The original recovery plan for Gila topminnow listed 10 extant natural populations: Monkey Spring, Cottonwood Spring, Sheehy Spring, Sharp Spring, Santa Cruz River near Lochiel, Redrock Canyon, Cienega Creek, Sonoita Creek (presumably including localities above and below Patagonia Lake), Salt Creek, and Bylas Springs (USFWS 1984). Gila topminnows were also known from Middle Spring (also known as SII or Second Spring) on the San Carlos Apache Indian Reservation (Meffe et al. 1983). Middle Spring was considered part of the Bylas Springs complex in the earlier recovery plan.

Since 1984, Gila topminnows have been discovered or rediscovered at 4 additional locations: North Fork of Ash Creek in 1985 (Jennings 1987), Fresno Canyon in 1992, Santa Cruz River north of Nogales in 1994, and Coal Mine Canyon in 1996 (Weedman and Young 1997). However, Gila topminnow were last collected from the North Fork of Ash Creek in 1985 and from Sheehy Spring in 1987. They have also been very rare or absent during recent surveys (last 5 years) of Sonoita Creek above Patagonia Lake and Santa Cruz River near Lochiel. Mosquitofish are quite common in both areas. Topminnows were extirpated from 1 of the original 10 localities, Salt Creek, by mosquitofish (Marsh and Minckley 1990), but the stream was renovated and restocked with Gila topminnows from Middle Spring. Subsequently, mosquitofish were found in the stream and it was again renovated and restocked with topminnows from Bylas Spring. Thus, there are 14 naturally occurring localities (considering Sonoita Creek above and below Patagonia Lake as 2 separate localities) currently known to support Gila topminnows in the United States.

Eleven of the naturally occurring locations currently supporting Gila topminnows are in the Santa Cruz River system: Redrock Canyon, Cottonwood Spring, Monkey Spring, upper Sonoita Creek, Fresno Canyon, Coal Mine Canyon, lower Sonoita Creek, Santa Cruz River north of Nogales, Cienega Creek, Sharp Spring, and the upper Santa Cruz River. The 2 remaining localities (Bylas Springs and Middle Spring) and Salt Creek are next to the Gila River on the San Carlos Apache Indian Reservation. Bylas Springs has been unsuccessfully poisoned twice to remove mosquitofish (Meffe et al. 1983; Brooks 1985; Marsh and Minckley 1990). Another attempt at renovation of Bylas Springs was done by USFWS Arizona Fishery Resource Office and has so far been successful. The population at Middle Spring was eliminated by lack of water during the summer of 1989, but was recently reestablished (following construction of additional pool habitat) with Gila topminnows from the original Middle Spring population held at Roper Lake State Park. Salt Creek has also been renovated and restocked with topminnows originally from Bylas Spring.

As part of past recovery actions, more than 200 Gila topminnow reintroductions or natural dispersals from reintroductions have occurred at 175 wild locations. For this count, a wild location refers to an area that does not have a mailing address, in contrast with a captive population that does (following Simons 1987). Eighteen wild populations remained in 1997, 17 of which are in historic range (Weedman and Young 1997). Seven of these populations are secure enough that they should persist into the foreseeable future. Minckley and Brooks (1985), Brooks (1985, 1986), Simons (1987), Bagley et al. (1991), Brown and Abarca (1992), and Weedman and Young (1997) describe the plight of re-established and captive populations of Gila topminnows.

Gila topminnows also have been stocked into many captive locations for propagation or conservation. Twelve captive populations were known to persist in 1997. The following publicly maintained populations are large enough to provide individuals for reintroductions, although one is known to be mixed with topminnows from more than one natural population (Arizona-Sonora Desert Museum, Boyce-Thompson Arboretum (mixed), Dexter National Fish Hatchery and Technology Center, Roper Lake State Park, Arizona State University, and Hassayampa River Preserve).

2.8e Environmental Baseline

Gila topminnow currently occupy the Santa Cruz River in its perennial reaches, as far north as Chavez Siding Road. This reach of the river was also occupied by longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus clarki*), Sonora sucker (*Catostomus insignis*), green sunfish (*Lepomis cyanellus*), and mosquitofish as recently as 1997 (USFWS 2001d). No Gila topminnows occur on the Tumacacori EMA and there are currently no plans for reintroductions in any locations (CNF 2000; D. Duncan, USFWS, pers. comm., 1 October 2002).

2.8f Effects of Proposed Action on the Gila topminnow

Direct Effects

The effects of the proposed action on this species are not anticipated to include direct effects to individual Gila topminnow because no construction will occur within occupied habitat.

Indirect Effects

Habitat Modification

Some indirect impacts to Gila topminnow habitat from erosion are possible from the construction of the proposed action. While the removal of vegetation for construction of access roads will increase surface runoff and sediment transport, and decrease infiltration of precipitation (Gifford and Hawkins 1978, Busby and Gifford 1981, Blackburn 1984, DeBano and Schmidt 1989, Belnap 1992, Belsky and Blumenthal 1997), the implementation of BMPs will help control erosion. However, unusually large precipitation events may temporarily overwhelm BMPs and result in some increase in sediment transport. Nevertheless, the distance of the proposed action from the Santa Cruz River will minimize the amount of sediments reaching Gila topminnow habitat.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Roads constructed for the proposed action also may allow the establishment or increased density of non-native grasses, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Wildfires could remove groundcover that is important in dissipating rainfall energy and reducing erosion.

However, new roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining what suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban 1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape.

The measures outlined in the Fire Prevention Plan being developed will minimize the risks of wildfires associated with the proposed action. Measures outlined in the Invasive Species Management Plan also will minimize the introduction or spread of invasive species that may facilitate fires.

2.8g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this BA. While the action area for this species encompasses private, state, and federal land, the habitat with the highest potential for occupancy by Gila topminnow occurs on private land in Santa Cruz County. Most future actions on private land will not be subject to Section 7 consultation.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew by 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand for recreational use of national forest lands.

An undetermined level of border crossings by UDI also occurs within the action area, resulting in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase.

2.7h Effects Determination and Incidental Take

The transport of sediments into the Santa Cruz River may affect the Gila topminnow; however, any increase in sediments will be relatively small because of the distance of the proposed action from occupied habitat. Therefore, it is not likely to adversely affect the species.

Because the proposed action is not likely to adversely affect the species, no take of Gila topminnow is anticipated.

2.9 MEXICAN GRAY WOLF *(Canis lupus baileyi)* (Endangered)

2.9a. Action Area

The action area includes all areas potentially affected, directly or indirectly, by all aspects of the project. Potential habitat for Mexican gray wolf is found within portions of Santa Cruz County containing oak and pine/juniper savannas above 4,000 ft (1,200 m). Wolves may travel long distances during hunting expeditions, typically in an irregular circle 20 mi (34 km) 60 mi (68 km) in diameter. The action area for the Mexican gray wolf considered for the proposed action includes all potential habitat and travel corridors in western Santa Cruz and southern Pima County.

2.9b. Natural History and Distribution

Mexican gray wolves (Figure 20) are the smallest and southernmost of the 5 subspecies of gray wolf in North America. The Mexican gray wolf is a large dog-like carnivore with a mixed brown, rust, black, gray, and white. This species has a distinct white lip line, chin, and throat. Adults weigh between 50-90 lbs (23-41 kg) (Hoffmeister 1986). The historic range was from southeastern Arizona, southwestern New Mexico, southwestern Texas, and south through the Sierra Madre of Mexico. The Mexican gray wolf is the southernmost occurring and most endangered subspecies in North America. This wolf is the last subspecies of gray wolf known to occur in the Arizona-New Mexico area. The last known naturally occurring U.S. specimen was found in New Mexico in 1970 (USFWS 2001d).

Figure 20. Mexican gray wolf.

Historically, Mexican gray wolf habitat was montane woodlands, presumably because of the favorable combination of cover, water, and prey availability. Most wolf collections came from pine, oak, and pinyon/juniper woodlands, and intervening or adjacent grasslands above 1,372 m (4,500 ft) (Brown 1983b). Wolves avoided desertscrub and semi-desert grasslands, but wooded riparian corridors were probably used for travelling and hunting (Parsons 1996).

These are social animals in the dog family that live and travel in packs of 7 to 30 animals depending upon prey size and availability. Mexican gray wolves prey upon a variety of animals from mice and squirrels to deer and elk. Territory size can range from 30 (78 km^2 to 500 mi^2 (1,295 km^2) or more. Packs are led by a pair of dominant animals that control most of the breeding. Breeding season lasts from late winter to early spring, and the dominant female produces up to 6 pups for the pack. The wolves care for the pups communally.

During the late 1800s through the mid 1900s, extensive hunting, trapping, and poisoning efforts at local, state, and federal levels resulted in the extirpation of this species from the United States portion of its range. Reintroduction efforts of captive bred wolves are under way in the Blue Range Recovery Area of eastern Arizona and New Mexico. Fourteen packs have been released to date.

2.9c Critical Habitat
No critical habitat has been designated for this species.

2.9d Current Status Statewide
Mexican gray wolves were listed as endangered by the USFWS in 1976 (41 FR 17736) without critical habitat. In 1998, an experimental, non-essential population was designated for the southwest (63 FR 1763) and a reintroduction program was initiated. Eleven wolves from captive breed stock were reintroduced into the Apache National Forest in southeastern Arizona under the experimental, non-essential designation in an effort to re-establish the subspecies to a portion of its historic range. A Recovery Plan for this subspecies was completed in 1982 and revisions are currently in progress (USFWS 2001d).

Mexican gray wolf populations steadily declined in Arizona because of predator control programs and conflicts with livestock interests. Pressure to control wolves became a priority beginning in the 1920s when this subspecies was nearly eliminated from the state and prevention of wolves from entering from Mexico was undertaken. In 1921 and 1922, a reported 58 wolves were taken by trapping or poisoning in Arizona. By 1924, reported takings dropped to 29 and by 1936, to 5. After 1952, only 2 wolves were reported taken in Arizona, 1 in 1958 and another in 1960 (Hoffmeister 1986). Reports of Mexican gray wolves living in the wild in Arizona continued into the early 1970s (USFWS 1982).

Similar predator control programs in Mexico reduced populations and may have eliminated the wolf by the 1980s. Surveys conducted in Mexico in the early 1990s did not confirm Mexican gray wolf populations in the wild (Parsons 1996).

2.9e Environmental Baseline
The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consideration.

The Tumacacori EMA contains some areas of montane and riparian woodlands that may serve as dispersal corridors for Mexican gray wolves. If wolf populations exist in the mountains of Sonora, these corridors may be used as hunting and dispersal corridors. There are currently no plans to reintroduce the Mexican gray wolf into southern Arizona and, because of the distance and fragmentation of intervening habitat, it is unlikely that current experimental populations in northern Arizona could disperse into Santa Cruz County.

2.9f Effects of Proposed Action on the Mexican Gray Wolf

Direct Effects

Construction Noise and Activity

Because the only wild populations of Mexican gray wolves in Arizona occur in the Apache National Forest, disturbance from construction of the proposed action, even in suitable dispersal habitat, is highly unlikely. In the event that populations of wolves exist in Mexico and could disperse into southern Arizona, the greatest likelihood of disturbance will result from the use of helicopters during early morning or late evening hours. However, because of the linear nature of the proposed action, any noise or construction disturbance will be widely distributed and relatively minor in any single area.

Indirect Effects

Habitat Modification and Fragmentation

Roads can reduce habitat value because of habitat fragmentation and edge effects. Gray wolves (*Canis lupus*) in Wisconsin are limited to places with pack-area mean road densities of 0.7 mi/1 mi^2 (1.1 km/1 km^2) or less (Mladenoff et al. 1995). Some studies have shown that a few large areas of low road density, even in a landscape of high average road density, may be the best indicator of suitable habitat for large vertebrates (Rudis 1995). Access and construction roads for the proposed action commonly are spurs from existing roads and range between 500 ft (152 m) and 1,000 ft (305 m) in length, which do not isolate or separate habitat patches. Furthermore, construction activities within montane woodlands, riparian corridors or major canyons will be minimal and widely distributed, resulting in negligible impacts to the composition or structure of Mexican gray wolf habitat.

Increased Legal and Unauthorized Access to Mexican Gray Wolf Habitat

Gray wolves experience negative interactions with humans and roads are a key facilitator (Thiel 1985). Increased human access to potential wolf habitat through the use of temporary proposed construction roads could reduce the quality of the habitat and human interactions may increase mortality (Mech 1973). The road closure techniques outlined in the SECTION 1.4 and the RA (URS 2003) will minimize unintended uses of these roads.

Accidental Wildfire

Increased road access may contribute to an increase in the frequency of human-caused ignitions in some areas (Gucinski et al. 2001). Because of their mobility, wolves will not likely be directly impacted by wildfires; however, these wildfires could potentially alter or destroy portions of prey species habitat. While the short-term effects of wildfires may affect prey species through loss of forage from the fire, increased herbaceous production in the years following a fire may improve habitat in the long term.

New roads also may act as firebreaks and improve response time of firefighters to wildfires, thereby preventing these fires from gaining in size and intensity. A study in southern California concluded that the road network had been a key factor in determining suppression strategies were used, both in firefighter access and because roads were widely used for backfiring and burning-out operations (Salazar and Gonzalez-Caban

1987). Early studies of fuelbreak effectiveness in southern California came to similar conclusions (Green 1977). If deemed appropriate, new roads may allow fuelwood collection in areas currently not accessible, thereby reducing the density of downed, woody material, which is capable of carrying wildfires across the landscape. Fire prevention measures outlined in the Fire Prevention Plan will minimize the risks of wildfires associated with the proposed action.

Invasive Species

Roads may be the first point of entry for invasive species into a new landscape, and can serve as a corridor along which plants move farther into the landscape (Lonsdale and Lane 1994, Greenberg et al. 1997). Some invasive plants may then be able to move into adjacent patches of suitable habitat. Invasion by these plants may have significant biological and ecological effects if the species are able to disrupt the structure or function of an ecosystem. Roads constructed for the proposed action could allow the establishment or increased density of non-native plants, such as Lehmann's lovegrass, an invasive species that facilitates wildfires (McPherson 1995). Measures outlined in the Invasive Species Management Plan will minimize the introduction or spread of invasive species as a result of the proposed action.

2.9g Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this biological assessment. While the action area for this species encompasses private, state, and federal lands, the habitat with the highest potential for occupancy by Mexican gray wolf occurs on USFS land in Santa Cruz County. Future federal actions will be subject to Section 7 consultation and will not be considered cumulative.

Although the amount of future private development within Santa Cruz County is unknown, many rural areas of Arizona are experiencing substantial growth. Between 1990 and 2000, Santa Cruz County grew 29.3 percent (U.S. Census Bureau 2000). Despite its distance from the proposed action, an increase in population in Nogales, Arizona and other regional population centers translates into an increased demand for recreational use of USFS land.

An undetermined level of border crossings by UDI also occurs within the action area and results in habitat damage from new roads, discarded trash, illegal campfires, and disturbance near water sources. These border crossings are likely to continue or increase into the foreseeable future.

2.9h Incidental Take

Construction noise and activity associated with the proposed action may affect the Mexican gray wolf, but it is not likely to adversely affect the species because any disturbance will be widely distributed and short term in duration. Because the proposed action is not likely to adversely affect the Mexican gray wolf, no take is anticipated.

3.0 USFS SENSITVE SPECIES

USFS special status species are plant and wildlife species that are of concern because their populations are declining in size. We contacted federal (USFWS) and state (AGFD) natural resource agencies requesting information on possible special status species (sensitive, threatened and endangered) that may exist on or near the proposed Crossover Corridor of the TEP Sahuarita – Nogales Transmission Line. Agency correspondence is presented in Appendix B.

In a letter dated 2 May 2002, AGFD listed 23 USFS Sensitive species that are known to occur within 3 mi (4.8 km) of the proposed corridor or may be expected to occur along the corridor if suitable habitat exists. The information listed in the letter was based on AGFD Heritage Data Management System. In addition, 18 USFS sensitive species known to occur within 5 mi (8 km) to 10 mi (16 km) of the proposed corridor have been included (AGFD letter dated 25 April 2002). AGFD species abstracts and other literature were reviewed for species' historical ranges and habitat preferences and field reconnaissance surveys were conducted along the entire corridor. However, species-specific surveys were impractical because of ongoing drought conditions in the project area, therefore the potential presence of sensitive species was assumed in all areas containing potential habitat. The 43 USFS Sensitive species that may occur on or near the proposed Central Corridor are listed in Table 3.

TABLE 3. SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Alamos Deer Vetch *Lotus alamosanus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arid Throne Fleabane *Erigeron arisolis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arizona Giant Sedge *Carex ultra*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Arizona Metalmark *Calephelis rawsoni arizonensis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona. • Mitigation plantings of host species will reduce impacts.
American Peregrine Falcon *Falco peregrinus anatum*	No Impacts	• Known occurrences and potential habitat are outside project area.
Bartram's Stonecrop *Graptopetalum bartramii*	No Impacts.	• Known populations occur outside project area.
Beardless Chinch Weed *Pectis imberbis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona. • Species is adapted to disturbances.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Broadleaf ground cherry *Physalis latiphysa*	No Impacts.	• Known populations occur outside project area.
Catalina Beardtongue *Penstemon discolor*	No Impacts.	• Known populations occur outside project area.
Cave Myotis *Myotis velifer*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Chiltepine *Capsicum annuum* var.*glabriusculum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Chihuahuan Sedge *Carex chihuahuensis*	No Impacts.	• Known populations occur outside project area.
Chiricahua Mountain Brookweed *Samolus vagans*	No Impacts.	• No construction in perennial aquatic habitats.
Five-Stripped Sparrow *Aimophila quinquestriata*	No Impacts.	• Potential habitat and know occurrences are outside project area.
Foetid Passionflower *Passiflora foetida*	No Impacts.	• Known populations occur outside project area.
Gentry Indigo Bush *Dalea tentaculoides*	No Impacts.	• Known populations occur outside project area.
Giant Spotted Whiptail *Cnemidophorus burti strictogrammus*	No Impacts.	• Known populations occur outside project area.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	EFFECTS DETERMINATION	JUSTIFICATION
Large-Flowered Blue Star *Amsonia grandiflora*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Lowland Leopard Frog *Rana yavapaiensis*	No Impacts.	• Known populations occur outside project area. • No construction in perennial aquatic habitats.
Lumholtz Nightshade *Solanum lumholtzianum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Mexican Garter Snake *Thamnophis eques megalops*	No Impacts.	• No construction in perennial aquatic habitats. • Minimal impacts to riparian habitat.
Mock-Pennyroyal *Hedeoma dentatum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Nodding Blue-eyed Grass *Sisyrinchium cernuum*	No Impacts.	• Known populations occur outside project area.
Northern Gray Hawk *Asturina nitida maxima*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Mitigation and avoidance of riparian vegetation. • Populations within Arizona appear stable.
Pima Indian mallow *Abutilon parishii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Santa Cruz Beehive Cactus *Coryphantha recurvata*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Santa Cruz Star Leaf *Choisya mollis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Santa Cruz Striped Agave *Agave parviflora* ssp. *parviflora*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Plants occur throughout Nogales Ranger District. • Mitigation plantings of agave will reduce impacts.
Seeman Groundsel *Senecio carlomasonii*	No Impacts.	• Known populations occur outside project area.
Sonoran Noseburn *Tragia laciniata*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Southern Pocket Gopher *Thomomys umbrinus intermedius*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Superb Beardtongue *Penstemon superbus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Supine Bean *Macroptilium supinum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Pre-construction surveys will be conducted and, if necessary, mitigation measures will be coordinated with USFS personnel.
Sweet Acacia *Acacia smallii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Three-nerved scurf-pea *Pediomelum pentaphyllum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Thurber Hoary Pea *Tephrosia thurberi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.

TABLE 3 (CONTINUED). SUMMARY OF EFFECTS ON U. S. FOREST SERVICE SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Thurber's Morning-glory *Ipomoea thurberi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Virlet Paspalum *Paspalum virletti*	No Impacts.	• Known populations occur outside project area.
Weeping Muhly *Muhlenbergia xerophila*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Western Barking Frog *Eleutherodactylus augusti cactorum*	No Impacts.	• Known populations occur outside project area.
Western Yellow-billed Cuckoo *Coccyzus americanus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Wiggins Milkweed Vine *Metastelma mexicanum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Populations within Arizona appear stable. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Wooly Fleabane *Laennecia eriophylla*	No Impacts.	• Known populations occur outside project area.

3.1 Plants

Alamos deer vetch (*Lotus alamosanus*)
Alamos deer vetch is a perennial herb found in southern Arizona, and Sonora, Chihuahua, and Durango, Mexico. Within Arizona, this plant is found in Sycamore Canyon and the Pajarito Mountains of Santa Cruz County, and near Garden Valley in Maricopa County. This plant is considered a wetland obligate species that is restricted to stream banks in canyons at elevations ranging from 3,500 ft (1,067 m) to 5,500 ft (1,676 m) (AGFD 1999a). Within the Nogales RD, this plant occurs in the Sycamore Canyon and Peña Blanca Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

Population trends for Alamos deer vetch are unknown (AGFD 1999a). The proposed transmission line may cross potential Alamos deer vetch habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Furthermore, viable populations occur outside of the project area, including the Gooding RNA. There may be an impact to individual plants during development of the line; however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Arid throne fleabane (*Erigeron arisolis*)
Arid throne fleabane is an annual to short-lived perennial forb that occurs in Arizona, southwestern New Mexico and Sonora, Mexico. Within Arizona, this plant is found in Apache, Cochise, Pima, and Santa Cruz counties. This species is typically found on moist rocky soils in grasslands, grassy openings within oak woodlands, and roadsides at elevations between 4,200 ft (1,280 m) and 5,500 ft (1,676 m) (AGFD 2000a). On the CNF Nogales RD, it has been documented from Box Canyon and Ruby Roads (T. Newman, CNF, pers. comm., 20 August 2002).

Arid throne fleabane favors moist areas in grasslands and grassy openings in oak woodlands, areas also favored by livestock for grazing (AGFD 2000a). The proposed transmission line parallels Ruby Road, a known location for this species. Placement of the transmission line may impact individual arid throne fleabane, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Arizona giant sedge (*Carex ultra*)
Arizona giant sedge is the largest sedge found in Arizona. Its range includes southeast Arizona, extreme southwest New Mexico (Hidalgo County, Indian Springs in the Pelocillos) and Mexico (Sonora and Coahila). Within Arizona, this sedge is found in Cochise, Graham, Pinal, Yavapai, Pima (Santa Rita Mountains and the Rincon Valley), and Santa Cruz counties (Santa Rita and Atascosa mountains). Typically only 1 patch per mountain has been found. Like other sedges, this plant is associated with moist soil near perennial wet springs and streams and undulating rocky-gravelly terrain at

elevations ranging from 2,040 ft (622 m) to 6,000 ft (1,829 m) (AGFD 2000b). Within the Nogales RD, Arizona giant sedge is found in Sycamore Canyon and Mule Ridge in the Atascosa Mountains, and at Deering Spring and Big Casa Blanca Canyon in the Santa Rita Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

Small populations of this sedge are vulnerable to local disturbance of aquatic or riparian habitat (AGFD 2000b). The proposed transmission line may cross potential Arizona giant sedge habitat; however, no construction will occur in perennial aquatic habitats and construction within riparian habitats will be minimized to the greatest extent possible. There may be an impact to individual plants during development of the line; however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Bartram's stonecrop (*Graptopetalum bartramii*)
Bartram's stonecrop is a small succulent perennial found in southern Arizona and Chihuahua, Mexico (one record). In Arizona, this plant occurs in Santa Cruz County within the Patagonia, Santa Rita, and Tumacacori Mountains, in Pima County within the Baboquivari, Dragoon, and Rincon mountains, and in Cochise County within the Chiricahua Mountains. Habitat for Bartram's stonecrop consists of cracks in rocky outcrops within shrub live oak-grassland communities located on the sides of rugged canyons. This plant is usually found in heavy litter cover and shade where moisture drips from rocks at elevations ranging from 3,900 ft (1,189 m) to 6,700 ft (2,042 m) (AGFD 1997a). Bartram's stonecrop plants are found on the west side of the Nogales RD in Tres Amigos Gulch; Sycamore, Peña Blanca, Alamo, and Peñasco canyons; in the vicinity of Montana Peak and Peña Blanca Lake (T. Newman, CNF, pers. comm., 20 August 2002).

Bartram's stonecrop populations are typically small and isolated. Illegal collection of the plant is the main management issue at this time. Other factors that may affect populations include mining and mineral exploration, habitat alteration due to livestock grazing, trampling by cattle and recreationists, and road construction and maintenance. The proposed transmission line crosses over known Bartram's stonecrop populations within the Nogales RD. Placement of the transmission line may impact individual Bartram's stonecrop, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to Bartram's stonecrop are not likely to result in a trend toward federal listing or loss of viability.

Beardless chinch weed (*Pectis imberbis*)
Beardless chinch weed is a perennial herb that is found in southern Arizona, western Chihuahua and eastern Sonora, Mexico. Within Arizona, this plant can be found in Cochise, Pima, and Santa Cruz counties (within Santa Cruz County it is found along Ruby Road in the Atascosa Mountains and in the Red Rock area of Canelo Hills).

Habitat for this species consists of open areas in grassland and oak-grassland communities. Beardless chinch weed has an extremely broad habitat range and can be found at elevations from 4,000 ft (1,219 m) to 5,000 ft (1,524 m) (AGFD 1998a).

Populations of beardless chinch weed may be susceptible to impacts from grazing and road maintenance activities but the species is adapted to disturbances and grows along road cuts (AGFD 1998a). The proposed transmission line crosses over known beardless chinch weed populations within the Nogales RD. Placement of the transmission line may impact individual beardless chinch weed, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to beardless chinch weed are not likely to result in a trend toward federal listing or loss of viability.

Broad-leaf ground cherry (*Physalis latiphysa*)
Broad-leaf ground cherry is an herbaceous annual found in southern Arizona. This plant can be found in the San Bernardino Valley of Cochise County, the Pinaleno Mountains of Graham County, in the vicinity of Arivaca Creek in Pima County, and the Santa Cruz River of Santa Cruz County. Habitat for the broad-leaf ground cherry consists of washes, often in the shade of shrubs and boulders, desertscrub vegetation, and grasslands at elevations ranging from 3,000 ft (914 m) to 4,500 ft (1,372 m) (AGFD 2000c). There are no known sites for this plant in the Nogales RD. The nearest locations are northwest of Arivaca Lake and in the vicinity of Tubac on the Santa Cruz River (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of broad-leaf ground cherry (AGFD 2000c). The proposed transmission line does not cross known broad-leaf ground cherry populations within the Nogales RD, therefore placement of the transmission line will not impact this species.

Catalina beardtongue (*Penstemon discolor*)
Catalina beardtongue is a perennial herbaceous sub-shrub found in southern Arizona. This shrub is found in Cochise, Graham, Pinal, Pima (within the Santa Catalina Mountains), and Santa Cruz counties (within the Atascosa and Tumacacori mountains). Habitat for Catalina beardtongue consists of bare rock outcrops, barren soil outcrops, and bedrock openings in chapparal or pine-oak woodlands at elevations ranging from 4,120 ft (1,256 m) to 7,600 ft (2,316) (AGFD 1999b). On the Nogales RD, this shrub occurs in the upper end of Peck Canyon, Corral Nuevo, and the adjacent Bartalo Mountain (Cedar Canyon), typically on whitish volcanic ash (T. Newman, CNF, pers. comm., 20 August 2002).

Rock climbers threaten some populations of this plant but few other threats exist (AGFD 1999b). The proposed transmission line does not cross known Catalina beardtongue populations within the Nogales RD, therefore placement of the transmission line will not impact this species.

Chiltepine (*Capsicum annuum* var.*glabriusculum*)
Chiltepine is an herbaceous to woody perennial shrub that is found in south Texas, southern New Mexico, southern Arizona, and south to tropical America. Within Arizona, a few populations of this plant are found in the Chiricahua, Tumacacori, Baboquivari, and Ajo Mountains. This plant occurs in protected, frost-free canyons in oak woodlands of slopes at less than 4,500 ft (1,372 m) elevation (typically found at elevations ranging from 3,600 ft [1,097 m] to 4,400 ft [1,341 m]). Chiltepine plants grow under nurse shrubs and usually are associated with rock ledges and outcrops. Within the Nogales RD, there are populations in the Tumacacori Mountains and Cobre Ridge area, and there are suspected populations on the west side of the RD (AGFD 1991a; T. Newman, CNF, pers. comm., 20 August 2002).

This plant is declining in some areas because of drought, overgrazing, and local over-collection of berries (AGFD 1991a). Placement of the transmission line may impact individual chiltepine plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to chiltepine are not likely to result in a trend toward federal listing or loss of viability.

Chihuahuan sedge (*Carex chihuahuensis*)
Chihuahuan sedge is a grass-like perennial plant that occurs in southeastern Arizona, New Mexico (Hidalgo County), and Mexico (Sonora and Chihuahua). Within Arizona, this plant ranges from Cochise, Graham, Gila, Pima (Santa Catalina, San Luis, and Rincon mountains), and Santa Cruz counties (Atascosa and Santa Rita mountains, and the Santa Cruz River). Chihuahuan sedge can be found in wet soils along streambeds and in shallower draws of pine-oak forests and riparian woodlands. It also is found in wet meadows, cienegas, marshy areas, and canyon bottoms from 1,100 ft (335 m) to 8,000 ft) (AGFD 1999c). Within the Nogales RD, this plant has been found near Arivaca Lake (on private land), Sycamore Canyon, and south of Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement on the population status of Chihuahuan sedge (AGFD 1999c). The proposed transmission line does not cross known Chihuahuan sedge populations within the Nogales RD, therefore placement of the transmission line will not impact this species.

Chiricahua Mountain brookweed (*Samolus vagans*)
Chiricahua Mountain brookweed is a perennial herb found in southeastern Arizona, western Chihuahua, and eastern Sonora, Mexico. This plant apparently reaches its southern limit in southern Sonora, Mexico. Within Arizona, this species is found in the

Huachuca Mountains of Cochise County, the Rincon, Santa Catalina, and Santa Rita mountains of Pima County, and the Canelo Hills and Pajarito mountains of Santa Cruz County. The Chiricahua Mountain brookweed is confined to areas with permanent water, such as springs, seeps, and in and along streams at elevations ranging from 1,219 to 2,195 m (4,000 – 7,200 ft) (AGFD 1999d). Within the Nogales RD, this plant occurs in Florida Canyon of the Santa Rita Mountains and in Sycamore Canyon of the Atascosa Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Chiricahua Mountain brookweed (AGFD 1999d). Because no construction will occur within perennial aquatic habitats, the proposed action will have no effect on the population status of the Chiricahua Mountain brookweed.

Foetid passionflower (*Passiflora foetida*)
The foetid passionflower is a herbaceous vine found in southeastern Texas and the Rio Grande Valley, southern Arizona, and southward throughout Mexico, Central and South America, and the West Indies. Within Arizona, this species is found in the Baboquivari Mountains, Arivaca, and Las Guijas Mountains of Pima County and in California Gulch and the Bartlett Mountains of Santa Cruz County. In Arizona, this plant occurs on hillsides and canyons of the Lower Sonoran zone from 1,067 to 1,707 m (3,500 – 5,600 ft) in elevation (AGFD 2000c). Within the Nogales RD, foetid passionflowers have been recorded in the California Gulch and Holden Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of foetid passionflower (AGFD 2000c). Because the known populations of this plant occur outside of the proposed TEP transmission line corridor, there will be no effect on the population status of the foetid passionflower.

Gentry indigo bush (*Dalea tentaculoides*)
The Gentry indigo bush is an herbaceous perennial shrub found primarily in southern Arizona, but its range may extend into Mexico. Within Arizona, this shrub is found in the Sycamore Canyon drainage of the Atascosa Mountains, in the Pajarito Mountains of Santa Cruz County, and within the Baboquivari Mountains (1930s record) and Mendoza Canyon (1965 record) of Pima County. Gentry indigo bush is typically found along canyon bottoms on cobble terraces subject to occasional flooding and seems to prefer disturbance-prone environments at elevations ranging from 1,097 to 1,341 m (3,600 – 4,400 ft) (AGFD 1998b). Historic collection records indicate that this plant may grow on rocky hillsides. Within the Nogales RD, this plant has been recorded in Sycamore Canyon, in the vicinity of Peñasco Canyon, Kaiser Canyon, and north of Manzanita Mountain (T. Newman, CNF, pers. comm., 20 August 2002).

Potential threats to Gentry indigo bush populations are cattle grazing, recreational foot traffic, and flooding events that eliminate terraces occupied by this species (AGFD 1998b). Because known locations of this plant occur outside of the proposed TEP transmission line corridor, the proposed TEP transmission line will have no effect on the population status of the Gentry indigo bush.

Large-flowered blue star (*Amsonia grandiflora*)
The large-flowered blue star is an herbaceous perennial that is found in northern Sonora and Durango, Mexico, and southern Arizona. Within Arizona, this plant is found in the Patagonia, Atascosa/Pajarito mountains of Santa Cruz and Pima counties. Habitat for this species consists of canyon bottoms in oak woodlands typically dominated by Emory oak and Mexican blue oak; however, site-specific qualities are inconsistent. Large-flowered blue star plants have adapted to rock fall disturbance and are typically found at elevations ranging from 1,189 to 1,372 m (3,900 4,500 ft) (AGFD 1998c). Within the west side of the Nogales RD, this plant occurs at Peña Blanca and Arivaca Lakes, Sycamore Canyon, Chiminea Canyon, California Gulch, and near Ruby (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of large-flowered blue star are rare, with only 15 to 20 populations within 2 mountain ranges as the total world distribution, but populations seem to be stable. This plant is highly susceptible to disturbance, and expanding development in the Nogales area (AGFD 1998c) may impact populations. The proposed TEP transmission line crosses near a known large-flowered blue star population in Peña Blanca Canyon, and some individual plants, comprising a small percentage of the total population, may be impacted. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Lumholtz nightshade (*Solanum lumholtzianum*)
The Lumholtz nightshade is an herbaceous annual that is found in southern Arizona and northern Mexico. Within Arizona, this plant is found in the Arivaca and San Luis Mountains of Pima County and the Patagonia, Atascosa, and Santa Rita Mountains of Santa Cruz County. Lumholtz nightshade plants are typically found in washes and low ground near wet depressions and along stream banks from 914 to 1,402 m (3,000 – 4,600 ft) elevation in desert grassland plant communities. This plant is also often found in disturbed, weedy areas (AGFD 2000d). Within the Nogales RD, this nightshade is found in the vicinity of Arivaca, Ruby, California Gulch, Nogales, Cobre Ridge, and Oro Blanco Wash (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Lumholtz nightshade (AGFD 2000d). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mock-pennyroyal (*Hedeoma dentatum*)
The mock-pennyroyal is an herbaceous perennial plant found in southeastern Arizona and northern Sonora, Mexico. Within Arizona, this plant is found in the Chiricahua, Huachuca, Mule, Whetstone, and Winchester mountains of Cochise County, the Pinaleno Mountains of Graham County, the Baboquivari, Rincon, and Santa Cruz mountains of Pima County, and the Atascosa, Mustang, Pajarito, and Santa Rita mountains of Santa Cruz County. Habitat for this plant consists of oak woodland, oak-pine forest, and pine forest. It can be found on open roadcuts, steep rocky outcrops, and gravelly slopes in wooded canyons with open to full sunlight at elevations ranging from 1,173 to 2,500 m (3,850 – 8,200 ft) (AGFD 2000e).

Populations of mock-pennyroyal seem to be restricted to a relatively small geographic area, and populations are apparently small. Because habitat for this species is widespread, placement of the transmission line may impact individual plants. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Nodding blue-eyed grass *(Sisyrinchium cernuum*)
Nodding blue-eyed grass is a perennial forb with grass-like leaves that occurs in southeastern Arizona, west Texas, and Mexico. Within Pima and Santa Cruz counties, Arizona it occurs in the Pajarito, Santa Rita, Atascosa, and Rincon mountains as well as Sycamore Canyon. This species can be found in desert grassland and pine-oak woodlands from 1,006 to 2,438 m (3,300 – 8,000 ft) in elevation along streams in partial shade and in canyon bottoms. It grows in wet soil by seeps, pools, or springs in desert scrub. It has also been found on sandy stream banks. On the Nogales RD, this plant has been found at 1,189 m (3,900 ft) in Sycamore Canyon on the west side and at 1,402 m (4,600 ft) in Big Casa Blanca Canyon in the Santa Rita Mountains (AGFD 1999e). The known location of this plant in Sycamore Canyon is within the Goodding RNA, located approximately 1.6 km (1 mi) west of the proposed ROW (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of nodding blue-eyed grass (AGFD 1999e). However, this species is not likely to be affected by the proposed placement of a transmission line within the Nogales RD. The proposed transmission line will not cross over or near known locations of this plant within the Goodding RNA. Therefore, placement of the TEP transmission line from Sahuarita to Nogales will have no impact on the nodding blue-eyed grass.

Santa Cruz beehive cactus (*Coryphantha recurvata*)
The Santa Cruz beehive cactus is a succulent perennial that occurs in southern Arizona and northern Sonora (about 20 km [12.4 mi] south of the international border), Mexico. Within Arizona, this species occurs in western Santa Cruz County from Nogales and the Tumacacori Mountains west to the Atascosa/Pajarito mountains. Santa Cruz beehive cacti are found in alluvial soils of valleys and foothills in grassland and oak woodland habitats from 1,219 to 1,829 m (4,000 – 6,000 ft). These plants are either on rocky hillsides with high grass cover or in rock crevices where runoff accumulates and provides a more favorable moisture relationship than the surrounding soils (AGFD 1998d). Within the Nogales RD known plant locations have increased since 1997 (813 plant clumps in 1997, 807 plant clumps in 1998, and 175 in 1999) (T. Newman, CNF, pers. comm., 20 August 2002).

Accessible populations of the Santa Cruz beehive cactus have declined due to collection, but the status of populations beyond accessible areas is unknown (AGFD 1998d). The proposed TEP transmission line crosses over several known Santa Cruz beehive cactus populations within the Nogales RD. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz star leaf (*Choisya mollis*)
The Santa Cruz star leaf is a perennial shrub that occurs in southern Arizona within the Atascosa, Pajarito, and Tumacacori mountains of Santa Cruz County. Santa Cruz star leaf plants are found primarily within madrean evergreen woodland communities from 1,067 to 1,524 m (3,500 – 5,000 ft) in elevation. This plant is usually found in canyon bottoms and slopes, usually in the shade of oaks and other trees, or rock outcrops (AGFD 1999f). Santa Cruz star leaf plants have been found throughout the eastern portion of the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Santa Cruz star leaf are typically found in rugged and remote mountainous areas where human activity is low and the likelihood of disturbance or removal of plants is minimal. However, the species population trend is unknown and existing populations are relatively rare, have a restricted range, and are only found within specific habitats (AGFD 1999f). The proposed TEP transmission line will cross areas with known populations of Santa Cruz star leaf. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz striped agave (*Agave parviflora* ssp. *parviflora*)

Santa Cruz striped agave is a small perennial succulent found in southern Arizona and northern Mexico. Within Arizona, this species is found near Arivaca in Pima County, and in the Las Guijas, Pajarito, Patagonia, Santa Rita, and Atascosa mountains of Santa Cruz County. Habitat for this agave consists of rocky or gravelly slopes of middle elevation mountains, in desert grassland or oak woodlands. This plant appears to prefer soils on rounded ridge-tops where grasses and shrubs are sparse and soil is bare or nearly so (AGFD 1998e). Santa Cruz striped agave have been found throughout the Nogales RD (primarily within the Atascosa, Pajarito, San Luis, and Las Guijas mountains), and in recent years the documented number of individual plants and number of locations has increased for this area (T. Newman, CNF, pers. comm., 20 August 2002).

Some populations of Santa Cruz striped agave have declined due to illegal collection and loss of habitat due to mining and road construction. Livestock grazing has caused degradation of habitat and browsing of flower stalks (AGFD 1998e). The proposed TEP transmission line crosses areas with known populations of Santa Cruz striped agave and there may be an impact to individual plants during development of the line. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area and transplanting of agave plants in project area will minimize impacts. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Seeman groundsel (*Senecio carlomasonii*)
The seeman groundsel is a perennial herb or subshrub found in southern Arizona and Mexico (Sonora, Chihuahua, Nayarit). Within Arizona, this plant is found in the Chiricahua and Huachuca mountains of Cochise County, the Baboquivari and Santa Rita mountains of Pima County, and the Santa Rita, Pajarito, and Peña Blanca mountains of Santa Cruz County (AGFD 2000f). Within the Nogales RD, seeman groundsel have been recorded in the Peña Blanca Lake and Sycamore Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of seeman groundsel (AGFD 2000f). A potential threat to seeman groundsel habitat may be trampling by hikers. The proposed transmission line will not cross over or near known locations of this plant, therefore, placement of the TEP transmission line will have no impact on the population status of the seeman groundsel.

Sonoran noseburn (*Tragia laciniata*)
Sonoran noseburn is an herbaceous perennial that occurs in southern Arizona, Mexico (Sonora and Chihuahua), and possibly New Mexico. Within Arizona this plant can be found in Cochise County in the Huachuca Mountains and Canelo Hills, in Pima County in the Santa Rita Mountains, and in Santa Cruz County in the Atascosa Mountains (Sycamore Canyon), Patagonia Mountains, Pajarito Mountains, Canelo Hills (O'Donnell

Canyon), and Santa Rita Mountains. Sonoran noseburn typically occur at elevations of 1,067 to 1,722 m (3,500 – 5,650 ft) along streams and canyon bottoms, on shaded hillsides within the upper parts of the Lower Sonoran and Upper Sonoran biotic communities, and open woodland areas (AGFD 2000g). This species has been found in canyons, along streams, and near roadways of the Nogales RD (AGFD 2000g).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Sonoran noseburn (AGFD 2000g). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Superb beardtongue (*Penstemon superbus*)
The superb beardtongue is a perennial herbaceous forb found in southeastern Arizona, New Mexico, and Mexico (Chihuahua). Within southern Arizona, this species is found in Pima County in the Santa Catalina and Santa Rita mountains, and in Santa Cruz County within the Tumacacori Mountains. This plant is generally found in rocky canyons, dry hillsides, and along washes in sandy or gravelly soils at elevations between 945 and 1,676 m (3,100 – 5,500 ft) (AGFD 2000h). Within the Nogales RD, it has been found in Rock Corral Canyon and Box Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of superb beardtongue (AGFD 2000h). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Supine bean (*Macroptilium supinum*)
The supine bean is a perennial herb that grows in colonies and produces underground fruits. The total range for this species includes Santa Cruz County, Arizona, south into Mexico, including the states of Sonoran and Nayarit. Within Arizona, this plant can be found in the Atascosa/Pajarito, San Luis, and Patagonia Mountains, and the southern portion of the Santa Cruz River drainage in Santa Cruz County (much of this area is within the Nogales RD). Supine bean are typically found along ridge tops and gentle slopes of rolling hills in semi-desert grassland or grassy openings in oak-juniper woodlands at elevations between 1,097 and 1,494 m (3,600 – 4,900 ft) (AGFD 1999g).

There are currently an estimated 12 populations of this species in Arizona. Populations range from small (around 20 individuals) to relatively large (around 3,500 individuals). A 43% decline in a monitored population was recorded from 1989 to 1993. This decline was apparently due to low reproductive output and poor recruitment, although the reasons for these are unknown (AGFD 1999g). Possible threats to this species include degradation of habitat due to livestock grazing, off-road vehicle activity, recreation (camping and hiking), Border Patrol activities, utility corridor and road construction/maintenance, and home building (AGFD 1999g).

Because of the recent decline in monitored populations and drought conditions noted in 2002, additional surveys will be conducted prior to construction in potential supine bean habitat. If populations of this species are found in the vicinity of construction, consultation with USFS biologists will be initiated to minimize impacts. Development of the proposed TEP transmission line is likely to have an impact on this species. However, once additional surveys are completed, impacts are likely to be limited to individual plants and not whole populations. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Sweet acacia (*Acacia smallii*)
The sweet acacia is a woody perennial spiny shrub or small tree found in Texas, Arizona, and California south to Argentina. Within Arizona, this species is found in the Baboquivari Mountains of Pima County and Sycamore Canyon and Atascosa Mountains of Santa Cruz County. Sweet acacia are typically found in the lower slopes of canyons of riparian areas in desert grassland communities from elevations ranging from 1,067 to 1,219 m (3,500 – 4,000 ft) (AGFD 1992).

Population trends for the sweet acacia are unknown (AGFD 1992). The proposed TEP transmission line may cross potential sweet acacia habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Three-nerved scurf-pea (*Pediomelum pentaphyllum*)
Three-nerved scurf-pea is an herbaceous perennial found in southeastern Arizona, Hidalgo County New Mexico, western Texas, and Chihuahua, Mexico. Within Arizona, this plant occurs in desert grasslands in sandy substrates and loamy soils. Three-nerved scurf-pea are generally found in bare areas between other plants in elevations ranging from 1.098 to 1,373 m (3,600 to, 4,500 feet) (AGFD 2001a). Within the Nogales RD, this plant is known to occur from Peñasco Canyon (in the Sycamore Canyon watershed) and Peck and Pine Canyons (Middle Santa Cruz watershed) (T. Newman, CNF, pers. comm., 20 August 2002).

The impact of common management practices such as grazing, burning, mowing, herbicide use, and mechanical soil disturbance on this species is unknown (AGFD

2001a). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Thurber hoary pea (*Tephrosia thurberi*)
The Thurber hoary pea is a perennial shrub that occurs in southern Arizona and Mexico (northern Sonora and southwestern Chihuahua). Within Arizona, this plant can be found in Cochise, Santa Cruz, and Pima counties. On the Nogales RD, Thurber hoary pea plants are found in the Santa Rita and Atascosa mountains. This species typically occurs on rocky slopes among oaks, pines, junipers, manzanitas, open hilltops, and grasslands at elevations between 1,067 and 2,134 m (3,500 – 7,000 ft) (AGFD 1999h).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Thurber hoary pea (AGFD 1999h). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Thurber's morning-glory (*Ipomoea thurberi*)
Thurber's morning-glory are perennial herbaceous vines that are found in southern Arizona and Mexico (Chihuahua and Sonora). Within Arizona, this plant is found in the Huachuca and Mule Mountains of Cochise County, the Santa Rita Mountains of Pima County, and in the vicinity of Nogales, the Canelo Hills, and the Patagonia and Atascosa/Pajarito mountains of Santa Cruz County. Habitat in Arizona typically consists of rocky hillsides and canyon slopes in madrean evergreen woodland and semi-desert grassland communities in elevations between 1,158 and 1,570 m (3,800 – 5,150 ft) (AGFD 2000i). On the Nogales RD, this morning glory has been found in the vicinity of Peña Blanca Lake, east of Peñasco Canyon, and Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Thurber's morning-glory (AGFD 2000i). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Virlet paspalum (*Paspalum virletti*)

The virlet paspalum is a perennial grass found in southeastern Arizona and Mexico (Sonora and San Luis Potosi). Within Arizona, this grass is found in the Huachuca Mountains of Cochise County, and in the Pajarito Mountains and Sycamore Canyon of Santa Cruz County. This grass is found in sandy soils of canyon bottoms in semi-desert grassland communities and grassy areas within madrean evergreen woodland communities at elevations ranging from 1,067 to 1,737 m (3,500 – 5,700 ft) (AGFD 1999i). In the Nogales RD, the only known location for this grass is in Sycamore Canyon growing in a sandy canyon bottom (T. Newman, CNF, pers. comm., 20 August 2002).

This species is rare in Arizona, where it is known from only 2 widely separated populations. There is no information on the potential effects of land use activities, such as utility placement, on the population status of virlet paspalum (AGFD 1999i). Known locations of this plant occur outside of the proposed TEP transmission line corridor; therefore, placement of the line is not likely to impact the virlet paspalum.

Weeping muhly (Sycamore Canyon muhly) (*Muhlenbergia xerophila*)
Weeping muhly is a perennial herbaceous grass found only in southern Arizona. Populations occur in the Santa Catalina, Rincon, Santa Rita, Tumacacori, and Baboquivari mountains of Pima County, and in Sycamore Canyon within the Pajarito Mountains of Santa Cruz County. Weeping muhly most often grow in crevices of cliffs, bedrock, and other rocks along canyon bottoms. This grass is also known from rocky canyon slopes in oak, pine-oak, and riparian woodlands at elevations between 1,073 and 1,829 m (3,520 – 6,000 ft) (AGFD 1999j).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of weeping muhly (AGFD 1999j). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Wiggins milkweed vine (*Metastelma mexicanum*)
Wiggins milkweed vine is a perennial herbaceous vine with a woody base found in southeastern Arizona to southern Sonora, Mexico. Within Arizona, this vine occurs around the Nogales and Ruby areas, Sycamore Canyon area, and Patagonia Mountains of Santa Cruz County, and Baboquivari, Coyote, and Catalina mountains of Pima County. This vine is typically found on open slopes within open oak woodland on granite soils of juniper flats at elevations between 1,067 and 1,554 m (3,500 – 5,100 ft) (AGFD 2000j). Wiggins milkweed vine has been found in several locations within the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of Wiggins milkweed vine within Arizona appear to be stable. This vine depends on surrounding vegetation for microhabitat and will be affected by any disturbance to area habitat (AGFD 2000j). Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Wooly fleabane (*Laennecia eriophylla*)
Wooly fleabane is a perennial herb found in southeastern Arizona and northern Mexico (Sonora and Chihuahua). In Arizona, wooly fleabane occurs in the Atascosa Mountains, Pajarito Mountains, Santa Rita Mountains, Canelo Hills, and in the vicinity of Sonoita Creek in Santa Cruz County. This species is typically found in gravelly soil of rocky slopes and ridges with dense grass cover in semi-desert grassland, dry oak woodland, and pine-oak woodland communities at elevations between 1,292 and 1,722 m (4,240 – 5,650 ft) (AGFD 1999k). There are known locations of wooly fleabane in the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Population sizes of this plant are usually very small, with typically no more than 40 plants found in any of the populations known from Arizona. Population numbers fluctuate with the amount and timing of summer rains from year to year. This species was probably more common before its habitat was altered by excessive grazing (AGFD 1999k). Known locations of this plant and potential habitat occur outside of the proposed TEP transmission line corridor; therefore, placement of the line is not likely to impact the wooly fleabane.

3.2 INVERTEBRATES

Arizona metalmark (*Calephelis rawsoni arizonensis*)
The Arizona metalmark is a small, brown butterfly with bands of blue metallic markings on the upper and underside of the body. This butterfly occurs in Arizona, and from the Animas Mountains in southwestern New Mexico southward to Sonora, Mexico. The southern limits of its range are poorly defined to date. In Arizona, this species is known from as far north as Gila County then southward through Graham, Cochise, Pima, and Santa Cruz counties in most of the mountains therein. Arizona metalmark butterflies occur mostly above the desert floor in mountain foothills. Within these mountains, it is found in riparian canyons in oak woodland or more arid regions at elevations from 716 to 1,676 m (2,350 – 5,500 ft). Canyons with standing water for a major portion of the year appear to contain populations of this species as long as *Agave* spp. are present for larvae development (AGFD 2001a). There is no information on the potential effects of land use activities, such as utility placement, on the population status of Arizona metalmark (AGFD 2001a).

Placement of the transmission line may indirectly impact individuals of this species through habitat modification, however because the species is widely distributed across southern Arizona, only a small percentage of Arizona metalmarks may be impacted.

Furthermore, transplanting of agave plants also will minimize impacts. Impacts are not likely to result in a trend toward federal listing or loss of viability.

3.3 BIRDS

American peregrine falcon (*Falco peregrinus anatum*)
The American peregrine falcon subspecies is a medium-sized raptor that nests from central Alaska south to Baja California, Sonora, and the highlands of Central Mexico. Within Arizona, this raptor breeds wherever sufficient prey is available near cliffs. These raptors are rare or absent as breeders in the southwestern quarter of Arizona. Optimum habitat for peregrine falcons consists of steep, sheer cliffs overlooking woodlands, riparian areas, or other habitats supporting avian prey species in abundance. These raptors may also be found in less optimal habitat consisting of small broken cliffs in ponderosa pine forests or large sheer cliffs in very xeric areas. The presence of an open expanse is critical. American peregrine falcons can be found at elevations ranging from 122 to 2,743 m (400 – 9,000 ft) (Glinski 1998, AGFD 1998f). Peregrine falcon nests were found on Ramanote Peak and along Sycamore Canyon (CNF 2000). Both these nests are at least 1.6 km (1 mi) from the proposed ROW. In 2002, another nest was found on Castle Rock, which is within the MSO PAC and within 0.3 km (0.18 mi) of proposed structures. The seasonal restrictions in effect for MSO (SECTION 1.4) will prevent breeding season disturbance of peregrines on Castle Rock.

American peregrine falcons have been found in great numbers in Arizona as well as in areas that will have formerly been considered marginal habitat. This trend suggests that populations in Arizona may have reached levels saturating the optimal habitat available (AGFD 1998f). Placement of the proposed transmission line is not likely to disturb known nesting peregrine falcons. If new nest sites are encountered during construction, conservation measures will be developed in coordination with CNF biologists to prevent adverse effects. Development of the TEP line is not likely to result in a trend toward federal listing or loss of viability of this species.

Five-stripped sparrow (*Aimophila quinquestriata*)
The five-stripped sparrow is found in western portions of northern Sinaloa and Sonora, Mexico and the southeastern most portions of Arizona. This sparrow is primarily found in Mexico, but its range reaches into southeastern Arizona. Here, it is rarely found during breeding season, and there are only a few winter records. Five-stripped sparrow habitat is highly specialized, consisting of tall, dense shrubs on rocky, semi-desert hillsides and canyon slopes (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). Within the Nogales RD, this sparrow has been recorded within Sycamore Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of five-stripped sparrow have declined because of habitat loss, fragmentation, and degradation (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). The proposed TEP transmission line will not cross Sycamore Canyon where these sparrows have been observed. This species is not likely to be affected by the proposed placement of a transmission line within the Nogales RD.

Northern gray hawk (*Asturina nitida maxima*)
The gray hawk is a medium-sized raptor with a gray back, black tail with 2 or 3 white bands, and a finely barred gray and white chest, abdomen, and thighs (Glinski 1998). The gray hawk prefers Sonoran riparian deciduous forest and woodland plant communities and can be found along the Santa Cruz and San Pedro rivers, Sonoita Creek, and Sopori Wash. This species also has been reported from the Hassayampa and Salt rivers. This hawk species is migratory and usually arrives in Arizona in mid-March and returns south during winter months (AGFD 2000k). Gray hawks prefer cottonwood, mesquite, and hackberry woodlands with a prey base of lizards, especially the whiptail lizard *(Cnemidophorus* spp.*)*.

The current population trend for gray hawks is considered stable by the AGFD (2000k). Potential nesting habitat exists along small portions of the proposed TEP transmission line corridor along Sopori Wash and within Peck Canyon. Individual gray hawks may be indirectly impacted by habitat modification from construction activity related to transmission line placement; however, construction within riparian habitats will be minimized to the greatest extent possible. Furthermore, riparian plants within Sopori Wash will be mitigated to facilitate habitat recovery and disturbance to riparian vegetation in Peck Canyon will be avoided through the use of helicopters. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)
The western yellow-billed cuckoo is a long and slender bird with short, dark legs that nests from southern California through the northeastern United States, south through the United States to the Florida Keys, Central America and southern Baja California, Mexico. This species winters from South America to central Argentina and Uruguay. Within Arizona, western yellow-billed cuckoo are found in southern and central Arizona and the extreme northeast portion of the state. This species is typically found in streamside areas with cottonwood, willow groves, and larger mesquite bosques (AGFD 1998g). This species has been observed in Sopori Wash and Sycamore, Peck, and Peña Blanca canyons (AGFD 1998g; CNF 2000; P. Titus, T. Furgason, SWCA, pers. comm.16 October 2002).

Populations of western yellow-billed cuckoo have been reduced; a general decline is occurring in all areas with known populations (AGFD 1998g). This species is sensitive to habitat fragmentation and degradation of riparian woodlands due to agricultural and residential development (Hughes 1999). The proposed transmission line may cross potential cuckoo habitat; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

3.4 Reptiles and Amphibians

Giant spotted whiptail (*Cnemidophorus burti strictogrammus*)
The giant spotted whiptail is a long, slender lizard found in southeastern Arizona, extreme southwest New Mexico, and northern Sonora, Mexico. Within southeastern Arizona, this lizard is found in Cochise County; the Santa Catalina, Santa Rita, Baboquívari, and Pajarito mountains and in the vicinity of Oracle in Pima County; and in Pinal County. Giant spotted whiptail lizards inhabit mountain canyons, arroyos, and mesas in arid and semi-arid regions, entering lowland deserts along stream courses. They are found in dense shrubby vegetation, often among rocks near permanent and intermittent streams at elevations ranging from near sea level to 1,372 m (4,500 ft). Open areas of bunch grass within these riparian habitats are also occupied (AGFD 2001b).

Giant spotted whiptail populations are thought to be stable and some populations are locally abundant even though this species is limited in distribution (AGFD 2001b). Because the known populations occur outside the project area, the proposed transmission line will have no significant effect on the population status of the giant spotted whiptail.

Lowland leopard frog (*Rana yavapaiensis*)
The lowland leopard frog is found in low elevations in the drainage of the lower Colorado River and its tributaries in Nevada, California, Arizona, New Mexico, northern Sonora and extreme northeast Baja California, Mexico (probably extirpated from California and Nevada). Within Arizona, this frog has been found in the Virginia River drainage in the extreme northwestern part of the state, in the Colorado River near Yuma, and west, central, and southeast Arizona south of the Mogollon Rim. This frog frequents desert, grassland, oak, and oak-pine woodland in permanent pools of foothill streams, rivers, and permanent stock tanks. They typically stay close to water at elevations ranging from 244 to 1,676 m (800 – 5,500 ft) (AGFD 1997b). Within the Nogales RD, this frog has been recorded in Pesquiera and Alamo canyons, California Gulch, Adobe, Temporal Gulch, Big Casa Blanca, Box Canyon, and Gardner Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Lowland leopard frog populations are considered stable in central Arizona but declining in southeast Arizona, and populations have been extirpated from southwestern Arizona. Potential threats to this species are manipulation to major watercourses, water pollution, introduced species (fish, bullfrogs, and crayfish), heavy grazing, and habitat fragmentation (AGFD 1997b). Because no construction will occur within perennial aquatic habitats and known populations occur outside project area, the proposed transmission line will have no significant effect on the population status of the lowland leopard frog.

Mexican garter snake (*Thamnophis eques megalops*)
The Mexican garter snake ranges from southeastern Arizona and extreme southwestern New Mexico, southward into the highlands of western and southern Mexico, to Oaxaca. Within Arizona, this snake occurs in the southeast corner of the state from the Santa Cruz Valley east and generally south of the Gila River. Valid records (post 1980) have recorded this snake in the San Rafael and Sonoita grasslands area and from Arivaca. Mexican garter snakes are most abundant in densely vegetated desert grassland habitat surrounding cienegas, cienega-streams, stock tanks, and in or near water along streams in valley floors and generally open areas, but not in steep mountain canyon stream habitat. This snake is generally found at elevations ranging from 914 to 1,524 m (3,000 – 5,000 ft) but may reach elevations of 2,591 m (8,500 ft) (AGFD 2001c).

Populations of Mexican garter snakes are decreasing, with extirpations at several localities since 1950 as habitat has changed and introduced predators have invaded. Management concerns for this species include predation by introduced bullfrogs and predatory fishes, urbanization and lowered water tables, and habitat destruction, including that due to overgrazing (AGFD 2001c). Because no construction will occur within perennial aquatic habitats and construction within riparian habitats will be minimized, the proposed transmission line will have no significant effect on the population status of the Mexican garter snake.

Western barking frog (*Eleutherodactylus augusti cactorum*)
The western barking frog is a secretive terrestrial frog found in extreme southern Arizona, southeast New Mexico, and central Texas south to the Isthmus of Tehuantepec. In Arizona, this frog historically occurred in Pima and Santa Cruz counties within the Santa Rita and Pajarito mountains. Habitat consists of rocky hillsides of canyons in woodland vegetation at elevations between 1,158 and 2,134 m (3,800 – 7,000 ft). Permanent water is not a necessary component of western barking frog habitat. There are very few records of this species in Arizona, and none have been recorded within the Nogales RD (AGFD 1995b).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of western barking frogs (AGFD 1995b). Because known populations occur outside the project area, the proposed transmission line will have no significant effect on the population status of the western barking frog and is not likely to result in a trend toward listing or loss of viability.

3.5 MAMMALS

Cave myotis (*Myotis velifer*)

The cave myotis is a large bat found in the southwestern half of Arizona and the immediate adjacent parts of California, Nevada, New Mexico, and the northern third of Sonora, Mexico. Within Arizona, this bat is found south of the Mogollon Plateau from Lake Mohave, Burro Creek, Montezuma Well, San Carlos Apache Reservation, and the Chiricahua Mountains south to Mexico. Cave myotis have not been recorded in the extreme southwestern part of the state and are found in small numbers in southeastern Arizona in the winter. This bat typically prefers desertscrub habitats of creosote, brittlebush, paloverde, and cacti but they sometimes can be found up in pine-oak communities. Cave myotis roost in caves, tunnels, mineshafts, under bridges, and sometimes buildings within a few kilometers of a water source (AGFD 1997c).

Cave myotis colonies are vulnerable at the roost sites, especially maternity roosts, because the congregate in large numbers (AGFD 1997c). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the cave myotis.

Southern pocket gopher (*Thomomys umbrinus intermedius*)
The southern pocket gopher is a small gopher found in extreme southeastern Arizona and southwestern New Mexico, south into Mexico. Within Arizona, this gopher is found primarily in the southern most portion of the state in the oak belt of the Santa Rita, Patagonia, Atascosa, Pajarito, and Huachuca mountains. Southern pocket gophers have been found at Peña Blanca Spring in gravelly soil along a broad wash. Elsewhere, this species is generally found on rocky slopes within open oak woodlands in the lower parts of mountain ranges from 1,372 to 2,743 m (4,500 – 9,000 ft) in elevation. There has been only 1 record for the southern pocket gopher within the Nogales RD, specifically at Peña Blanca Canyon in the Atascosa/Pajarito mountains. However, it is suspected that this species has a much wider range (AGFD 1998h).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of southern pocket gopher (AGFD 1998h). Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

4.0 BLM SENSITIVE SPECIES

Criteria for BLM Sensitive species include those that are:

1. Under status review by the USFWS, or
2. Whose numbers are declining so rapidly that Federal listing may become necessary, or
3. With typically small and widely dispersed populations,
4. Those inhabiting ecological refugia or other specialized or unique habitats.

The potential impacts to BLM Sensitive species were determined based on the habitat conditions within the BLM lands crossed by the proposed action, the life history of the species, and the proposed construction methods. Only those species that have a potential of occurring on or near the BLM parcel were evaluated. The 13 BLM Sensitive species evaluated were identified in the BLM Sensitive species list for Arizona (Instruction Memorandum No. AZ-2000-018) dated 21 April 2000 and are listed in Table 4.

TABLE 4. SUMMARY OF EFFECTS ON BUREAU OF LAND MANAGEMENT SENSITIVE SPECIES.

COMMON NAME *Scientific Name*	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Balloonvine *Cardiospermum corindum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
False grama *Cathestecum erectum brevifolium*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Tumamoc globeberry *Tumamoca macdougalii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.
Loggerhead shrike *Lanius ludovicianus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Rufous-winged sparrow *Aimophila carpalis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

Table 4 (continued). Summary of effects on Bureau of Land Management Sensitive species.		
Common Name *Scientific Name*	**Effects Determination**	**Justification**
Western burrowing owl *Athene curnicularia hypugea*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total population within project area may be impacted. • Populations of this species occur throughout southwestern U.S.
Texas horned lizard *Phrynosoma cornutum*	No Impacts.	• Known populations occur outside project area.
Big free-tailed bat *Nyctinomops macrotis*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
California leaf-nosed bat *Macrotus californicus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Fringed myotis *Myotis thysandodes*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Pocketed free-tailed bat *Nyctinomops femorosaccus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Spotted bat *Euderma maculatum*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.
Underwood's mastiff bat *Eumops underwoodi*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• No known roosts within project area. • Only small percentage of foraging habitat within project area may be impacted. • Populations of this species occur throughout southern Arizona.

4.1 Plants

Balloonvine (*Cardiospermum corindum*)
This perennial vine is widely distributed in tropical and subtropical regions and is known from the Coyote Mountains in Pima County (Kearny and Peebles 1960). Because potential habitat for this species is widespread, placement of the transmission line may impact individual plants. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

False grama (*Cathestecum erectum* (*brevifolium*))
False grama is a perennial, drought-tolerant grass found on dry hills and plains of Southern Arizona and Northern Mexico. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Tumamoc globeberry (*Tumamoca macdougalii*)
This perennial vine occurs in shade of nurse plants along sandy washes below ~914 m (3,000 ft) in elevation. The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual plants, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

4.2 Birds

Loggerhead shrike (*Lanius ludovicianus*)
The loggerhead shrike occurs in open country with scattered trees and shrubs, savanna, desertscrub and occasionally open woodland (AGFD 2002). In Arizona, this species usually summers throughout open parts of the state below the Transition Zone and is also periodically found along the Mexican border west of Baboquívari Mountains (Phillips et al. 1983). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Rufous-winged sparrow (*Aimophila carpalis*)
The rufous-winged sparrow is classified as a migratory bird and is a resident of eastern Pima County, including Avra Valley, and was once thought to be extirpated in Arizona due to overgrazing but was rediscovered in the Tucson Area in 1936. Rufous-winged sparrows generally use habitats characterized by scattered low shrubs and trees, which provide cover and foraging areas during mid-summer days. Many of these areas contain significant grassland components. Threats to the species include urban development, overgrazing, and exotic species, all of which result in losses of grassland communities utilized by this species (Pima County 2001). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

Western burrowing owl (*Athene cunicularia hypugea*)
The Western burrowing owl inhabits heavily grazed tracts of mixed-grass prairie, particularly where there are burrows created by large rodents, such as prairie dogs and Richardson ground squirrels. Distribution extends from southern Canada through the western United States to South America. Arizona is 1 of 3 states that provide important wintering areas for this species (USGS 2003). Because habitat for this species is widely distributed, placement of the transmission line may impact this species. However because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur throughout the southwestern United States. Therefore, impacts are not likely to result in a trend toward federal listing or loss of viability.

4.3 Reptiles and Amphibians

Texas horned lizard (*Phrynosoma cornutum*)
The Texas horned lizard occurs from Kansas to extreme southeastern Arizona and lives mainly in sandy areas of deserts, grasslands, prairies, and scrublands (Bartlett and Bartlett 1999) where it often inhabits abandoned animal burrows (Bockstanz 1998). Because known populations occur outside of the project area, the proposed transmission line will have no significant effect on the population status of this species.

4.4 Mammals

Big free-tailed bat (*Nyctinomops macrotis*)
Distribution of the big free-tailed bat occurs from the southwestern United States southward through the Caribbean, Central America, and into the northern part of South America. Northern populations are known to migrate to southern Arizona and Mexico in

the fall, yet this species is widely scattered throughout Arizona during the spring and summer too. In Arizona, this bat has been found in pinyon-juniper, Douglas-fir, and Sonoran desertscrub habitats, but it is believed that these locations are foraging sites. Preferred roosting sites include rock crevices and fissures of mountain cliffs in rugged, rocky areas of desertscrub habitat (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the big free-tailed bat.

California leaf-nosed bat (*Macrotus californicus*)
Distribution of the California leaf-nosed bat in the United States spans southern California, southern Nevada, and southwestern Arizona and extends southward into Mexico, to the southern tip of Baja California, northern Sinaloa, and southwestern Chihuahua. This bat lives predominantly in Sonoran and Mohave desertscrub habitats, but is occasionally found in the Chihuahuan and Great Basin deserts. Daytime roosting sites are usually mines and caves, and nighttime roosts include open buildings, cellars, bridges, porches, and mines. These bats do not hibernate or migrate; therefore, they tend to live in the same area year after year and remain active year-round (AGFD 1993, 2001d; Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the California leaf-nosed bat.

Fringed myotis (*Myotis thysandodes*)
Distribution of the fringed myotis ranges from southern British Columbia, Canada southward throughout the western United States, and down to southern Mexico. It occurs in a variety of habitats – from desertscrub to oak and pinyon woodlands to spruce-fir forests. Roosting sites include caves, mines, and buildings. These bats tend to roost in tight clusters and may change locations periodically in response to thermoregulatory needs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the fringed myotis.

Pocketed free-tailed bat (*Nyctinomops femorosaccus*)
The pocketed free-tailed bat ranges from the southwestern United States (including southern California, Arizona, and New Mexico, and the Trans-Pecos region of Texas), south into Mexico through Baja, Sonora, Durango, and Jalisco to, at least, Michoacan.

This bat can be found in the arid lowlands of the desert Southwest, where it roosts in crevices and caves of rugged cliffs, slopes, and rock outcrops (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

Spotted bat (*Euderma maculatum*)
Distribution of the spotted bat ranges throughout centralwestern North America, from southcentral British Columbia down to southern Mexico. In Arizona, its habitat ranges from low desert areas in the Southwest to high desert and riparian habitats in the northwestern part of the state. This bat has also been documented in conifer forests in northern Arizona. Roosting sites are often situated in rock crevices on high cliffs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of the spotted bat.

Underwood's mastiff bat (*Eumops underwoodi*)
The range of Underwood's mastiff bat is limited, from south-central Arizona, into the arid lowlands of Sonoran and western Mexico, and into Honduras. It is believed to be a year-round resident of Arizona, ranging from the Baboquívari Mountains down to Organpipe National Monument. This bat prefers Sonoran desertscrub and mesquite/grassland plant communities. Roosting tends to occur in crevices along steep cliffs and sometimes in the cracks of buildings (AGFD 1993). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed. Furthermore, populations of this species occur throughout southern Arizona. Therefore, impacts will not likely result in a trend toward federal listing or loss of viability of this species.

5.0 AGFD WILDLIFE OF SPECIAL CONCERN

AGFD was consulted in regards to state listed special status species and habitats that may be affected by the proposed action. Several state listed special status species and overall wildlife habitat may be affected by the proposed action. The AGFD mission is to conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs. Continued consultation and input from AGFD will ensure that impacts of the proposed action are minimized and mitigation efforts are successful.

Listed in Table 5 are state special status species that may be found in the vicinity of the proposed action, based on AGFD's Heritage Data Management System (HDMS) (1 July 2002). Effects of the proposed action on the majority of these species will be avoided or minimized through mitigation efforts stipulated for federally listed species. However, additional mitigation is recommend for the Sonoran Desert tortoise as 5 individuals were located near the Tinaja Hills area during field surveys of the proposed ROW (HEG 2002, unpublished data).

TABLE 5. SUMMARY OF EFFECTS ON WILDLIFE OF SPECIAL CONCERN IN ARIZONA.

COMMON NAME *Scientific Name*	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Black-bellied whistling duck *Dendrocyna autumnalis*	No Impacts.	• No construction in perennial aquatic habitats.
Crested caracara *Caracara cheriway*	No Impacts.	• Known populations occur outside project area.
Desert tortoise - Sonoran population *Gopherus agassizii*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total potential habitat within project area may be impacted. • Pre-construction surveys will minimize impacts to species.
Elegant trogon *Trogon elegans*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Populations of this species occur in isolated mountain ranges throughout southern Arizona.
Great Plains narrow-mouthed toad *Gastrophryne olivacea*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

Mexican long-tongued bat *Choeronycteris mexicana*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Only small percentage of total potential habitat within project area may be impacted. • Mitigation plantings of agaves will reduce impacts.

TABLE 5 (CONTINUED). SUMMARY OF EFFECTS ON WILDLIFE OF SPECIAL CONCERN IN ARIZONA.		
COMMON NAME ***Scientific Name***	**EFFECTS DETERMINATION**	**JUSTIFICATION**
Mexican vine snake *Oxibelis aeneus*	No Impacts.	• Known occurrences are outside project area.
Osprey *Pandion haliaetus*	No Impacts	• No construction in perennial aquatic habitats.
Rose-throated becard *Pachyramphus aglaiae*	No Impacts.	• Known occurrences are outside project area.
Thick-billed kingbird *Tyrannus crassirostris*	No Impacts	• No potential habitat within project area.
Tropical Kingbird *Tyrannus melancholicus*	May impact individuals of this species, but is not likely to result in a trend toward federal listing or loss of viability.	• Minimal impacts to riparian habitat. • Only small percentage of total population within project area may be impacted. • Other viable populations occur outside of project area.

Black-bellied whistling duck (*Dendrocyna autumnalis*)
The black-bellied whistling duck is "goose-like" with a long neck and long pink legs. This species has a cinnamon or chestnut breast and back with a black belly and bright coral-red bill. The total range for this species is from the Gulf coast and lower Rio Grande Valley of Texas and central Arizona south through Mexico, Central America to southern Brazil. In Arizona, the range for the black-bellied whistling duck is southeastern and central Arizona. Black-bellied whistling ducks are commonly seen in the Santa Cruz Valley, particularly in ponds near and around Nogales. The habitat for this species consists of the banks of rivers, lakes, ponds, riparian areas, and stock tanks (Brown 1985).

Because of habitat loss and apparent population declines from historic levels, the black-bellied whistling duck has been placed on the AGFD Threatened Native Wildlife of Arizona List as a candidate species. This species appears to be increasing in Arizona in urban settings at man-made ponds and at sewage treatment plants. It also appears to be stable at some private ranch ponds, which tend to be isolated from hunting pressure (Corman 1994).

Because no construction will occur in perennial aquatic habitats, the proposed transmission line will have no effect on the population status of the black-bellied whistling duck.

Crested caracara (*Caracara cheriway*)

The crested caracara is a medium sized raptor with bold black and white plumage and a bright yellow-orange face and legs. The crested caracara ranges from southern Arizona and northern Mexico to Tierra del Fuego. In the United States, it occurs only along the southern border in Texas and Arizona, and in Florida, where there is an isolated population in the south-central peninsula. In Arizona, their range extends up from San Miguel in the Baboquivari Valley north to Quijotoa, Sells, and Coyote Pass. This raptor occurs regularly on the Tohono O'odham Indian Reservation. Small groups of crested caracara are seen in Sasabe and south of the Mexican border near Sonoyta, Sonora. This raptor is found in open habitats, typically grassland, prairie, pastures, or desert with scattered taller trees, shrubs, or cacti. The crested caracara is found in areas characterized by low-profile ground vegetation and scattered tall vegetation. Specifically in Arizona, vegetation consists of saguaro, mesquite, paloverde, cholla and acacia (Morrison 1996).

Arizona populations of crested caracara on the Tohono O’odham Reservation are likely stable because few threats exist. Reports of individual, and in some cases groups, of this raptor outside of the reservation indicate that its range within Arizona is probably as extensive as it was historically. No apparent threat currently exits to Arizona populations; however, the AGFD has listed the crested caracara as a threatened native wildlife. This species is considered vulnerable if habitat conditions worsen (Morrison 1996).

Habitat surveys did not detect the presence of any bird of prey nests along the corridor. Furthermore, no know populations of this species occur within the project area. Therefore, the proposed action will have no effect on the population status of the crested caracara.

Desert tortoise (Sonoran) (*Gopherus agassizii*)
The Sonoran Desert tortoise ranges from northern Sinaloa, Mexico to southern Nevada and southwestern Utah, and from southcentral California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act. The threatened Mojave population occurs north and west of the Colorado River and the unlisted Sonoran population occurs south and east of the Colorado River. Within Arizona, the Sonoran Desert tortoise is found south and east of the Colorado River from Mojave County to the south, beyond the International Boundary and many scattered locations in between. The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desertscrub at elevations ranging from 152 to 1,615 m (500 – 5,300 ft). Burrows and shelter sites are generally below rocks and boulders, in rock crevices, under vegetation, and also in caliche caves of incised wash banks (AGFD 2001e).

Several threats to tortoise populations in the Sonoran Desert have been identified, including habitat fragmentation, habitat loss and degradation from urban and agricultural development and roads, wildfires associated with invasion of non-native grasses and forbs, illegal collection, and genetic contamination of wild populations by escaped or released captives. Although current evidence suggests that Arizona populations are stable there are substantial gaps in available data (Arizona Interagency Desert Tortoise Team 1996).

During ground surveys of the proposed transmission line corridor, 5 desert tortoise were found (HEG, unpublished data). Per recommendations of Spencer and Humphrey (1999) for any ground disturbing projects, surveys should be conducted a minimum of 48 hours prior to grading and again just prior (as it is occurring) to vegetation clearing (Desert Tortoise Council 1999). While the proposed action may have a minimal effect on the potential habitat of this species, pre-construction surveys will minimize impacts to individual tortoise and is therefore not likely to result in a trend toward listing or loss of viability.

Elegant trogon (*Trogon elegans*)
The elegant trogon is a medium sized bird with a round head, large eyes, a white band on an iridescent green breast, black face and throat, red belly and undertail coverts. The total range for this bird is from southern Arizona and New Mexico south through Mexico to southern Nicaragua to northwestern Costa Rica. In Arizona, the elegant trogon is found in sky island mountains, most commonly the Atascosa, Chiricahua, Huachuca, and Santa Rita mountains. Elegant trogons are found in riparian areas consisting of sycamore, cottonwood, and oak, and also in coniferous woodlands at elevations ranging from 1,036 to 2,073 m (3,400 – 6,800 ft) (AGFD 2001f).

Population trends for the elegant trogon are not well known. No evidence indicates population declines in any of the core canyons occupied over the past few decades. Threats to this species include degradation and loss of native riparian habitat through stream diversion, groundwater withdrawal, erosion, and overgrazing (AGFD 2001f).

The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual trogons, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur in isolated mountain ranges throughout southern Arizona. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Great Plains narrow-mouthed toad (*Gastrophryne olivacea*)
The Great Plains narrow-mouthed toad is a small, stout toad with stubby limbs, a small pointed head with a fold of skin on the back of the head. The total range for this species is from southeastern Nebraska and Missouri south through Texas to western Mexico. Within Arizona, the Great Plains narrow-mouthed toad is found in the vicinity of Santa Cruz County, Pima County, to near Casa Grande, Arizona in Pinal County. Habitat for this species in Arizona consists of mesquite semi-desert grassland communities to oak

woodland communities near riparian areas at elevations ranging from sea level to around 1,250 m (4,100 ft) (AGFD 1995c).

Population trends for the Great Plains narrow-mouthed toad are currently unknown. Populations in Arizona are at the extreme northwestern edge of the species range and distribution is limited throughout its range (AGFD 1995c). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individuals of this species, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside the project area. Therefore, impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mexican long-tongued bat (*Choeronycteris mexicana*)
The Mexican long-tongued bat has a long, slender nose with a leaf-like structure on the base of the nose. The total range for this species is from southeastern Arizona, southwestern New Mexico, and California south through Central America to Venezuela. In Arizona, the Mexican long-tongued bat is found from the Chiricahua Mountains extending as far north as the Santa Catalina Mountains and west to the Baboquivari Mountains. Habitat for this bat is typically within canyons of mixed oak-conifer forests in mountains at elevations ranging from 1,082 to 2,231 m (3,550 – 7,320 ft) (AGFD 1994). This species do not congregate in sizeable maternity or bachelor colonies like *Leptonycteris* bats do (Hoffmeister 1986). They feed on nectar and pollen, especially from paniculate agaves (AGFD 1994).

Populations of Mexican long-tongued bats in Arizona appear to be highly variable (AGFD 1994) and there is no evidence of a long-term decline or any clear trend. The limitation of riparian zones and the distribution of food plants may limit populations of this species in Arizona and loss of riparian vegetation may be a greater threat to this species than human disturbance at particular roost sites (Pima County 2001). The proposed TEP transmission line will not cross near known roost sites, but potential foraging habitat may be disturbed during construction; however, these disturbances will be isolated and will impact only a small percentage of potential habitat. Furthermore, transplanting of agave plants also will minimize impacts. Impacts to this species are not likely to result in a trend toward federal listing or loss of viability.

Mexican vine snake (*Oxibelis aeneus*)
The Mexican vine snake has an elongated head, pointed snout, and is thin bodied with an ash gray to yellow-brown and tan coloring. The total range for this species is from extreme southern Arizona south to Brazil. In Arizona, this species occurs in the Tumacacori, Pajarito, and Patagonia mountains in Santa Cruz County. Habitat for the Mexican vine snake consists of brush-covered hillsides and riparian areas with sycamore,

oak, walnut and wild grape trees at elevations ranging from 914 to 1,768 m (3,000 – 5,800 ft) (AGFD 1991b).

Population trends for the Mexican vine snake are currently unknown. Populations in Arizona are at the extreme northern edge of the species range and distribution is limited, with occurrences known from Sycamore Canyon (AGFD 1991b). A potential threat is the high interest by collectors for this species (AGFD 1991b). Because known occurrences of this species are outside the project area, the proposed action will have no effect on the population status of the Mexican vine snake.

Osprey (*Pandion haliaetus*)
This raptor is dark brown on its back and white on the underparts with a prominent dark eye stripe. The total range for the osprey is from Alaska to Newfoundland, along the Atlantic and Pacific coastlines, and in the Rocky Mountains south through central and South America. Within Arizona, the osprey occurs primarily in the White Mountains, along the Mogollon Rim, and along the Salt and Verde rivers. In southeastern Arizona, this raptor is an uncommon spring and fall transient, usually seen at ponds and reservoirs. Nesting habitat of the osprey consists of coniferous trees along rivers and lakes at elevations ranging from 1,829 to 2,377 m (6,000 – 7,800 ft) (AGFD 1997d).

Osprey population trends in Arizona are not well known. Only about 20 nest sites are known in the southwest, all within Arizona. This raptor is threatened by loss of nesting habitat and foraging perch sites. It is also threatened by recreational use of nesting habitat, shooting, and pesticide poisoning on wintering grounds (AGFD 1997d).

Because no construction will occur in perennial aquatic habitats, the proposed action will have no effect on the population status of the osprey.

Rose-throated becard (*Pachyramphus aglaiae*)
The rose-throated becard is a big-headed, thick billed bird that breeds in southeast Arizona, southern Texas (rare visitor along the Rio Grande), south through Mexico to Costa Rica. This species winters from northern Mexico south through to its breeding range. Within Arizona, rose-throated becards have been found breeding along Sonoita and Arivaca creeks, Sycamore Canyon (Atascosa Mountains), and Patagonia. Historically, this species nested in Guadalupe Canyon (east of Douglas) and near Tucson. Rose-throated becards typically inhabit marshes of Sonoran desertscrub communities of open to dense vegetation of shrubs, low trees, and succulents dominated by paloverde, prickly pear, and saguaro. This species also is found in the desert riparian deciduous woodland communities of marsh-woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of deciduous trees and shrubs along the margins. In Arizona, the rose-throated becard is found at elevations ranging from 1,082 to 1,228 m (3,550 – 4,030 ft) (AGFD 2001g).

Population trends for the rose-throated becard are currently unknown. Potential threats to this species include disturbance from bird watchers and degradation and loss of native riparian habitat through overgrazing, urban development, and groundwater depletion (AGFD 2001g). Because known occurrences of this species are outside the project area, the proposed action will have no effect on the population status of the rose-throated becard.

Thick-billed kingbird (*Tyrannus crassirostris*)
The thick-billed kingbird is a relatively stocky flycatcher with a large head and heavy bill. This kingbird occurs from southeastern Arizona and southwestern New Mexico south through western Mexico to western Guatemala. In Arizona, thick-billed kingbirds are most often seen around Sonoita and Arivaca creeks and in Madera and Guadalupe canyons. This species may occur in mountains of Pima, Santa Cruz and Cochise counties where there are drainages with well-developed riparian areas. Habitat for the thick-billed kingbird consists of broad-leaved, riparian forests usually with well-developed large sycamores and cottonwoods at elevations ranging from 914 to 1,981 m (3,000 – 6,,500 ft) (Tibbitts 1991).

Present distribution of the thick-billed kingbirds in Arizona is very limited. Potential threats include human recreational activities, encroachment of human development into breeding habitat, woodcutting, grazing, and groundwater depletion (Tibbitts 1991). Because no potential habitat occurs within the project area, the proposed action will have no effect on the population status of the thick-billed kingbird.

Tropical Kingbird (*Tyrannus melancholicus*)
The tropical kingbird is a large tyrant-flycatcher with a large bill and long, slightly notched tail. The tropical kingbird ranges from southeastern Arizona through western and central Mexico to central Argentina. Breeding birds have been found in Tucson, along the Santa Cruz Valley from Green Valley south, east of Phoenix in the Salt River Valley, to the San Pedro Valley. This species also has been reported from Sopori Wash. The Tropical Kingbird inhabits open and semi-open areas with scattered trees and shrubs. Also found in urban areas and roadsides with tall human-made fixtures (Stouffer and Chesser 1998).

Tropical kingbirds seem to persist or even thrive in developed areas. No negative effects of human activities have been reported (Stouffer and Chesser 1998). The proposed transmission line may cross potential habitat for this species; however, construction within riparian habitats will be minimized to the greatest extent possible. Placement of the transmission line may impact individual tropical kingbirds, however because of the linear nature of the project, only a small percentage of the population within the project area may be impacted. Furthermore, populations of this species occur outside of the project area. Therefore, impacts to tropical kingbirds are not likely to result in a trend toward federal listing or loss of viability.

Common Name	**Scientific Name**	**Status**
Alamos Deer Vetch	*Lotus alamosanus*	S
Arid Throne Fleabane	*Erigeron arisolis*	S
Arizona Giant Sedge	*Carex ultra*	S, S[1]
Arizona Metalmark	*Calephelis rawsoni arizonensis*	S
American Peregrine Falcon	*Falco peregrinus anatum*	SC, S, WC
Bartram's Stonecrop	*Graptopetalum bartramii*	SC, S, S[1], SR
Beardless Chinch Weed	*Pectis imberbis*	SC, S
Broad-leaf ground cherry	*Physalis latiphysa*	S
Catalina Beardtongue	*Penstemon discolor*	S, HS
Cave Myotis	*Myotis velifer*	SC, S
Chiltepin	*Capsicum annuum* var.*glabriusculum*	S
Chihuahuan Sedge	*Carex chihuahuensis*	S
Chiricahua Mountain Brookweed	*Samolus vagans*	S
Five-Stripped Sparrow	*Aimophila quinquestriata*	S
Foetid Passionflower	*Passiflora foetida*	S
Gentry Indigo Bush	*Dalea tentaculoides*	SC, S, S[1], HS
Giant Spotted Whiptail	*Cnemidophorus burti strictogrammus*	SC, S, S[1]
Large-Flowered Blue Star	*Amsonia grandiflora*	SC, S
Lowland Leopard Frog	*Rana yavapaiensis*	SC, S, WC
Lumholtz Nightshade	*Solanum lumholtzianum*	S
Mexican Garter Snake	*Thamnophis eques megalops*	SC, S, WC
Mock-Pennyroyal	*Hedeoma dentatum*	S
Nodding Blue-eyed Grass	*Sisyrinchium cernuum*	S
Northern Gray Hawk	*Asturina nitida maxima*	SC, S, S[1], WC
Pima Indian Mallow	*Abutilon parishii*	SC, S, SR
Santa Cruz Beehive Cactus	*Coryphantha recurvata*	S, S[1], HS
Santa Cruz Star Leaf	*Choisya mollis*	SC, S
Santa Cruz Striped Agave	*Agave parviflora* ssp. *parviflora*	SC, S, S[1], HS
Seeman Groundsel	*Senecio carlomasonii*	S
Sonoran Noseburn	*Tragia laciniata*	S
Southern Pocket Gopher	*Thomomys umbrinus intermedius*	S
Superb Beardtongue	*Penstemon superbus*	S, HS
Supine Bean	*Macroptilium supinum*	SC, S, HR
Sweet Acacia	*Acacia smallii*	S
*Three-nerved Scruf-pea	*Pediomelum pentaphyllum*	S
Thurber Hoary Pea	*Tephrosia thurberi*	S
Thurber's Morning-glory	*Ipomoea thurberi*	S
Virlet Paspalum	*Paspalum virletti*	S
Weeping Muhly	*Muhlenbergia xerophil*)	S
Western Barking Frog	*Eleutherodactylus augusti cactorum*	S, WC
Wiggins Milkweed Vine	*Metastelma mexicanum*	SC, S
Wooly Fleabane	*Laennecia eriophylla*	S
Yellow-billed Cuckoo	*Coccyzus americanus*	C, S,

*Indicates species not on AGFD HDMS list but known to occur in the vicinity of project.

STATUS DEFINITIONS

C: **Candidate.** Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list as Endangered or Threatened under ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.

WC: **Wildlife of Special Concern in Arizona.** Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by AGFD listing of **Wildlife of Special Concern in Arizona (WSCA)**. Species included in WSCA are currently the same as those in Threatened Native Wildlife in Arizona (1988).

SC: **Species of Concern.** The terms "Species of Concern" or "Species at Risk" should be considered as terms-of-art that describe the entire realm of taxa whose conservation status may be of concern to USFWS, but neither term has official status (currently all former C2 species).

S: **Sensitive.** Those taxa occurring on National Forests in Arizona which are considered sensitive by the Regional Forester or Bureau of Land Management.

HS: **Highly Safeguarded.** Those species of native plants and parts of plants, including the seeds and fruit, whose prospects for survival in Arizona are in jeopardy or which are in danger of extinction.

HR: **Harvest Restricted.** Those species of native plants that are not included in the highly safeguarded category but are subject to excessive harvesting or overcutting because of their intrinsic value.

SR: **Salvage Restricted.** Plants that have a high potential for theft or vandalism and focuses on the taking of the whole plant. Protected by permits, tags, and seals needed for salvage of plants.

3.1 PLANTS

Alamos deer vetch (*Lotus alamosanus*)

Alamos deer vetch is a perennial herb found in southern Arizona, and Sonora, Chihuahua, and Durango, Mexico. Within Arizona, this plant is found in Sycamore Canyon and the Pajarito Mountains of Santa Cruz County, and near Garden Valley in Maricopa County. This plant is considered a wetland obligate species that is restricted to stream banks in canyons at elevations ranging from 3,500 ft (1,067 m) to 5,500 ft (1,676 m) (AGFD 1999a). Within the Nogales RD, this plant occurs in the Sycamore Canyon and Peña Blanca Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

Population trends for Alamos deer vetch are unknown (AGFD 1999a). The proposed transmission line may cross potential Alamos deer vetch habitat, however, construction within aquatic habitats will be minimized to the greatest extent possible. There may be an impact to individual plants during development of the line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Arid throne fleabane (*Erigeron arisolis*)

Arid throne fleabane is an annual to short-lived perennial forb that occurs in Arizona, southwestern New Mexico, and Sonora, Mexico. Within Arizona, this plant is found in Apache, Cochise, Pima, and Santa Cruz counties. This species is typically found on moist rocky soils in grasslands, grassy openings within oak woodlands, and roadsides at elevations between 4,200 ft (1,280 m) and 5,500 ft (1,676 m) (AGFD 2000a). On the CNF Nogales RD, it has been documented from Box Canyon and Ruby Roads (T. Newman, CNF, pers. comm., 20 August 2002).

Arid throne fleabane favors moist areas in grasslands and grassy openings in oak woodlands, areas also favored by livestock for grazing (AGFD 2000a). The proposed transmission line may cross potential arid throne fleabane habitat. There may be an impact to individual plants during development of the line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Arizona giant sedge (*Carex ultra*)
Arizona giant sedge is the largest sedge found in Arizona. Its range includes southeast Arizona, extreme southwest New Mexico (Hidalgo County, Indian Springs in the Pelocillos) and Mexico (Sonora and Coahila). Within Arizona, this sedge is found in Cochise, Graham, Pinal, Yavapai, Pima (Santa Rita Mountains and the Rincon Valley), and Santa Cruz counties (Santa Rita and Atascosa Mountains). Typically only 1 patch per mountain has been found. Like other sedges, this plant is associated with moist soil near perennial wet springs and streams and undulating rocky-gravelly terrain at elevations ranging from 2,040 ft (622 m) to 6,000 ft (1,829 m) (AGFD 2000b). Within the Nogales RD, Arizona giant sedge is found in Sycamore Canyon and Mule Ridge in the Atascosa Mountains, and at Deering Spring and Big Casa Blanca Canyon in the Santa Rita Mopuntains (T. Newman, CNF, pers. comm., 20 August 2002).

Small populations of this sedge in isolated wetlands are vulnerable to local disturbance of aquatic habitat (AGFD 2000b). The proposed transmission line is not likely to cross potential Arizona giant sedge habitat, however, any construction within aquatic habitats will be minimized to the greatest extent possible. Individual plants are not likely to be impacted during development of the proposed transmission line, if disturbance occurs it will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Bartram's stonecrop (*Graptopetalum bartramii*)
Bartram's stonecrop is a small succulent perennial found in southern Arizona and Chihuahua, Mexico (one record). In Arizona, this plant occurs in Santa Cruz County within the Patagonia, Santa Rita, and Tumacacori Mountains, in Pima County within the Baboquivari, Dragoon, and Rincon Mountains, and in Cochise County within the Chiricahua Mountains. Habitat for Bartram's stonecrop consists of cracks in rocky outcrops within shrub live oak-grassland communities along the sides of rugged canyons. This plant is usually found in heavy litter cover and shade where moisture drips from

rocks at elevations ranging from 3,900 ft (1,189 m) to 6,700 ft (2,042 m) (AGFD 1997a). Bartram's stonecrop plants are found on the west side of the Nogales RD in Sycamore Canyon, Tres Amigos Gulch, Peña Blanca Canyon, Alamo Canyon, Peñasco Canyon, in the vicinity of Montana Peak, and in the vicinity of Peña Blanca Lake (T. Newman, CNF, pers. comm., 20 August 2002).

Bartram's stonecrop populations are typically small and isolated. Illegal collection of the plant is the main management issue at this time. Other factors that may affect populations include mining and mineral exploration, habitat alteration due to livestock grazing, trampling by cattle and recreationists, and road construction and maintenance (AGFD 1997a). The proposed transmission line does not cross known Bartram's stonecrop populations within the Nogales RD. Placement of the transmission line is not likely to result in a trend toward federal listing or loss of viability.

Beardless chinch weed (*Pectis imberbis*)
Beardless chinch weed is a perennial herb that is found in southern Arizona, western Chihuahua and eastern Sonora, Mexico. Within Arizona, this plant can be found in Cochise, Pima, and Santa Cruz counties (within Santa Cruz County it is found along Ruby Road in the Atascosa Mountains and in the Red Rock area of Canelo Hills). Habitat for this species consists of open areas in grassland and oak-grassland communities. This species is adapted to disturbances and grows along road cuts. Beardless chinch weed has an extremely broad habitat range and can be found at elevations from 4,000 ft (1,219 m) to 5,000 ft (1,524 m) (AGFD 1998a).

Populations of beardless chinch weed may be susceptible to impacts from grazing and road maintenance activities (AGFD 1998a). The proposed transmission line crosses in the vicinity of known beardless chinch weed populations within the Nogales RD. Placement of the transmission line may impact individual beardless chinch weed. Because of the linear nature of the proposed action, these impacts will be widely distributed and relatively minor in any single area. Impacts are not likely to result in a trend toward federal listing or loss of viability.

Broad-leaf ground cherry (*Physalis latiphysa*)
Broad-leaf ground cherry is an herbaceous annual found in southern Arizona. This plant can be found in the San Bernardino Valley of Cochise County, the Pinaleno Mountains of Graham County, in the vicinity of Arivaca Creek in Pima County, and the Santa Cruz River of Santa Cruz County. Habitat for the broad-leaf ground cherry consists of washes, often in the shade of shrubs and boulders, desertscrub vegetation, and grasslands at elevations ranging from 3,000 ft (914 m) to 4,500 ft (1,372 m) (AGFD 2000c). There are no known sites for this plant in the Nogales RD. The nearest locations are northwest of Arivaca Lake and in the vicinity of Tubac on the Santa Cruz River (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of broad-leaf ground cherry (AGFD 2000c). The proposed transmission line does not cross known broad-leaf ground cherry populations within the Nogales RD. Placement of the transmission line is not likely to result in a trend toward federal listing or loss of viability.

Catalina beardtongue (*Penstemon discolor*)
Catalina beardtongue is a perennial herbaceous sub-shrub found in southern Arizona. This shrub is found in Cochise County, Graham County, Pinal County, Pima County (within the Santa Catalina Mountains), and Santa Cruz County (within the Atascosa and Tumacacori Mountains). Habitat for Catalina beardtongue consists of bare rock outcrops, barren soil outcrops, and bedrock openings in chapparal or pine-oak woodlands at elevations ranging from 4,120 ft (1,256 m) to 7,600 ft (2,316 m) (AGFD 1999b). On the Nogales RD, this shrub occurs in the upper end of Peck Canyon, Corral Nuevo, and the adjacent Bartalo Mountain (Cedar Canyon) typically on whitish volcanic ash (T. Newman, CNF, pers. comm., 20 August 2002).

Some populations of this plant are threatened by rock climbers, but few other threats exist (AGFD 1999b). The proposed transmission line does not cross known Catalina beardtongue populations within the Nogales RD. Placement of the transmission line is not likely to result in a trend toward federal listing or loss of viability for this species.

Chiltepin (*Capsicum annuum* var.*glabriusculum*)
Chiltepin is a herbaceous to woody perennial shrub that is found in south Texas, southern New Mexico, southern Arizona, and south to tropical America. Within Arizona, a few populations of this plant are found in the Chiricahua, Tumacacori, Baboquivari, and Ajo Mountains. This plant occurs in protected, frost-free canyons in oak woodlands of slopes at less than 4,500 ft (1372 m) elevation (typically found at elevations ranging from 3,600 ft [1,097 m] to 4,400 ft [1,341 m]). Chiltepin plants grow under nurse shrubs and usually are associated with rock ledges, and outcrops. Within the Nogales RD, there are populations in the Tumacacori Mountains and Cobre Ridge area and there are suspected populations on the west side the RD (AGFD 1991 and T. Newman, CNF, pers. comm., 20 August 2002).

This plant is declining in some areas because of drought, overgrazing, and local over-collection of berries (AGFD 1991a). The proposed transmission line will not cross known locations of this plant, however, the line will cross potential chiltepin habitat. Individual chiltepin plants may be impacted during development of the transmission line. Because of the linear nature of the proposed action, these impacts will be widely distributed and relatively minor in any single area. Impacts are not likely to result in a trend toward federal listing or loss of viability.

Chihuahuan sedge (*Carex chihuahuensis*)

Chihuahuan sedge is a grasslike perennial plant that occurs in southeastern Arizona, New Mexico (Hidalgo County), and Mexico (Sonora and Chihuahua). Within Arizona, this plant ranges from Cochise, Graham, Gila, Pima (Santa Catalina, San Luis, and Rincon mountains), and Santa Cruz counties (Atascosa and Santa Rita Mountains, and the Santa Cruz River). Chihuahuan sedge can be found in wet soils along streambeds, shallower draws in pine-oak forest and riparian woodland. It also is found in wet meadows, cienegas, marshy areas, and canyon bottoms from 1,100 ft (335 m) to 8,000 ft (2,438 m) (AGFD 1999c). Within the Nogales RD, this plant has been found near Arivaca Lake (on private land), Sycamore Canyon, and south of Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Chihuahuan sedge (AGFD 1999c). The proposed transmission line does not cross known Chihuahuan sedge populations within the Nogales RD. Placement of the transmission line is not likely to result in a trend toward federal listing or loss of viability for this species.

Chiricahua mountain brookweed (*Samolus vagans*)
The Chiricahua Mountain brookweed is a perennial herb found in southeastern Arizona, western Chihuahua, and eastern Sonora, Mexico. This plant apparently reaches its southern limit in southern Sonora, Mexico. Within Arizona, this species is found in the Huachuca Mountains of Cochise County, the Rincon, Santa Catalina, and Santa Rita Mountains of Pima County, and the Canelo Hills and Pajarito Mountains of Santa Cruz County. The Chiricahua Mountain brookweed is confined to areas with permanent water, such as springs, seeps, and in and along streams at elevations ranging from 1,219 to 2,195 m (4,000 to 7,200 ft) (AGFD 1999d). Within the Nogales RD, this plant occurs in Florida Canyon of the Santa Rita Mountains and in Sycamore Canyon of the Atascosa Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of Chiricahua Mountain brookweed (AGFD 1999d). To reduce disturbance in areas of permanent water (such as springs and streams), construction within these aquatic habitats will be minimized to the greatest extent possible. The proposed TEP transmission line will have no effect on the population status of the Chiricahua Mountain brookweed and is not likely to result in a trend toward listing or loss of viability.

Foetid passionflower (*Passiflora foetida*)
The foetid passionflower is a herbaceous vine found in southeastern Texas and the Rio Grande Valley, southern Arizona, and southward throughout Mexico, Central and South America, and the West Indies. Within Arizona, this species is found in the Baboquivari Mountains, Arivaca, and Las Guijas Mountains of Pima County and in California Gulch and the Bartlett Mountains of Santa Cruz County. In Arizona, this plant occurs on hillsides and canyons of the Lower Sonoran zone from 1,067 to 1,707 m (3,500 to 5,600

ft) in elevation (AGFD 2000d). Within the Nogales RD, foetid passionflowers have been recorded in the California Gulch and Holden Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of foetid passionflower (AGFD 2000d). Known locations of this plant occur outside of the proposed TEP transmission line corridor.
The proposed TEP transmission line will have no effect on the population status of the foetid passionflower and is not likely to result in a trend toward listing or loss of viability.

Gentry indigo bush (*Dalea tentaculoides*)
The Gentry indigo bush is a herbaceous perennial shrub found primarily in southern Arizona but its range may extend into Mexico. Within Arizona, this shrub is found in the Sycamore Canyon drainage in the Atascosa Mountains, in the Pajarito Mountains of Santa Cruz County, and within the Baboquivari Mountains (1930s record) and Mendoza Canyon (1965 record) of Pima County. Gentry indigo bush is typically found along canyon bottoms on cobble terraces subject to occasional flooding and seems to prefer disturbance prone environments at elevations ranging from 1,097 to 1,341 m (3,600 to 4,400 ft) (AGFD 1998b). Historic collection records indicate that this plant may grow on rocky hillsides. Within the Nogales RD, this plant has been recorded in Sycamore Canyon, in the vicinity of Peñasco Canyon, Kaiser Canyon, and north of Manzanita Mountain (T. Newman, CNF, pers. comm., 20 August 2002).

Potential threats to Gentry indigo bush populations are cattle grazing, recreational foot traffic, and flooding events that eliminate terraces occupied by this species (AGFD 1998b). Known locations of this plant occur outside of the proposed TEP transmission line corridor. The proposed TEP transmission line will have no effect on the population status of the Gentry indigo bush and is not likely to result in a trend toward listing or loss of viability.

Large-flowered blue star (*Amsonia grandiflora*)
The large-flowered blue star is a herbaceous perennial that is found in northern Sonora and Durango, Mexico, and southern Arizona. Within Arizona, this plant is found in the Patagonia, Atascosa/Pajarito Mountains of Santa Cruz and Pima counties. Habitat for this species consists of canyon bottoms in oak woodlands typically dominated by Emory oak and Mexican blue oak, however, site-specific qualities are inconsistent. Large-flowered blue star plants have adapted to rock fall disturbance and are typically found at elevations ranging from 1,189 to 1,372 m (3,900 to 4,500 ft) (AGFD 1998c). Within the west side of the Nogales RD, this plant occurs at Peña Blanca and Arivaca lakes, Sycamore Canyon, Chiminea Canyon, California Gulch, and near Ruby (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of large-flowered blue star are rare, with only 15 to 20 populations within 2 mountain ranges as the total world distribution, but populations seem to be stable. This plant is highly susceptible to disturbance and populations may be impacted by expanding development in the Nogales area (AGFD 1998c). The proposed transmission line will cross in the vicinity of a known population of large-flowered blue star, however, little or no disturbance will occur in the area of this population. Therefore, placement of the line is not likely to result in a trend toward federal listing or loss of viability of large-flowered blue star.

Lumholtz nightshade (*Solanum lumholtzianum*)
The Lumholtz nightshade is a herbaceous annual that is found in southern Arizona and northern Mexico. Within Arizona, this plant is found in the Arivaca and San Luis Mountains of Pima County and the Patagonia, Atascosa, and Santa Rita Mountains of Santa Cruz County. Lumholtz nightshade plants are typically found in washes and low ground near wet depressions and along stream banks from 914 to 1,402 m (3,000 to 4,600 ft) elevation in desert grassland plant communities. This plant is also often found in disturbed, weedy areas (AGFD 2000e). Within the Nogales RD, this nightshade is found in the vicinity of Arivaca, Ruby, California Gulch, Nogales, Cobre Ridge, and Oro Blanco Wash (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of Lumholtz nightshade (AGFD 2000e). There may be an impact to individual plants during development of the proposed line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Mock-pennyroyal (*Hedeoma dentatum*)
The mock-pennyroyal is a herbaceous perennial plant found in southeastern Arizona and northern Sonora, Mexico. Within Arizona, this plant is found in the Chiricahua, Huachuca, Mule, Whetstone, and Winchester Mountains of Cochise County, the Pinaleno Mountains of Graham County, the Baboquivari, Rincon, and Santa Cruz Mountains of Pima County, and the Atascosa, Mustang, Pajarito, and Santa Rita Mountains of Santa Cruz County. Habitat for this plant consists of oak woodland, oak-pine forest, and pine forest. It can be found on open roadcuts, steep rocky outcrops, and gravelly slopes in wooded canyons with open to full sunlight at elevations ranging from 1,173 to 2,500 m (3,850 to 8,200 ft) (AGFD 2000f).

Populations of mock-pennyroyal seem to be restricted to a relatively small geographic area and populations are apparently small (AGFD 2000f). There may be an impact to individual plants during development of the proposed line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Nodding blue-eyed grass *(Sisyrinchium cernuum*)
Nodding blue-eyed grass is a perennial forb with grass-like leaves that occurs in southeastern Arizona, west Texas, and Mexico. Within Pima and Santa Cruz counties,

Arizona it occurs in the Pajarito, Santa Rita, Atascosa, and Rincon Mountains as well as Sycamore Canyon. This species can be found in Desert Grassland and Pine-Oak Woodlands from 1,006 to 2,438 m (3,300 to 8,000) ft in elevation along streams in partial shade and in canyon bottoms. It grows in wet soil by seeps, pools, or springs in desert scrub. It has also been found on sandy stream banks. On the CNF Nogales Ranger District (RD) this plant has been found at 1,189 m (3,900 ft) in Sycamore Canyon on the west side and at 1,402 m (4,600 ft) in Big Casa Blanca Canyon in the Santa Rita Mountains (AGFD 1999e). The known location of this plant in Sycamore Canyon is within the Gooding RNA, located approximately 7 miles west of the proposed ROW (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of nodding blue-eyed grass (AGFD 1999e). The proposed transmission line will not cross over or near known locations of this plant within the Gooding RNA. Therefore, placement of the TEP transmission line will have no impact on the nodding blue-eyed grass.

Pima indian mallow (*Abutilon parishii*)
The Pima Indian mallow is a perennial woody based plant with herbaceous branches. This plant is known from 84 populations in 17 mountain ranges from near the town of Bagdad in central Arizona to Nachopouli Canyon, Sonora, Mexico. Within Arizona, Pima Indian mallow are found in the Superstition Mountains of Maricopa County, the Santa Catalina, Rincon, Silverbell, and Tucson Mountains of Pima County, the Mineral Hills, Superstition, Picacho, Tortolito, and Dripping Springs mountains of Pinal County, the Santa Rita and Tumacacori mountains of Santa Cruz County, and the Little Shipp Wash and Cottonwood Creek areas near Bagdad in Yavapai County. This plant has also been identified within Sabino Canyon in Pima County. Pima Indian mallow are typically found in mesic situations in full sun within higher elevations of Sonoran Desertscrub. They can be found on rocky slopes, cliff bases, lower side slopes and ledges of canyons among rocks and boulders. In riparian zones, this plant occurs on flat secondary terraces but typically not in canyon bottoms. Pima Indian mallow are often found near trails, probably because of the trails influence on the light, heat, and water on the micro-habitat. This species is found at elevations ranging from 900 to 1,440 m (3,000 to 4,800 feet) (AGFD 1997b). Within the Nogales RD, this plan occurs in the Devils Cash Box area of the Santa Rita Mountains and within Peck Canyon in the Tumacacori Mountains (T. Newman, CNF, pers. comm., 20 August 2002).

In Arizona, few threats exist to the populations of Pima Indian mallow because this plant grows in steep areas eliminating grazing pressures and freezing or light fires do not harm it (AGFD 1997b). The proposed TEP transmission line crosses over known Pima Indian mallow populations within the Nogales RD. Placement of the transmission line may impact individual Pima Indian mallow but is not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz beehive cactus (*Coryphantha recurvata*)
The Santa Cruz beehive cactus is a succulent perennial that occurs in southern Arizona and northern Sonora (about 20 km south of the international border), Mexico. Within Arizona, this species occurs in western Santa Cruz County from Nogales and the Tumacacori Mountains west to the Pajarito and Atascosa Mountains. Santa Cruz beehive cacti are found in alluvial soils of valleys and foothills in grassland and oak woodland habitats from 1,219 to1,829 m (4,000 to 6,000 ft). These plants are either on rocky hillsides with high grass cover or in rock crevices where runoff accumulates and provides a more favorable moisture relationship than the surrounding soils (AGFD 1998d). Within the Nogales RD known plant locations have increased since 1997 (813 plant clumps in 1997, 807 plant clumps in 1998, and 175 in 1999) (T. Newman, CNF, pers. comm., 20 August 2002).

Accessible populations of the Santa Cruz beehive cactus have declined due to collection but the status of populations beyond accessible areas is unknown (AGFD 1998d). There may be an impact to individual plants during development of the proposed line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz star leaf (*Choisya mollis*)
The Santa Cruz star leaf is a perennial shrub that occurs in southern Arizona within the Atascosa, Pajarito, and Tumacacori mountains of Santa Cruz County. Santa Cruz star leaf plants are found primarily within madrean evergreen woodland communities from 1,067 to 1,524 m (3,500 to 5,000 ft) in elevation. This plant is usually found in canyon bottoms and slopes, usually in the shade of oaks and other trees, or rock outcrops (AGFD 1999f). Santa Cruz star leaf plants have been found throughout the eastern portion of the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Santa Cruz star leaf are typically found in rugged and remote mountainous areas where human activity is low and the likelihood of disturbance or removal of plants is minimal. However, the species population trend is unknown and existing populations are relatively rare, have a restricted range, and are only found within specific habitats (AGFD 1999f). The proposed TEP transmission line crosses over known Santa Cruz star leaf populations within the Nogales RD. Placement of the transmission line may impact individual Santa Cruz star leaf but is not likely to result in a trend toward federal listing or loss of viability.

Santa Cruz striped agave (*Agave parviflora* ssp. *parviflora*)
Santa Cruz striped agave is a small perennial succulent found in southern Arizona and northern Mexico. Within Arizona, this species is found near Arivaca in Pima County, and in the Las Guijas, Pajarito, Patagonia, Santa Rita, and Atascosa Mountains of Santa Cruz County. Habitat for this agave consists of rocky or gravelly slopes of middle elevation mountains, in desert grassland or oak woodlands. This plant appears to prefer soils on rounded ridge-tops where grasses and shrubs are sparse and soil is bare or nearly

so (AGFD 1998e). Santa Cruz striped agave have been found throughout the Nogales RD (primarily within the Atascosa, Pajarito, San Luis, and Las Guijas mountains) and in recent years the documented number of individual plants and number of locations has increased for this area (T. Newman, CNF, pers. comm., 20 August 2002).

Some populations of Santa Cruz striped agave have declined due to illegal collection and loss of habitat due to mining and road construction. Livestock grazing has caused degradation of habitat and browsing of flower stalks (AGFD 1998e). There may be an impact to individual plants during development of the proposed line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Seeman groundsel (*Senecio carlomasonii*)
The seeman groundsel is a perennial herb or sub-shrub found in southern Arizona and Mexico (Sonora, Chihuahua, Nayarit). Within Arizona, this plant is found in the Chiricahua and Huachuca Mountains of Cochise County, the Baboquivari and Santa Rita Mountains of Pima County, and the Santa Rita, Pajarito, and Peña Blanca Mountains of Santa Cruz County (AGFD 2000g). Within the Nogales RD, seeman groundsel have been recorded in the Peña Blanca Lake and Sycamore Canyon areas (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, or on the population status of seeman groundsel. A potential threat to seeman groundsel habitat may be trampling by hikers (AGFD 2000g). The proposed transmission line will not cross over or near known locations of this plant, therefore, placement of the TEP transmission line will have no impact on the population status of the seeman groundsel and will not result in a trend toward federal listing or loss of viability.

Sonoran noseburn (*Tragia laciniata*)
Sonoran noseburn is a herbaceous perennial that occurs in southern Arizona, Mexico (Sonora and Chihuahua), and possibly New Mexico. Within Arizona this plant can be found in Cochise County in the Huachuca Mountains and Canelo Hills, in Pima County in the Santa Rita Mountains, and in Santa Cruz County in the Atascosa Mountains (Sycamore Canyon), Patagonia Mountains, Pajarito Mountains, Canelo Hills (O'Donnell Canyon), and Santa Rita Mountains. Sonoran noseburn typically occur at elevations of 1,067 to 1,722 m (3,500 to about 5,650 ft) along streams and canyon bottoms, on shaded hillsides within the upper parts of the Lower Sonoran and Upper Sonoran biotic communities, and open woodland areas (AGFD 2000h). This species has been found in canyons, along streams, and near roadways of the Nogales RD (AGFD 2000h).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of Sonoran noseburn (AGFD 2000h). There may be an impact to individual plants during development of the proposed line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Superb beardtongue (*Penstemon superbus*)
The superb beardtongue is a perennial herbaceous forb found in southeastern Arizona, New Mexico, and Mexico (Chihuahua). Within southern Arizona, this species is found in Pima County in the Santa Catalina and Santa Rita Mountains, and in Santa Cruz County within the Tumacacori Mountains. This plant is generally found in rocky canyons, dry hillsides, and along washes in sandy or gravelly soils at elevations between 945 to 1,676 m (3,100 to 5,500 ft) (AGFD 2000i). Within the Nogales RD, it has been found in Rock Corral Canyon and Box Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of superb beardtongue (AGFD 2000i). There may be an impact to individual plants during development of the line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Supine bean (*Macroptilium supinum*)
The supine bean is a perennial herb that grows in colonies and produces underground fruits. The total range for this species includes Santa Cruz County, Arizona, south into Mexico, including the states of Sonoran and Nayarit. Within Arizona this plant can be found in the Atascosa-Pajarito, San Luis, and Patagonia Mountains, and the southern portion of the Santa Cruz River drainage in Santa Cruz County (much of this area is within the Nogales RD). Supine bean are typically found along ridge tops and gentle slopes of rolling hills in semi-desert grassland or grassy openings in oak-juniper woodlands at elevations between 1,097 to 1,494 m (3,600 to 4,900 ft) (AGFD 1999g).

There are currently an estimated 12 populations of this species in Arizona. Populations range from small (around 20) to relatively large (around 3,500). A 43% decline in a monitored population was recorded from 1989 to 1993. This decline was apparently due to low reproductive output and poor recruitment, although the reasons for these are unknown (AGFD 1999g). Possible threats to this species include degradation of habitat due to livestock grazing, off-road vehicle activity, recreation (camping and hiking), Border Patrol activities, utility corridor and road construction and maintenance, and home building (AGFD 1999g).

Development of the proposed TEP transmission line is likely to have an impact on this species. However, impacts are likely to be limited to individual plants and not whole populations. Effects are not likely to result in a trend toward federal listing or loss of viability.

Sweet acacia (*Acacia smallii*)

The sweet acacia is a woody perennial spiny shrub or small tree found in Texas, Arizona, and California south to Argentina. Within Arizona, this species is found in the Baboquivari Mountains of Pima County and Sycamore Canyon and Atascosa Mountains of Santa Cruz County. Sweet acacia are typically found in the lower slopes of canyons of riparian areas in desert-grassland communities from elevations ranging from 1,067 to 1,219 m (3,500 to 4,000 ft) (AGFD 1992).

Population trends for the sweet acacia are unknown (AGFD 1992). The proposed TEP transmission line may cross potential sweet acacia habitat, however, construction within aquatic habitats will be minimized to the greatest extent possible. There may be an impact to individual plants during development of the line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Three-nerved scurf-pea (*Pediomelum pentaphyllum*)
Three-nerved scurf-pea is an herbaceous perennial found in southeastern Arizona, Hidalgo County New Mexico, western Texas, and Chihuahua, Mexico. Within Arizona, this plant occurs in desert grasslands in sandy substrates and loamy soils. Three-nerved scurf-pea are generally found in bare areas between other plants in elevations ranging from 1.098 to 1,373 m (3,600 to, 4,500 feet) (AGFD 2001a). Within the Nogales RD, this plant is known to occur from Peñasco Canyon (in the Sycamore Canyon watershed) and Peck and Pine Canyons (Middle Santa Cruz watershed) (T. Newman, CNF, pers. comm., 20 August 2002).

The impact of common management practices such as grazing, burning, mowing, herbicide use, and mechanical soil disturbance on this species is unknown (AGFD 2001a). The proposed TEP transmission line crosses over known three-nerved scruf-pea populations within the Nogales RD. Placement of the transmission line may impact individual plants but is not likely to result in a trend toward federal listing or loss of viability.

Thurber hoary pea (*Tephrosia thurberi*)
The Thurber hoary pea is a perennial shrub that occurs in southern Arizona and Mexico (northern Sonora and southwestern Chihuahua). Within Arizona this plant can be found in Cochise, Santa Cruz, and Pima counties. On the Nogales RD, Thurber hoary pea plants are found in the Santa Rita and Atascosa Mountains. This species typically occurs on rocky slopes among oaks, pines, junipers, manzanitas, open hilltops, and grasslands at elevations between 1,067 to 2,134 m (3,500 and 7,000 ft) (AGFD 1999h).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of Thurber hoary pea (AGFD 1999h). Placement of the proposed transmission line will have no impact on the population status of the Thurber hoary pea and will not result in a trend toward federal listing or loss of viability.

Thurber's morning-glory (*Ipomoea thurberi*)
Thurber's morning-glory are perennial herbaceous vines that are found in southern Arizona and Mexico (Chihuahua and Sonora). Within Arizona this plant is found in the Huachuca and Mule Mountains of Cochise County, the Santa Rita Mountains of Pima County, and the Canelo Hills, in the vicinity of Nogales, Patagonia Mountains, and Pajarito-Atascosa Mountains of Santa Cruz County. Habitat in Arizona typically consists of rocky hillsides and canyon slopes in madrean evergreen woodland and semi-desert grassland communities in elevations between 1,158 to 1,570 m (3,800 and 5,150 ft) (AGFD 2000j). On the Nogales RD, this morning glory has been found in the vicinity of Peña Blanca Lake, east of Peñasco Canyon, and Bear Valley (T. Newman, CNF, pers. comm., 20 August 2002).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of Thurber's morning-glory (AGFD 2000j). There may be an impact to individual plants during development of the line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Virlet paspalum (*Paspalum virletti*)
The virlet paspalum is a perennial grass found in southeastern Arizona and Mexico (Sonora and San Luis Potosi). Within Arizona, this grass is found in the Huachuca Mountains of Cochise County, and in the Pajarito Mountains and Sycamore Canyon of Santa Cruz County. This grass is found in sandy soil of canyon bottoms in semi-desert grassland communities and grassy areas within madrean evergreen woodland communities at elevations ranging from 1,067 to 1,737 m (3,500 to 5,700 ft) (AGFD 1999i). In the Nogales RD, the only known location for this grass is in Sycamore Canyon growing in a sandy canyon bottom (T. Newman, CNF, pers. comm., 20 August 2002).

This species is rare in Arizona, where it is known from only 2 widely separated populations. There is no information on the potential effects of land use activities, such as utility placement, or the population status of virlet paspalum (AGFD 1999i). Known locations of this plant occur outside of the proposed TEP transmission line corridor, therefore, placement of the line is not likely to result in a trend toward listing or loss of viability of the virlet paspalum.

Weeping muhly (Sycamore Canyon muhly) (*Muhlenbergia xerophila*)
Weeping muhly is a perennial herbaceous grass found only in southern Arizona. Populations occur in the Santa Catalina, Rincon, Santa Rita, Tumacacori, and Baboquivari Mountains of Pima County, and in Sycamore Canyon within the Pajarito Mountains of Santa Cruz County. Weeping muhly most often grow in crevices of cliffs, bedrock, and other rocks along canyon bottoms. This grass is also known from rocky canyon slopes in oak, pine-oak, and riparian woodlands at elevations between 1,073 to 1,829 m (3,520 to 6,000 ft) (AGFD 1999j).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of weeping muhly (AGFD 1999j). There may be an impact to individual plants during development of the proposed transmission line, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Wiggins milkweed vine (*Metastelma mexicanum*)
Wiggins milkweed vine is a perennial herbaceous vine with a woody base found in southeastern Arizona to southern Sonora, Mexico. Within Arizona, this vine occurs around the Nogales and Ruby areas, Sycamore Canyon area, and Patagonia Mountains of Santa Cruz County, and Baboquivari, Coyote, and Catalina Mountains of Pima County. This vine is typically found on open slopes within open oak woodland on granite soils of Juniper Flats at elevations between 1,067 to1,554 m (3,500 and 5,100 ft) (AGFD 2000k). Wiggins milkweed vine has been found in several locations within the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of Wiggins milkweed vine within Arizona appear to be stable. This vine depends on surrounding vegetation for microhabitat and would be affected by any disturbance to area habitat (AGFD 2000k). Development of the proposed TEP transmission may impact individual plants or surrounding habitat, however, disturbance will be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Wooly fleabane (*Laennecia eriophylla*)
Wooly fleabane is a perennial herb found in southeastern Arizona and northern Mexico (Sonora and Chihuahua). In Arizona, wooly fleabane occurs in the Atascosa Mountains, Pajarito Mountains, Santa Rita Mountains, Canelo Hills and in the vicinity of Sonoita Creek in Santa Cruz County. This species is typically found in gravelly soil of rocky slopes and ridges with dense grass cover in semi-desert grassland, dry oak woodland, and pine-oak woodland communities at elevations between 1,292 to 1,722 m (4,240 to 5,650 ft) (AGFD 1999k). There are known locations of wooly fleabane in the Nogales RD (T. Newman, CNF, pers. comm., 20 August 2002).

Population sizes of this plant are usually very small, with typically no more than 40 plants found in any of the populations known from Arizona. Population numbers fluctuate with the amount and timing of summer rains from year to year. This species was probably more common before its habitat was altered by excessive grazing (AGFD 1999k). Placement of the TEP transmission line corridor is not likely to impact wooly fleabane populations and is not likely to result in a trend toward federal listing or loss of viability.

3.2 INVERTEBRATES

Arizona metalmark (*Calephelis rawsoni arizonensis*)
The Arizona Metalmark is a small, brown butterfly with bands of blue metallic markings on the upper and underside of the body. This butterfly occurs in Arizona, and from the Animas Mountains in southwestern New Mexico southward to Sonora, Mexico. The southern limits of its range are poorly defined to date. In Arizona, this species is known from as far north as Gila County then southward through Graham, Cochise, Pima, and Santa Cruz counties in most of the mountains therein. Arizona metalmark butterflies occur mostly above the desert floor in mountain foothills. Within these mountains it is found in riparian canyons within oak woodlands or more arid regions at elevations from 716 to 1,676 m (2,350 to 5,500 ft). Canyons with standing water for a good portion of the year appear to contain populations of this species as long as the host is present (AGFD 2001b).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of Arizona metalmark (AGFD 2001b). Placement of the transmission line may indirectly impact individual Arizona metalmark through habitat modification, but is not likely to result in a trend toward federal listing or loss of viability.

3.3 BIRDS

American peregrine falcon (*Falco peregrinus anatum*)
The American peregrine falcon subspecies is a medium-sized raptor that nests from central Alaska south to Baja California, Sonora, and the highlands of Central Mexico. Within Arizona, this raptor breeds wherever sufficient prey is available near cliffs. These raptors are rare or absent as breeders in the southwestern quarter of Arizona. Optimum habitat for peregrine falcons consists of steep, sheer cliffs overlooking woodlands, riparian areas, or other habitats supporting avian prey species in abundance. These raptors may also be found in less optimal habitat consisting of small broken cliffs in ponderosa pine forest or large sheer cliffs in very xeric areas. The presence of an open expanse is critical. American peregrine falcons can be found at elevations ranging from 122 to 2,743 m (400 to 9,000 ft) (Glinski 1998, AGFD 1998f). Peregrine falcon nests were found on Ramanote Peak and along Sycamore Canyon (CNF 2000). Both these nests are several miles from the proposed ROW. In 2002, another nest was found at Castle Rock, south of Ruby Road and 6.4 km (4 mi) southwest of the Crossover Corridor.

American peregrine falcons have been found in great numbers in Arizona as well as in areas that would have formerly been considered marginal habitat. This trend suggests that populations in Arizona may have reached levels saturating the optimal habitat available (AGFD 1998f). Placement of the proposed transmission line is not likely to disturb known nesting peregrine falcons. If nest sites are located near the proposed corridor prior to or during construction TEP will consult with CNF biologist.

Development of the TEP line is not likely to result in a trend toward federal listing or loss of viability of this species.

Five-stripped sparrow (*Aimophila quinquestriata*)
The five-stripped sparrow is found in western portions of northern Sinaloa and Sonora, Mexico and the southeastern most portions of Arizona. This sparrow is primarily found in Mexico but its range reaches into southeastern Arizona, where it is rarely found during breeding season and there are only a few winter records. Five-stripped sparrow habitat is highly specialized, consisting of tall, dense shrubs on rocky, semidesert hillsides and canyon slopes (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). Within the Nogales RD, this sparrow has been recorded within Sycamore Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Populations of five-stripped sparrow have declined because of habitat loss, fragmentation, and degradation (New Mexico Game and Fish Department and the Fish and Wildlife Information Exchange 2000). The proposed TEP transmission line will not cross Sycamore Canyon where these sparrows have been observed. This species is not likely to be affected by the proposed placement of a transmission line within the Nogales RD.

Northern gray hawk (*Asturina nitida maxima*)
The gray hawk is a medium-sized raptor with a gray back, black tail with 2 or 3 white bands, and a finely barred gray and white chest, abdomen, and thighs (Glinski 1998). The gray hawk prefers Sonoran riparian deciduous forest and woodland plant communities and can be found along the Santa Cruz and San Pedro rivers, and Sonoita Creek. Observations also were recorded along the Hassayampa and Salt rivers. This hawk species is migratory and usually arrives in Arizona in mid-March and returns south during winter months (AGFD 2000l). Gray hawks prefer cottonwood (*Populus fremontii*), mesquite, and hackberry (*Celtis pallida*) woodlands with a prey base of lizards, especially the whiptail lizard *(Cnemidophorus* spp.*).*

The current population trend for gray hawks is considered stable by the AGFD (2000k). Potential nesting habitat exists along small portions of the proposed TEP transmission line corridor along Sopori Wash. Individual gray hawks may be disturbed by construction activity related to transmission line placement, however, construction within riparian habitats will be minimized to the greatest extent possible. The proposed transmission line will have no effect on the population status of the northern gray hawk and is not likely to result in a trend toward listing or loss of viability.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)
The western yellow-billed cuckoo is a long and slender bird with short, dark legs that nests from southern California through the northeastern United States, south through the United States to the Florida Keys, central America and southern Baja California. This species winters from South America to central Argentina and Uruguay. Within Arizona,

western yellow-billed cuckoo are found in southern and central Arizona and the extreme northeast portion of the state. This species is typically found in streamside areas with cottonwood, willow groves, and larger mesquite bosques (AGFD 1998g). Within the Nogales RD, this species has been observed in Sycamore Canyon, Peck Canyon, and Peña Blanca Canyon.

Populations of western yellow-billed cuckoo have been reduced, a general decline is occurring in all areas with known populations (AGFD 1998g). This species is sensitive to habitat fragmentation and degradation of riparian woodlands due to agricultural and residential development (Hughes 1999). Individual western yellow-billed cuckoo may be disturbed by construction activity related to transmission line placement, however, construction within riparian habitats will be minimized to the greatest extent possible. Because of the linear nature of the proposed action, these impacts will be widely distributed and relatively minor in any single area. The proposed transmission line is not likely to result in a trend toward listing or loss of viability of the western yellow-billed cuckoo.

3.4 Reptiles And Amphibians

Giant spotted whiptail (*Cnemidophorus burti strictogrammus*)
The giant spotted whiptail is a long, slender lizard found in southeastern Arizona, extreme southwest New Mexico, and northern Sonora, Mexico. Within southeastern Arizona, this lizard is found in Cochise County, the Santa Catalina, Santa Rita, Baboquivari, and Pajarito Mountains, in the vicinity of Oracle, and in Pinal County. Giant spotted whiptail lizards inhabit mountain canyons, arroyos, and mesas in arid and semi-arid regions, entering lowland deserts along stream courses. They are found in dense shrubby vegetation, often among rocks near permanent and intermittent streams at elevations ranging from near sea level to 1,372 m (4,500 ft). Open areas of bunch grass within these riparian habitats are also occupied (AGFD 2001c).

Giant spotted whiptail populations are thought to be stable and some populations are locally abundant even though this species is limited in distribution (AGFD 2001c). The proposed transmission line will have no significant effect on the population status of the giant spotted whiptail and is not likely to result in a trend toward listing or loss of viability.

Lowland leopard frog (*Rana yavapaiensis*)
The lowland leopard frog is found in low elevations in the drainage of the lower Colorado River and its tributaries in Nevada, California, Arizona, New Mexico, northern Sonora and extreme northeast Baja California, Mexico (probably extirpated from California and Nevada). Within Arizona, this frog has been found in the Virginia River drainage in the extreme northwestern part of the state, in the Colorado River near Yuma, and west, central, and southeast Arizona south of the Mogollon Rim. This frog frequents desert, grassland, oak, and oak-pine woodland in permanent pools of foothill streams,

rivers, and permanent stock tanks. They typically stay close to water at elevations ranging from 244 to 1,676 m (800 to 5,500 ft) (AGFD 1997c). Within the Nogales RD, this frog has been recorded in Pesquiera and Alamo Canyons, California Gulch, Adobe, Temporal Gulch, Big Casa Blanca, Box Canyon, and Gardner Canyon (T. Newman, CNF, pers. comm., 20 August 2002).

Lowland leopard frog populations are considered stable in central Arizona but declining in southeast Arizona and populations have been extirpated from southwestern Arizona. Potential threats to this species are manipulation to major water courses, water pollution, introduced species (fish, bullfrogs, and crayfish), heavy grazing, and habitat fragmentation (AGFD 1997c). Construction within riparian habitats will be minimized to the greatest extent possible. The proposed transmission line will have no significant effect on the population status of the lowland leopard frog and is not likely to result in a trend toward listing or loss of viability.

Mexican garter snake (*Thamnophis eques megalops*)
The Mexican garter snake ranges from southeastern Arizona and extreme southwestern New Mexico, southward into the highlands of western and southern Mexico, to Oaxaca. Within Arizona, this snake occurs in the southeast corner of the state from the Santa Cruz Valley east and generally south of the Gila River. Valid records (post 1980) have recorded this snake in the San Rafael and Sonoita grasslands area and from Arivaca. Mexican garter snakes are most abundant in densely vegetated desert grassland habitat surrounding cienegas, cienega-streams, stock tanks, and in or near water along streams in valley floors and generally open areas, but not in steep mountain canyon stream habitat. This snake is generally found at elevations ranging from 914 to 1,524 m (3,000 to 5,000 ft) but may reach elevations of 2,591 m (8,500 ft) (AGFD 2001d).

Populations of Mexican garter snakes are decreasing, with extirpations at several localities since 1950 as habitat has changed and introduced predators have invaded. Management concerns for this species include predation by introduced bullfrogs and predatory fishes, urbanization and lowered water tables, and habitat destruction, including that due to overgrazing (AGFD 2001d). Construction within riparian habitats will be minimized to the greatest extent possible. The proposed transmission line will have no significant effect on the population status of the Mexican garter snake and is not likely to result in a trend toward listing or loss of viability.

Western barking frog (*Eleutherodactylus augusti cactorum*)
The western barking frog is a secretive terrestrial frog found in extreme southern Arizona, southeast New Mexico, and central Texas south to the Isthmus of Tehuantepec. In Arizona, this frog occurs in Pima and Santa Cruz counties within the Santa Rita and Pajarito Mountains. Habitat consists of rocky hillsides of canyons in woodland vegetation at elevations between 1,158 and 2,134 m (3,800 and 7,000 ft). Permanent water is not a necessary component of western barking frog habitat. There are very few

records of this species in Arizona and none have been recorded within the Nogales RD (AGFD 1995b).

There is no information on the potential effects of land use activities, such as utility placement, on the population status of western barking frogs (AGFD 1995b). The proposed transmission line will have no effect on the population status of the western barking frog and is not likely to result in a trend toward listing or loss of viability.

3.5 MAMMALS

Cave myotis (*Myotis velifer*)
The cave myotis is a large bat found in the southwestern half of Arizona and the immediate adjacent parts of California, Nevada, New Mexico, and the northern third of Sonora, Mexico. Within Arizona, this bat is found south of the Mogollon Plateau from Lake Mohave, Burro Creek, Montezuma Well, San Carlos Apache Reservation and the Chiricahua Mountains south to Mexico. Cave myotis have not been recorded in the extreme southwestern part of the state and are found in small numbers in southeastern Arizona in the winter. This bat typically prefers desertscrub habitats of creosote, brittlebush, paloverde, and cacti but they sometimes can be found up to pine-oak communities. Cave myotis roost in caves, tunnels, mine shafts, under bridges, and sometimes buildings within a few miles of a water source (AGFD 1997d).

Cave myotis colonies a vulnerable at the roost sites, especially maternity roosts, because the congregate in large numbers (AGFD 1997d). The proposed transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line, however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of the cave myotis.

Southern pocket gopher (*Thomomys umbrinus intermedius*)
The southern pocket gopher is a small gopher found in extreme southeastern Arizona and southwestern New Mexico, south into Mexico. Within Arizona, this gopher is found primarily in the southern most portion of the state in the oak belt of the Santa Rita, Patagonia, Atascosa, Pajarito, and Huachuca Mountains. Southern pocket gophers have been found at Peña Blanca Spring in gravelly soil along a broad wash. Elsewhere, this species is generally found on rocky slopes within open oak woodlands in the lower parts of mountain ranges from 1,372 to 2,743 m (4,500 to 9,000 ft) in elevation. There has been only one record for the southern pocket gopher within the Nogales RD, specifically at Peña Blanca Canyon in the Atascosa/Pajarito Mountains. However, it is suspected that this species has a much wider range (AGFD 1998).

There is no information on the potential effects of land use activities, such as utility placement, or the population status of southern pocket gopher (AGFD 1998h). There may be an impact to individual southern pocket gophers during development of the line, however, because of the linear nature of the proposed action, these impacts will be widely distributed and relatively minor in any single area. Impacts will be limited to a few individuals and are not likely to result in a trend toward federal listing or loss of viability for this species.

4.0 BLM SENSITIVE SPECIES

Criteria for BLM Sensitive species include those that are:

5. Under status review by the USFWS, or
6. Whose numbers are declining so rapidly that Federal listing may become necessary, or
7. With typically small and widely dispersed populations,
8. Those inhabiting ecological refugia or other specialized or unique habitats.

The potential impacts to BLM Sensitive species were determined based on the habitat conditions within the BLM lands crossed by the proposed action, the life history of the species, and the proposed construction methods. Only those species that have a potential of occurring on or near the BLM parcel were evaluated. The 13 BLM Sensitive species evaluated were identified in the BLM Sensitive species list for Arizona (Instruction Memorandum No. AZ-2000-018) dated 21 April 2000 and include:

PLANTS
Balloonvine (*Cardiospermum corindum*)
False grama (*Cathestecum erectum* (*brevifolium*))
Tumamoc globeberry (*Tumamoca macdougalii*)

BIRDS
Loggerhead shrike (*Lanius ludovicianus*)
Rufous-winged sparrow (*Aimophila carpalis*)
Western burrowing owl (*Athene curnicularia hypugea*)

REPTILES & AMPHIBIANS
Texas horned lizard (*Phrynosoma cornutum*)

MAMMALS
Big free-tailed bat (*Nyctinomops macrotis*)
California leaf-nosed bat (*Macrotus californicus*)
Fringed myotis (*Myotis thysandodes*)
Pocketed free-tailed bat (*Nyctinomops femorosaccus*)
Spotted bat (*Euderma maculatum*)
Underwood's mastiff bat (*Eumops underwoodi*)

4.1 PLANTS

Balloonvine (*Cardiospermum corindum*)

This perennial vine is widely distributed in tropical and subtropical regions and is known from the Coyote Mountains in Pima County (Kearny and Peables 1960). There may be an impact to individuals of this species during development of the line; however, disturbance would be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

False grama (*Cathestecum erectum* (*brevifolium*))

False grama is a perennial, drought-tolerant grass found on dry hills and plains of Southern Arizona and Northern Mexico. There may be an impact to individuals of this species during development of the line; however, disturbance would be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

Tumamoc globeberry (*Tumamoca macdougalii*)

This perennial vine occurs in shade of nurse plants along sandy washes below ~914 m (3,000 ft) in elevation. There may be an impact to individuals of this species during development of the line; however, disturbance would be limited to a few individuals and is not likely to result in a trend toward federal listing or loss of viability.

4.2 BIRDS

Loggerhead shrike (*Lanius ludovicianus*)

The loggerhead shrike occurs in open country with scattered trees and shrubs, savanna, desertscrub and occasionally open woodland (AGFD 2002). In Arizona, this species usually summers throughout open parts of the state below the Transition Zone and is also periodically found along the Mexican border west of Baboquívari Mountains (Phillips et al. 1983). Because habitat for this species is widely distributed, development of the TEP line is not likely to result in a trend toward federal listing or loss of viability of this species.

Rufous-winged sparrow (*Aimophila carpalis*)

The rufous-winged sparrow is classified as a migratory bird and is a resident of eastern Pima County, including Avra Valley, and was once thought to be extirpated in Arizona due to overgrazing but was rediscovered in the Tucson Area in 1936. Rufous-winged sparrows generally use habitats characterized by scattered low shrubs and trees, which provide cover and foraging areas during mid-summer days. Many of these areas contain significant grassland components. Threats to the species include urban development, overgrazing, and exotic species, all of which result in losses of grassland communities utilized by this species. Because habitat for this species is widely distributed, development of the TEP line is not likely to result in a trend toward federal listing or loss of viability of this species.

Western burrowing owl (*Athene cunicularia hypugea*)

The Western burrowing owl inhabits heavily grazed tracts of mixed-grass prairie, particularly where there are burrows created by large rodents, such as prairie dogs and

Richardson ground squirrels. Distribution extends from southern Canada through the western United States to South America. Arizona is 1 of 3 states that provide important wintering areas for this species (USGS 2003). Because habitat for this species is widely distributed, development of the TEP line is not likely to result in a trend toward federal listing or loss of viability of this species.

4.3 REPTILES & AMPHIBIANS

Texas horned lizard (*Phrynosoma cornutum*)

The Texas horned lizard lives mainly in sandy areas of deserts, grasslands, prairies, and scrublands (Bartlett and Bartlett 1999) where it often inhabits abandoned animal burrows (Bockstanz 1998). The proposed transmission line will have no significant effect on the population status of this species and is not likely to result in a trend toward listing or loss of viability.

4.4 MAMMALS

Big free-tailed bat (*Nyctinomops macrotis*)

Distribution of the big free-tailed bat occurs from the southwestern United States southward through the Caribbean, Central America, and into the northern part of South America. Northern populations are known to migrate to southern Arizona and Mexico in the fall, yet this species is widely scattered throughout Arizona during the spring and summer too. In Arizona, this bat has been found in pinyon-juniper, Douglas-fir, and Sonoran desertscrub habitats, but it is believed that these locations are foraging sites. Preferred roosting sites include rock crevices and fissures of mountain cliffs in rugged, rocky areas of desertscrub habitat (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

California leaf-nosed bat (*Macrotus californicus*)

Distribution of the California leaf-nosed bat in the United States spans southern California, southern Nevada, and southwestern Arizona and extends southward into Mexico, to the southern tip of Baja California, northern Sinaloa, and southwestern Chihuahua. This bat lives predominantly in Sonoran and Mohave desertscrub habitats, but is occasionally found in the Chihuahuan and Great Basin deserts. Daytime roosting sites are usually mines and caves, and nighttime roosts include open buildings, cellars, bridges, porches, and mines. These bats do not hibernate or migrate; therefore, they tend to live in the same area year after year and remain active year-round (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

Fringed myotis (*Myotis thysandodes*)

Distribution of the fringed myotis ranges from southern British Columbia, Canada southward throughout the western United States, and down to southern Mexico. It occurs in a variety of habitats – from desertscrub to oak and pinyon woodlands to spruce-fir forests. Roosting sites include caves, mines, and buildings. These bats tend to roost in tight clusters and may change locations periodically in response to thermoregulatory needs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

Pocketed free-tailed bat (*Nyctinomops femorosaccus*)
The pocketed free-tailed bat ranges from the southwestern United States (including southern California, Arizona, and New Mexico, and the Trans-Pecos region of Texas), south into Mexico through Baja, Sonora, Durango, and Jalisco to, at least, Michoacan. This bat can be found in the arid lowlands of the desert Southwest, where it roosts in crevices and caves of rugged cliffs, slopes, and rock outcrops (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

Spotted bat (*Euderma maculatum*)
Distribution of the spotted bat ranges throughout centralwestern North America, from southcentral British Columbia down to southern Mexico. In Arizona, its habitat ranges from low desert areas in the Southwest to high desert and riparian habitats in the northwestern part of the state. This bat has also been documented in conifer forests in northern Arizona. Roosting sites are often situated in rock crevices on high cliffs (AGFD 1993, Harvey et al. 1999). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

Underwood's mastiff bat (*Eumops underwoodi*)
The range of Underwood's mastiff bat is limited, from southcentral Arizona, into the arid lowlands of Sonoran and western Mexico, and into Honduras. It is believed to be a year-round resident of Arizona, ranging from the Baboquívari Mountains down to Organ Pipe National Monument. This bat prefers Sonoran desertscrub and mesquite/grassland plant communities. Roosting tends to occur in crevices along steep cliffs, and sometimes in the cracks of buildings (AGFD 1993). The proposed TEP transmission line will not cross near known roost sites. Potential foraging habitat may be disturbed during development of the transmission line; however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of this species.

5.0 AGFD WILDLIFE OF SPECIAL CONCERN

AGFD was consulted in regards to state listed special status species and habitats that may be affected by the proposed action. Several state listed special status species and overall wildlife habitat may be affected by the proposed action. The AGFD mission is to conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs. Continued consultation and input from AGFD will ensure that impacts of the proposed action are minimized and mitigation efforts are successful.

Listed below are state special status species that may be found in the vicinity of the proposed action, based on AGFD's Heritage Data Management System (HDMS) (1 July 2002). Effects of the proposed action on the majority of these species will be avoided or minimized through mitigation efforts stipulated for federally listed species.

Black-bellied whistling duck (*Dendrocyna autumnalis*)
The black-bellied whistling duck is "goose-like" with a long neck and long pink legs. This species has a cinnamon or chestnut breast and back with a black belly and bright coral-red bill. The total range for this species is from the Gulf coast and lower Rio Grande Valley of Texas and central Arizona south through Mexico, Central America to southern Brazil. In Arizona, the range for the black-bellied whistling duck is southeastern and central Arizona. Black-bellied whistling ducks are commonly seen in the Santa Cruz Valley, particularly in ponds near and around Nogales. The habitat for this species consists of the banks of rivers, lakes, ponds, riparian areas, and stock tanks (Brown 1985).

Because of habitat loss and apparent population declines from historic levels, the black-bellied whistling duck has been placed on the AGFD Threatened Native Wildlife of Arizona as a candidate species. This species appears to be increasing in Arizona in urban settings at man-made ponds and at sewage treatment plants. It also appears to be stable at some private ranch ponds, which tend to be isolated from hunting pressure (Corman 1994).

The proposed transmission line will have no effect on the population status of the black-bellied whistling duck and is not likely to result in a trend toward listing or loss of viability.

Crested Caracara (*Caracara cheriway*)
The crested caracara is a medium sized raptor with bold black and white plumage and a bright yellow-orange face and legs. The crested caracara ranges from southern Arizona and northern Mexico to Tierra del Fuego. In the United States, it occurs only along the southern border in Texas and Arizona, and in Florida, where there is an isolated

population in the south-central peninsula. In Arizona, this raptors range extends up from San Miguel in the Baboquivari Valley north to Quijotoa, Sells, and Coyote Pass. This raptor occurs regularly on the Tohono O'Odham Indian Reservation. Small groups of crested caracara are seen in Sasabe and south of the Mexican border near Sonoyta, Sonora. This raptor is found in open habitats, typically grassland, prairie, pastures, or desert with scattered taller trees, shrubs, or cacti. The crested caracara is found in areas characterized by low-profile ground vegetation and scattered tall vegetation. Specifically in Arizona, vegetation consists of saguaro, mesquite, palo verde, cholla and acacia (Morrison 1996).

Arizona populations of crested caracara on the Tohono O’Odham Reservation are likely stable because few threats exist. Reports of individual, and in some cases groups, of this raptor outside of the reservation indicate that its range within Arizona is probably as extensive as it was historically. No apparent threat currently exits to Arizona populations, however, the AGFD has listed the crested caracara as a Threatened Native Wildlife. This species is considered vulnerable if habitat conditions worsen (Morrison 1996).

Mitigation efforts for federally listed species will minimize effects of the proposed action on this species. Because of the linear nature of the proposed action, impacts will be widely distributed and relatively minor in any single area. The proposed action will have no effect on the population status of the crested caracara and is not likely to result in a trend toward listing or loss of viability.

Desert Tortoise (Sonoran) (*Gopherus agassizii*)
The Sonoran Desert tortoise ranges from northern Sinaloa, Mexico to southern Nevada and southwestern Utah, and from south central California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act. The threatened Mojave population occurs north and west of the Colorado River and the unlisted Sonoran population occurs south and east of the Colorado River. Within Arizona, the Sonoran Desert tortoise is found south and east of the Colorado River from Mojave County to the south, beyond the International Boundary and many scattered locations in between. The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desertscrub at elevations ranging from 152 to 1,615 m (500 to 5,300 ft). Burrows and shelter sites are generally below rocks and boulders, in rock crevices, under vegetation, and also caliche caves in incised wash banks (AGFD 2001f).

Several threats to tortoise populations in the Sonoran Desert have been identified, including habitat fragmentation, habitat loss and degradation from urban and agricultural development and roads, wildfires associated with invasion of non-native grasses and forbs, illegal collection, and genetic contamination of wild populations by escaped or released captives. Although current evidence suggests that Arizona populations are stable, there are substantial gaps in available data (Arizona Interagency Desert Tortoise

Team 1996).

Because of the linear nature of the proposed action, any impacts to this species will be widely distributed and relatively minor in any single area. The proposed action will have no effect on the population status of the Sonoran Desert tortoises and is not likely to result in a trend toward listing or loss of viability.

Elegant trogon (*Trogon elegans*)
The elegant trogon is a medium sized bird with a round head, large eyes, a white band on an iridescent green breast, black face and throat, red belly and undertail coverts. The total range for this bird is from southern Arizona and New Mexico south through Mexico to southern Nicaragua to northwestern Costa Rica. In Arizona, the elegant trogon is found in "sky islands", most commonly the Atascosa, Chiricahua, Huachuca, and Santa Rita Mountains. Elegant trogons are found in riparian areas consisting of sycamore, cottonwood and oak, and also in coniferous woodlands at elevations ranging from 1,036 to 2,073 m (3,400 to 6,800 ft) (AGFD 2001g).

Population trends for the elegant trogan are not well known. No evidence indicates population declines in any of the core canyons occupied over the past few decades. Threats to this species include degradation and loss of native riparian habitat through stream diversion, groundwater withdrawal, erosion, and overgrazing (AGFD 2001g).

Because of the linear nature of the proposed action, impacts will be widely distributed and relatively minor in any single area. The proposed action will have no effect on the population status of the elegant trogan and is not likely to result in a trend toward listing or loss of viability.

Great Plains Narrow-Mouthed Toad (*Gastrophryne olivacea*)
The Great Plains narrow-mouthed toad is a small, stout toad with stubby limbs, a small pointed head with a fold of skin on the back of the head. The total range for this species is from southeastern Nebraska and Missouri south through Texas to western Mexico. Within Arizona, the Great Plains narrow-mouthed toad is found in the vicinity of Santa Cruz County, Pima County, to near Casa Grande, Arizona in Pinal County. Habitat for this species in Arizona consists of mesquite semi-desert grassland communities to oak woodland communities near riparian areas at elevations ranging from sea level to around 1,250 m (4,100 ft) (AGFD 1995c).

Population trends for the Great Plains narrow-mouthed toad are currently unknown. Populations in Arizona are at the extreme northwestern edge of the species range and distribution is limited throughout its range (AGFD 1995c). Because of the linear nature of the proposed action, impacts will be widely distributed and relatively minor in any single area. The proposed action will have no effect on the population status of the Great

Plains narrow-mouthed toad and is not likely to result in a trend toward listing or loss of viability.

Mexican Long-Tongued Bat (*Choeronycteris mexicana*)
The Mexican long-tongued bat has a long, slender nose with a leaf-like structure on the base of the nose. The total range for this species is from southeastern Arizona, southwestern New Mexico, and California south through central America to Venezuela. In Arizona, the Mexican long-tongued bat is found from the Chiricahua Mountains extending as far north as the Santa Catalina Mountains and west to the Baboquivari Mountains. Habitat for this bat is typically within canyons of mixed oak-conifer forests in mountains raising from the desert at elevations ranging from 1,082 to 2,231 m (3,550 to 7,320 ft) (AGFD 1994).

Populations of Mexican long-tongued bats in Arizona appear to be highly variable (AGFD 1994). There is no evidence of a long-term decline or any clear trend. The limitation of riparian zones and the distribution of food plants may limit populations of this species in Arizona and loss of riparian vegetation may be a greater threat to this species than human disturbance at particular roost sites (Pima County 2001). Potential foraging habitat may be disturbed during development of the transmission line, however, these disturbances will be isolated and widely distributed and will not likely result in a trend toward federal listing or loss of viability of the Mexican long-tongued bat.

Mexican vine snake (*Oxibelis aeneus*)
The Mexican vine snake has an elongated head, pointed snout, and is thin bodied with an ash gray to yellow-brown and tan coloring. The total range for this species is from extreme southern Arizona south to Brazil. In Arizona, this species occurs in the Tumacacori, Pajarito, and Patagonia Mountains in Santa Cruz County. Habitat for the Mexican vine snake consists of brush covered hillsides and riparian areas with sycamore, oak, walnut and wild grape trees at elevations ranging from 914 to 1,768 m (3,000 to 5,800 ft) (AGFD 1991b).

Population trends for the Mexican vine snake are currently unknown. Populations in Arizona are at the extreme northern edge of the species range and distribution is limited. A potential threat is the high interest by collectors for this species (AGFD 1991b). The proposed action will have no effect on the population status of the Mexican vine snake and is not likely to result in a trend toward listing or loss of viability.

Osprey (*Pandion haliaetus*)
This raptor is dark brown on its back and white on the underparts with a prominent dark eye stripe. The total range for the osprey is from Alaska to Newfoundland, along the Atlantic and Pacific coastlines, and in the Rocky Mountains south through central and south America. Within Arizona, the osprey occurs primarily in the White Mountains, along the Mogollon Rim, and along the Salt and Verde Rivers. In southeastern Arizona, this raptor is an uncommon spring and fall transient, usually seen at ponds and reservoirs. Nesting habitat of the osprey consists of coniferous trees along rivers and lakes at elevations ranging from 1,829 to 2,377 m (6,000 to 7,800 ft) (AGFD 1997e).

Osprey population trends in Arizona are not well known. Only about 20 nest sites are known in the southwest, all within Arizona. This raptor is threatened by loss of nesting habitat and foraging perch sites. It is also threatened by recreational use of nesting habitat, shooting, and pesticide poisoning on wintering grounds (AGFD 1997e).

Mitigation efforts for federally listed species will minimize effects of the proposed action on this species. Because of the linear nature of the proposed action, impacts will be widely distributed and relatively minor in any single area. The proposed action will have no effect on the population status of the osprey and is not likely to result in a trend toward listing or loss of viability.

Thick-billed Kingbird (*Tyrannus crassirostris*)
The thick-billed kingbird is a relatively stocky flycatcher with a large head and heavy bill. This kingbird occurs from southeastern Arizona and southwestern New Mexico south through western Mexico to western Guatemala. In Arizona, thick-billed kingbirds are most often seen around Sonoita and Arivaca creeks and in Madera and Guadalupe canyons. This species may occur in mountains of Pima, Santa Cruz and Cochise counties where there are drainages with well-developed riparian areas. Habitat for the thick-billed kingbird consists of broad-leaved, riparian forests, usually with well-developed large sycamores and cottonwoods at elevations ranging from 914 to 1,981 m (3,000 to 6,500 ft) (Tibbitts 1991).

The thick-billed kingbirds present distribution in Arizona is very limited. Potential threats include human recreational activities, encroachment of human development into breeding habitat, woodcutting, grazing, and groundwater depletion (Tibbitts 1991).

Because of the linear nature of the proposed action, impacts will be widely distributed and relatively minor in any single area. The proposed action will have no effect on the population status of the thick-billed kingbird and is not likely to result in a trend toward listing or loss of viability.

Tropical Kingbird (*Tyrannus melancholicus*)
The Tropical kingbird is a large tyrant-flycatcher with a large bill and long, slightly notched tail. The tropical kingbird ranges from southeastern Arizona through western and central Mexico to central Argentina. Breeding birds have been found in Tucson, along the Santa Cruz Valley from Green Valley south, east of Phoenix in the Salt River Valley, to the San Pedro Valley. This species also has been reported from Sopori Wash. The Tropical Kingbird inhabits open and semi-open areas with scattered trees and shrubs. Also found in urban areas and roadsides with tall human-made fixtures (Stouffer and Chesser 1998).

Tropical kingbirds seem to persist or even thrive in developed areas. No negative effects of human activities have been reported (Stouffer and Chesser 1998). Because of the linear nature of the proposed action, impacts will be widely distributed and relatively minor in any single area. The proposed action will have no effect on the population status of the tropical kingbird and is not likely to result in a trend toward listing or loss of viability.

Rose-Throated Becard (*Pachyramphus aglaiae*)
The rose-throated becard is a big-headed, thick billed bird that breeds in southeast Arizona, southern Texas (rare visitor along the Rio Grande), south through Mexico to Costa Rica. This species winters from northern Mexico south through to its breeding range. Within Arizona, rose-throated becards have been found breeding along Sonoita and Arivaca creeks, Sycamore Canyon (Atascosa Mountains), and Patagonia. Historically, this species nested in Guadalupe Canyon (east of Douglas) and near Tucson. Rose-throated becards typically inhabit marshes of Sonoran Desert Scrub communities of open to dense vegetation of shrubs, low trees, and succulents dominated by paloverde, prickly pear and saguaro. This species also is found in the Desert Riparian Deciduous Woodland communities of marsh-woodlands, especially of cottonwoods, that occur where desert streams provide sufficient moisture for a narrow band of deciduous trees and shrubs along the margins. In Arizona, the rose-throated becard is found at elevations ranging from 1,082 to 1,228 m (3,550 to 4,030 ft) (AGFD 2001h).

Population trends for the rose-throated becard are currently unknown. Potential threats to this species include disturbance from bird watchers, and degradation and loss of native riparian habitat through overgrazing, urban development, and groundwater depletion (AGFD 2001h). Known locations of this bird occur outside of the proposed transmission line corridor, therefore, placement of the line is not likely to result in a trend toward listing or loss of viability of the rose-throated becard.

6.0 LITERATURE CITED

Abbate, D. J., A. Ditty, W. S. Richardson, and R. Olding. 1996. Cactus ferruginous pygmy-owl surveys and nest monitoring in the Tucson Basin area, Arizona. Final Report Internal Enhancement #U95503. Arizona Game and Fish Department, Phoenix, Arizona.

______, W. S. Richardson, R. L. Wilcox, M. J. Terrio, and S. M. Belhumeur. 1999. Cactus ferruginous pygmy-owl investigations in Pima and Pinal Counties, Arizona: 1997-1998. Region V Wildlife Program. Arizona Game and Fish Department, Tucson, Arizona. 83 pp.

______, _______, ______, and S. Lantz. 2000. Cactus ferruginous pygmy-owl investigations in Pima and Pinal Counties, Arizona: 1999. Region V Wildlife Program. Arizona Game and Fish Department, Tucson, Arizona. 37 pp.

Aiken, C. E. H. 1937. (E.R. Warren, Ed.). Birds of the Southwest. Colorado College Publication, General Series No. 212:1-73.

Alcorn, S. M., S. E. McGregor and G. Olin. 1962. Pollination requirements of the organpipe cactus. Cactus and Succulent Journal 34(5): 135-138.

Allison, L. J., J. Rourke, and T. McCarthey. 2000. Characterizing vegetation in nesting and non-nesting plots for southwestern willow flycatchers within the same patch of continuous riparian vegetation. Page 15 *in* Abstracts of presented papers and posters, The Ecology and Conservation of the Willow Flycatcher, 24-26 October 2000, Arizona State University, Tempe, AZ.

American Ornithologists' Union. 1957. Check-list of North American birds, 5th ed. American Ornithologists' Union, Baltimore, MD.

Anderson, D.E., O.J. Rongstad, and W.R. Mytton. 1990. Home range changes in post-breeding raptors exposed to increased human activity levels in southeastern Colorado. Wildlife Society Bulletin. 18:134-142.

Arizona Game and Fish Department. 1988. Threatened native wildlife in Arizona. Arizona Game and Fish Department, Phoenix. 32 pp.

______. 1991a. Chiltepin (*Capsicum annuum* var.*glabriusculum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 1991b. Mexican vine snake (*Oxibelis aeneus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 2 pp.

______. 1992. Sweet Acacia (*Acacia smallii*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1993. Arizona wildlife views – bats of Arizona. Volume 36, Number 8. 36 pp.

______. 1994. Mexican long-tongued bat (*Choeronycteris mexicana*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1995a. Western Barking Frog (*Eleutherodactylus augusti cactorum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1995b. Great plains Narrow-mouthed toad (*Gastrophryne olivacea*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1996. Species of Special Concern. Arizona Game and Fish Department, Phoenix, AZ.

______. 1997a. Bartram's Stonecrop (*Graptopetalum beartramii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1997b. Pima Indian Mallow (*Abutilon parishii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1997c. Lowland Leopard Frog (*Rana yavapaiensis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1997d. Cave Myotis (*Myotis velifer*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1997e. Osprey (*Pandion haliaetus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998a. Beardless Chinch Weed (*Pectis imberbis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 1998b. Gentry Indigo Bush (*Dalea tentaculoides*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1998c. Large-flowered Blue Star (*Amsonia grandiflora*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 9 pp.

______. 1998d. Santa Cruz beehive cactus (*Coryphantha recurvata*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 1998e. Santa Cruz striped agave (*Agave parviflora* ssp. *parviflora*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998f. American Peregrine Falcon (*Falco peregrinus anatum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1998g. Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1998h. Southern Pocket Gopher (*Thomomys umbrinus intermedius*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 1999a. Alamos Deer Vetch (*Lotus alamosanus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999b. Catalina Beardtongue (*Penstemon discolor*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999c. Chihuahuan Sedge (*Carex chihuahuensis*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999d. Chiricahua Mountain Brookweed (*Samolus vagans*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999e. Nodding blue-eyed grass (*Sisyrinchium cernuum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 1999f. Santa Cruz star leaf (*Choisya mollis*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999g. Supine Bean (*Macroptilium supinum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 1999h. Thurber Hoary Pea (*Tephrosia thurberi*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999i. Virlet paspalum (*Paspalum virletii).* Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 1999j. Weeping Muhly (*Muhlenbergia xerophila*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 1999k. Woolly Fleabane (*Laennecia eriophylla*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000a. Arid throne fleabane (*Erigeron arisolis*). Unpublished draft abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000b. Arizona Giant Sedge (*Carex ultra*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 2000c. Broad-leaf ground cherry (***physalis latiphysa***). Draft Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000d. Foetid Passionflower (*Passiflora foetida*). Draft Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000e. Lumholtz nightshade (*Solanum lumholtzianum*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000f. Mock-pennyroyal (*Hedeoma dentatum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2000g. Seeman Groundsel (*Senecio carlomasonii*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2000h. Sonoran Noseburn (*Tragia laciniata*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2000i. Superb beardtongue (*Penstemon superbus*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2000j. Thurber's Morning Glory (*Ipomiea thurberi*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 2000k. Wiggins Milkweed Vine (*Metastelma mexicanum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 6 pp.

______. 200l. Northern gray hawk (*Asturina nitida maxima*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 2001a. Three-nerved Scurf-Pea (*Pediomelum pentaphyllum*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2001b. Arizona Metalmark (*Calephelis rawsoni arizonensis*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 3 pp.

______. 2001c. Giant Spotted Whiptail (*Cnemidophorus burti strictogrammus*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2001d. Mexican Garter Snake (*Thamnophis eques megalops*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

______. 2001e. California Leaf-Nosed Bat (*Macrotus californicus*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 5 pp.

______. 2001f. Sonoran Desert Tortoise (*Gopherus agassizii*). Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 8 pp.

______. 2001g. Elegant trogon (*Trogon elegans*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2001h. Rose-Throated Becard (*Pachyramphus aglaiae*). Draft unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 7 pp.

______. 2002. Loggerhead shrike *(Lanius ludovicianus)*. Draft unpublished animal abstract completed and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 4 pp.

Arizona Interagency Desert Tortoise Team. 1996. Management Plan for the Sonoran Desert Population of the Desert Tortoise in Arizona.

Bagley, B. E., D. A. Hendrickson, F. J. Abarca, and S. Hart. 1991. Status of the Sonoran topminnow *(Poeciliopsis occidentalis*) and desert pupfish *(Cyprinodon macularius*) in Arizona. Special Report on Project E5-2, Job 9, Title VI of the Endangered Species Act. Arizona Game and Fish Department, Phoenix.

Bahre, C. J. 1991. A legacy of change. Historic human impact on vegetation in the Arizona borderlands. University of Arizona Press, Tucson.

Baird, S. F., and C. Girard. 1853. Description of new species of fishes collected by Mr. John H. Clark, on the U.S.-Mexican boundary survey, under Lt. Col. Jas. D. Graham. Proceedings of the Academy of Natural Sciences of Philadelphia 6:387-390.

Bartlett, P. and R. Bartlett. 1999. A field guide to Texas reptiles and amphibians. Gulf Publishing Company, Houston, Texas.

Belnap, J. 1992. Potential role of cryptobiotic soil crusts in semiarid rangelands. Paper presented at the Symposium on Ecology, Management, and Restoration of Intermountain Annual Rangelands, Boise, Idaho, May 18-22, 1992.

Belsky, A.J., and D.M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the interior west. Conservation Biology 11(2):315-327.

Bendire, C. E. 1892. Glaucidium phalænoides (Daudain), Ferruginous pygmy owl. Pages 409-411 in: Life Histories of North American Birds with special reference to their habits and eggs. Smithsonian Institute, U.S. National Museum Special Bulletin No. 1.

Berger L., R. Speare, P. Daszak, D.E. Green, A.A. Cunningham, C.L. Goggins, R. Slocombe, M.A. Ragan, A.D. Hyatt, K.R. McDonald, H.B. Hines, K.R. Lips, G. Marantelli, and H. Parkes. 1998. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. Proceedings of the National Academy of Science, USA 95:9031-9036.

Bevanger, K. 1994. Bird interactions with utility structures: collision and electrocution, causes and mitigating measures. Ibis 54:419-431.

Blackburn, W.H. 1984. Impacts of grazing intensity and specialized grazing systems on watershed characteristics and responses. Pp. 927-983. In: Developing strategies for rangeland management. National Research Council/National Academy of Sciences. Westview Press. Boulder, CO.

Bloomquist, S. M., K. J. Field, and M. J. Sredl. 2002. General Visual Encounter Survey Protocol, Chiricahua leopard frog. Guidelines published for the Arizona Game and Fish Department, Phoenix, Arizona.

Bockstanz, Lori. 1998. Herps of Texas – lizards: Texas Horned Lizard (*Phrynosoma cornutum*). http://www.zo.utexas.edu/research/txherps/lizards/phrynosoma.cornutum.html. 22 September 1999.

Bowers, J.E., and S.P. McLaughlin. 1994. Flora of the Huachuca Mountains. Pages 135-143 *in* L.F. DeBano *et al.* (Tech. Coord.), Biodiversity and management of the Madrean Archipelago: the sky islands of the Southwestern United States and Northwestern Mexico. USDA Forest Service General Technical Report RM-GTR-264.

Brooks, J. E. 1985. Factors affecting the success of Gila topminnow introductions on four Arizona National Forests. Report to U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico. Arizona Game and Fish Department, Phoenix.

______. 1986. Status of natural and introduced Sonoran topminnow *(Poeciliopsis o. occidentali*s) populations in Arizona through 1985. Report to U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico. Arizona Game and Fish Department, Phoenix.

Brown, D. E., C. H. Lowe, and J. F. Hausler. 1977. Southwestern riparian communities: their biotic importance and management in Arizona *in* R. R. Johnson and D. A. Jones (eds.), Importance, preservation, and management of riparian habitats: a symposium. General Technical Report RM-43. USDA Forest Service, Denver, CO.

______. 1983a. On the status of the jaguar in the Southwest. Southwestern Naturalist 28:459-460.

______. 1983b. The wolf in the southwest. University of Arizona Press, Tucson, Arizona. 195 pp.

______. 1985. Black-bellied whistling duck. *In* Arizona Wetlands and Waterfowl. Pages 110 - 112. The University Press, Tucson, Arizona, USA.

______. 1991. Revival for El Tigre? Defenders 66(1):27-35.

______. (Ed.). 1994. Biotic communities: southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City, Utah. 342 pp.

Brown, M., and F. J. Abarca. 1992. An update status report of the Sonoran topminnow, *Poeciliopsis occidentali*s, and desert pupfish, *Cyprinodon maculariu*s, in Arizona. Arizona Game and Fish Department, Phoenix.

Browning, M. R. 1993. Comments on the taxonomy of *Empidonax traillii* (willow flycatcher). Western Birds 24:241-257.

Busby, F.E., and G.F. Gifford. 1981. Effects of livestock grazing on infiltration and erosionrates measured on chained and unchained pinyon-juniper sites in southeastern Utah. J. Of Range Management 34:400-405.

Cartron, J. E., W. S. Richardson, and g. A. Proudfoot. 2000a. The cactus ferruginous pygmy-owl: taxonomy, distribution, and natural history. Pages 5-15 *in* Jean-Luc e. Cartron and D. M. Finch, eds. Ecology and conservation of the cactus ferruginous pygmy-owl in arizona. General technical report, rmrs-gtr-43, ogden, utah. U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 68 pp.

Cartron, J.E., S.H. Soleson, S. Russell, G.A. Proudfoot, and W.S. Richardson. 2000b. The ferruginous pygmy-owl in the tropics and at the northern end of its range: habitat relationships and requirements. Pp. 47-53 *in* J.E. Cartron and D.M. Finch (eds.), Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. Gen. Tech. Rpt. RMRSGTR-43. USDA, Forest Service, Rocky Mountain Research Station, Ogden, UT.

Chapman, D.W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117:1-21.

Clarkson, R.W., and J.C. Rorabaugh. 1989. Status of leopard frogs *(Rana pipiens* Complex) in Arizona and southeastern California. Southwestern Naturalist 34(4):531-538.

Cockrum, E.L. 1991. Seasonal distribution of northwestern populations of the long-nosed bat, Leptonycteris sanborni, Family Phyllostomidae. Anales Inst. Biol. Univ. Nac. Auton. Mexico, Ser. Zool. 62(2):181-202.

Constantine, D.G. 1966. New bat locality records from Oaxaca, Arizona and Colorado. Journal of Mammalogy 47(1):125-126.

______. 1998. Range extensions of ten species of bats in California. Bulletin of Southern California Academy of Science 97(2):49-75.

Constantz, G. D. 1974. Reproductive effort in *Poeciliopsis occidentalis* (Poeciliidae). Southwestern Naturalist 19:47-52.

______. 1975. Behavioral ecology of mating in the male Gila topminnow, *Poeciliopsis occidentalis* (Cyprinodontiformes: Poeciliidae). Ecology 56:966-973.

______. 1976. Life history strategy of the Gila topminnow, *Poeciliopsis occidentalis*: A field evaluation of theory on the evolution of life histories. Ph.D. Dissertation, Arizona State University, Tempe.

______. 1979. Life history patterns of a livebearing fish in contrasting environments. Oecologia 40:189-201.

______. 1989. Reproductive biology of poeciliid fishes. Pages 33-50 *in* G. K. Meffe and F. F. Snelson Jr., eds., Ecology and Evolution of Livebearing Fishes (Poeciliidae). Prentice Hall, Englewood Cliffs.

Corman, T. E. 1994. Black-bellied whistling duck. *In* Nongame Field Notes. Page 18. AGFD Wildlife News, Arizona.

Coronado National Forest (CNF). 2000. FY 1999 Annual monitoring and evaluation report. Coronado National Forest report, 27 pp.

Coues. E. 1872. A new bird to the United States. American Naturalist 6:370.

Cox, J. R., H. L. Morton, T. N. Johnsen, Jr., G. L. Jordan, S. C. Martin and L. C. Fierro. 1984. Vegetation restoration in the Chihuahuan and Sonoran Deserts of North America. Rangelands 6: 112-116.

______. and G.B. Ruyle. 1986. “Influence of climatic and edaphic factors on the distribution of Eragrostis lehmanniana Nees. in Arizona, U.S.A.” Journal of the Grassland Society of South Africa 3:25-29.

Dalton, V. M. and D.C. Dalton. 1993. Assessment of the impacts of low level military aircraft on *Leptonycteris curasoae,* an endangered bat, at Organ Pipe Cactus National Monument, Arizona. Contract Nos. USAF/Luke AFB F0260492MS359 and NPS/ORPI O.M. 1443 PX866092081. Report to Organ Pipe Cactus National Monument and 58th Civil Eng. Sq. Luke AFB. 54 pp.

Dalton, V. M., D .C. Dalton and S. L. Schmidt. 1994. Roosting and foraging use of a proposed military training site by the long-nosed bat, Leptonycteris curasoae. Contract Nos. DACA65-94-M-0831 and DACA65-94-M-0753. Report to Luke Air Force Natural Resources Program. 34 pp.

Davidson, C. 1996. Frog and toad calls of the Rocky Mountains. Library of Natural Sounds, Cornell Laboratory of Ornithology, Ithaca, NY.

Davidson, D., Pessier, A.P., J.E. Longcore, M. Parris, J. Jancovich, J. Brunner, D. Schock, and J.P. Collins. 2000. Chytridiomycosis in Arizona (USA) tiger salamanders. Page 23 *in* Conference and Workshop Compendium: Getting the Jump! On amphibian diseas. Cairns, Australia, August 2000.

DeBano, L.F., and L.J. Schmidt. 1989. Interrelationships between watershed condition and health of riparian areas of southwestern United States. Pp. 45-52 In: Practical approaches to riparian resource management. An educational workshop. May 8-11, 1989. Billings, MT. Gresswell, R.E., B.A. Barton, and J.L. Kershner, eds. U.S. Bureau of Land Management, Billings, MT.

Declining Amphibian Populations Task Force. 1993. Post-metamorphic death syndrome. Froglog 7: 1-2.

Degenhardt, W.G., C.W. Painter, and A.H. Price. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press, Albuquerque.

Delaney, D. K., T. G. Grubb, P. Beier, L. L. Pater, and M. H. Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. Journal of Wildlife Management 63:60-76.

Desert Tortoise Council. 1994 (Revised 1999). Guidelines for handling desert tortoises during construction projects. Edward L LaRue, Jr., editor. Wrightwood, California. 19 pp.

Dickerman, R.W. 1997. Geographic variation in southwestern U.S. and Mexican spotted owls, with the description of a new subspecies. Pp. 45-55 *in* R.W. Dickerman (Compiler) The era of Allan R. Phillips: A festschrift. Horizon Communications, Albuquerque, NM.

Drost, C.A. 1998. Survey of amphibians and amphibian habitat on the upper Santa Cruz River, Arizona. USGS, Biological Resources Division, Colorado Plateau Research Station, Flagstaff, AZ.

______., M. K. Sogge, and E. Paxton. 1998. Pre,iminary diet study of the nedangered southwestern willow flycatcher. Report to U. S. Bureau of Reclamation. U. S. G. S. Biological Resources Division/Colorado Plateau Research Station/Northern Arizona University. 26 pp.

Fleming, T. H. 1991. Nectar corridors and the diet of migratory nectarivorous bats. Bat Research News 33:71.

______. 1994. Lesser long-nosed bat recovery plan. U. S. Fish and Wildlife Service, Albuquerque, New Mexico. 49 pp.

______. 1995. Lesser long-nosed bat recovery plan. U.S. Fish and Wildlife Service. Albuquerque, New Mexico. Page 29.

Forrest, R. E. 1992. Habitat use and preference of Gila topminnow. M.S. Thesis, University of Arizona, Tucson.

Ganey, J.L. 1998. Spotted owl. Pp 170-174 *in*: R.L. Glinski ed., The raptors of Arizona. Univ. Ariz. Press, Tucson.

Ganey, J.L. and R.P. Balda. 1989. Distribution and habitat use of Mexican spotted owls in Arizona. Condor 91: 355-361.

______, ______, J.K. Dwyer, B.E. Strohmeyer, and J.S. Jenness. 1998. Dispersal movements and survival rates of Mexican spotted owls in northern Arizona. Wilson Bull. 110: 206-217.

______ and J.L. Dick, Jr. 1995. Habitat relationships of the Mexican spotted owl: Current knowledge. Chapter 4 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

______, R.B. Duncan, and W.M. Block. 1992. Use of oak and associated woodlands by Mexican spotted owls in Arizona. Pp. 125-128 *in* P.F. Ffolliot, G.J. Gottfried, D.A. Bennett, V.M. Hernandez C., A Ortega-Rubio, and R.H. Hamre, tech. coords. Ecology and management of oak and associated woodlands: perspectives in the southwestern United States and Mexico. Gen. Tech. Rep. RM-218, U.S. Forest Service, Ft. Colins, CO.

Gentry, H.S. 1982. Agaves of Continental North America. University of Arizona Press, Tucson Arizona. Pages 443-447 and 538-545.

Gerking, S. D., and D. V. J. Plantz. 1980. Size-biased predation by the Gila topminnow, *Poeciliopsis occidentalis* (Baird and Girard). Hydrobiologia 72:179-191.

Gifford, G.F. and R.H. Hawkins. 1978. Hydrologic impact of grazing on infiltration: a critical review. Water Resour. Res. 14: 305-313.

Glenn, W. 1996. Eyes of fire: encounter with a borderlands jaguar. Printing Corner Press, El Paso.

Glinski, R. L. 1998. The raptors of Arizona. Arizona Game and Fish Department and University of Arizona Press, Tucson. 220 pp.

Goldman, E.A. 1932. The jaguars of North America. Proc. Biol. Soc. Washington 45:143-146.

Green, L.R. 1977. Fuelbreaks and other fuel modifications for wildland fire control. Agric. Handb. 499. Washington, DC: U.S. Department of Agriculture, Forest Service. 79 p.

Greenberg, C.H.; Crownover, S.H.; Gordon, D.R. 1997. Roadside soils: a corridor for invasion of xeric scrub by nonindigenous plants. Natural Areas Journal. 17(2):99-109.

Gucinski, Hermann; Furniss, Michael J.; Ziemer, Robert R.; Brookes, Martha H. 2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNWGTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.

Gunderson, D.R. 1968. Floodplain use related to stream morphology and fish populations. Journal of Wildlife Management 32(3):507-514.

Gutiérrez, R.J., A.B. Franklin, and W.S. Lahaye. 1995. Spotted owl (Strix occidentalis). North American Birds No. 179 (A Poole and F. Gill, eds.). Acad. Nat. Sci, Philadelphia, and the American Ornithologists' Union, Washington, D.C.

Hale, S.F., and C.J. May. 1983. Status report for *Rana tarahumarae* Boulenger. Arizona Natural Heritage Program, Tucson. Report to Office of Endangered Species, US Fish and Wildlife Service, Albuquerque, NM.

______. and J.L. Jarchow. 1988. The status of the Tarahumara frog *(Rana tarahumara*e) in the United States and Mexico: part II. Report to the Arizona Game and Fish Department, Phoenix, Arizona, and the Office of Endangered Species, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

______. 1992. A survey of the historic and potential habitat for the Tarahumara frog, (Rana tarahumarae) in Arizona. Report to the Arizona Game and Fish Department, Phoenix, Arizona.

Hall, E. R. 1981. The mammals of North America. Second Edition. John Wiley and Sons, New York, 2:601-1181 + 90.

Hann, W. J., J. L. Jones, M. G Karl, [and others]. 1997. Landscape dynamics of the basin. *In*: T.M. Quigley, S. J. Arbelbide [Tech. Eds.], An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins: volume II. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station:

337-1055. Chapter 3. (Quigley, T.M., tech. ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

Harness, R. E. and K. R. Wilson. 2000. Raptor electrocutions and outages: a review of rural utility records spanning 1986-1996. Pages 765-771 *in* R. D. Chancellor and B. U. Meyburg [Eds.], Raptors at risk. Hancock House Publishers, Blaine, WA.

Harris, L. K., and R. B. Duncan. 1998. Cactus ferruginous pygmy-owl 1998 survey of southern Arizona, final report. United States Fish and Wildlife Service grant agreement # 1448-20181-98-G915. 39 pp.

______, and ______. 1999. Pima County cactus ferruginous pygmy-owl survey, final report. Pima County Government Contract #07-26-H-125828-0499. 78 pp.

Harvey, M. J., J. S. Altenbach, and T. L. Best. 1999. Bats of the United States. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service – Asheville Field Office. 64 pp.

Hatten, J., C. Paradzick, and M. Sumner. 2000. Constructing a nest-site suitability model for the southwestern willow flycatcher in Arizona. Page 20 *in* Abstracts of presented papers and posters, The Ecology and Conservation of the Willow Flycatcher, 24-26 October 2000, Arizona State University, Tempe.

Hayward, B. and E. L. Cockrum. 1971. The natural history of the western long-nosed bat, *Leptonycteris sanborni*. Western New Mexico University, Research Science 1(2):74-123.

Heath, W. G. 1962. Maximum temperature tolerance as a function of constant temperature acclimation in the Gila topminnow, *Poeciliopsis occidentali*s. Ph.D. Dissertation, University of Arizona, Tucson.

Hillis, D. M., J. S. Frost, and D. A. Wright. 1983. Phylogeny and biogeography of the *Rana pipens* complex: a biochemical evaluation. Systematic Zoology. 32(2):132-143.

Hoffmeister, D. F. 1986. Mammals of Arizona. University of Arizona Press, Tucson. 602 pp.

Howell, D.J. and B.S. Roth. 1981. Sexual reproduction in agaves: the benefits of bats; cost of semelparous advertising. Ecology 62:3-7.

Howell, S. N. G. And S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press, New York, New York. 851 pp.

Hubbs, C. L. and R. R. Miller. 1941. Studies of the fishes of the order Cyprinodontes. XVII -- genera and species of the Colorado River system. Occasional Papers of the Museum of Zoology, University of Michigan 433:1-9.

Hubbard, J. P. 1987. The status of the willow flycatcher in New Mexico. Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, New Mexico. 29 pp.

Hughes, J. M. 1999. Yellow-billed Cuckoo (*Coccyzus americanus*). *In* The Birds of North America, No. 418 (A. Poole and F Gill, eds.). The Birds of North America, Inc., Philadelphia, PA. 28 pp.

Jennings, M. R. 1987. Status of the western painted turtle *(Chrysemys picta belli*i) in Arizona. Journal of the Arizona-Nevada Academy of Sciences 22:129-133.

Johnson, R. R., and L.T. Haight. 1985. Avian use of xeroriparian ecosystems in the North American warm deserts. Pages 156-160 *in* R. R. Johnson et al., technical coordinator. Riparian ecosystems and their management: reconciling conflicting uses.

Kearney, T. H. and R. H. Peebles. 1960. Arizona flora – 2nd edition. University of California Press, Berkeley and Los Angeles, California. 1,085 pp.

Keitt, T., A.B. Franklin, and D. Urban. 1995. Landscape analysis and metapopulation structure. Chapter 3 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

Kerlinger, P. 2000. Avian mortality at communication towers: a review of recent literature, research, and methodology. USFWS Office of Migratory Bird Management. 38 pp.

Lange, K.K. 1960. The jaguar in Arizona. Transactions of the Kansas Academy of Science 63:96-101.

Lesh, T. D. and T. E. Corman. 1995. Cactus ferruginous pygmy-owl surveys in Arizona: 1993-1995. Nongame and Endangered Wildlife Program Technical Report 76. Arizona Game and Fish Department, Phoenix, Arizona. 23 pp.

Loncore, J.E., A.P. Pessier, and D.K. Nichols. 1999. *Batracytrium dendrobatidis* gen. Et sp. Nov., a chytrid pathogenic to amphibians. Mycologia 91(2):219-227.

Lonsdale, W.M.; Lane, A.M. 1994. Tourist vehicles as vectors of weed seeds in Kadudu National Park, northern Australia. Biological Conservation. 69(3): 277-283.

Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. Journal of Forestry. 81: 592-595.

Mader, H. J. 1984. Animal habitat isolation by roads and agricultural fields. Biological Conservation 29:81-96.

Marsh, P. C., and W.L. Minckley. 1990. Management of endangered Sonoran topminnow at Bylas Springs, Arizona. Description, critique and recommendations. Great Basin Naturalist 50(3):265-272.

Marti, Carl D. 2002. Enhanging raptor populations, a technique manual. The Peregrine Fund. Boise, ID. 77 pp.

Maynard, W. R. 1995. Summary of 1994 survey efforst in New Mexico for southwestern willow flycatcher (*Empidonax traillii extimus*). Contract #94-516-69. New Mexico Department of Game and Fish, Santa Fe, New Mexico. 48 pp.

McCarthey, T.D., C.E. Paradzick, J.W. Rourke, M.W. Sumner, and R.F. Davidson. 1998. Arizona partners in flight southwestern willow flycatcher 1997 survey and nest monitoring report. Report to the Bureau of Reclamation, Phoenix, AZ.

McDonald, C.B., J. Anderson, J.C. Lewis, R. Mesta, A. Ratzlaff, T.J. Tibbitts, and S.O. Williams. 1991. Mexican Spotted owl (*Strix occidentalis lucida*) status report. U.S. Fish and Wildl. Serv., Albuquerque, NM.

McGregor, S. E., S. M. Alcorn and G. Olin. 1962. Pollination and pollinating agents of the saguaro. Ecology 43:259-267.

McNeil, R., J. R. Rodriguez Sr., and H. Ouellet. 1985. Bird mortality at a power transmission line in northeastern Venezuela. Biological Conservation 31:151-165.

McPherson, G. R. 1995. The role of fire in desert grasslands. Pages 130-151 in M. P. McClaran and T. R. Van Devender (editors), The Desert Grassland. University of Arizona Press, Tucson, Arizona.

Mech, L.D. 1973. Wolf numbers in the Superior National Forest of Minnesota. Res. Pap. NC-97. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Experiment Station. 10 pp.

Meffe, G. K., D. A. Hendrickson, and W. L. Minckley. 1983. Factors resulting in decline of the endangered Sonoran topminnow, *Poeciliopsis occidentalis* (Antheriniformes: Poeciliidae) in the United States. Biological Conservation 25:135-159.

______. 1984. Effects of abiotic disturbance on coexistence of predator-prey fish species. Ecology 65(5):1525-1534.

______, and J. E. Brooks. 1985. Transplantations of native Arizona fishes: records through 1980. Journal of the Arizona-Nevada Academy of Sciences 20(2):73-90.

Mladenoff, D.J., T. A. Sickley, R. G. Haight, and A. P. Wydevens. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes region. Conservation Biology. 9(2): 279-294.

Monson, G. and A. R. Philips. 1981. Annotated checklist of the birds of Arizona, 2nd edition, University of Arizona Press, Tucson. 292 pp.

_____. 1987. An “almost certain” ferruginous pygmy-owl was heard along lower Aravaipa Canyon (Woods Ranch now owned by TNC) on 28 July 1987. American Birds 41:1471.

_____. 1998. Ferruginous pygmy-owl. Pp. 159-161 *in*: R. Glinski (Ed.). The Raptors of Arizona. University of Arizona Press, Tucson. 220 pp.

Morell, V. 1999. Are pathogens felling frogs? Science 284:728-731.

Morrison, J.L. 1996. Crested Caracara (*Caracara plancus*) *In* The Birds of North America, No. 249 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Muiznieks, B. D., S. J. Sferra, T. E. Corman, M. K. Sogge, and T. J. Tibbitts. 1994. Arizona Partners in Flight southwestern willow flycatcher survey 1993. Draft report: Nongame and endangered wildlife program, Arizona Game and Fish Department, Phoenix, AZ. Draft of April 1994. 28 pp.

Murray, R. C. and V. Dickinson. 1996. Management plan for the Sonoran desert population of the desert tortoise in Arizona. Arizona Interagency Desert Tortoise Team and Arizona Game and Fish Department, AZ. 33 pp.

Nelson, E.W. and E.A. Goldman. 1933. Revision of the jaguars. Journal of Mammalogy 14:221-240.

New Mexico Game and Fish Department and The Fish and Wildlife Information Exchange. 2000. Five-Stripped Sparrow (*Aimophila quinquestriata*). [Web page] No archive known [Accessed 7 June 2002]. BISON. http://www.fw.vt.edu/fishex/nmex_main/species/041830.htm

Nobel, T. A. 1995. Birds and power lines: selected interaction and managment issues in the electric utility industry. M. S. Thesis, Prescott College, Prescott, AZ.

Nowak, R. M. 1994. Walker's bats of the world. Johns Hopkins University Press, Baltimore. 287 pp.

Paradzick, C.E., R.F. Davidson, J.W. Rourke, M.W. Sumner, and T.D. McCarthey. 1999. Southwestern willow flycatcher 1998 survey and nest monitoring report. Nongame and Endangered Wildlife Program, Arizona Game and Fish Department, Phoenix, AZ, Technical Report 141.

______, R. F. Davidson, J. W. Rourke, M. W. Sumner, A. M. Wartell, and T. D. McCarthey. 2000. Southwestern willow flycatcher 1999 survey and nest monitoring report. Nongame and Endangered Wildlife Program Technical Report 151. Arizona Game and Fish Department, Phoenix, Arizona. 93 pp.

Parsons, D. R. 1996. Case study: The Mexican wolf. Pages 101-123 in E. A. Herrera and L. F. Huenneke eds. New Mexico's Natural Heritage: Biological Diversity in the Land of Enchantment. New Mexico Journal of Science, Volume 36.

Peterson, R. T. 1990. A field guide to western birds. Third Edition. Houghton Mifflin Company, Boston, Massachusetts. 432 pp.

Phillips, A., J. Marshall, and G. Monson. 1983. The birds of Arizona. University of Arizona Press, Tucson, AZ. 212 pp.

Phillips, A. R. 1948. Geographic variation in *Epidonax traillii*. The Auk 65:507-514.

______, J.T. Marshall Jr., and G. Monson. 1964. The Birds of Arizona. University of Arizona Press, Tucson. 220 pp.

Pima County. 2001. Priority Vulnerable Species: Analysis and review of species proposed for coverage by the multiple-species conservation plan DRAFT. Pima County, Arizona. 385 pp.

Platz, J.E., and J.S. Mecham. 1979. *Rana chiricahuensi*s, a new species of leopard frog (*Rana pipiens* Complex) from Arizona. Copeia 1979(3):383-390.

______. and ______. 1984. *Rana chiricahuensi*s. Catalogue of American Amphibians and Reptiles 347.1.

Postovit, H.R. and B.C. Postovit. 1987. Impacts and mitigation techniques. Pp. 183-213 *in* G.B. Pendleton, B.A. Mildsap, K.W. Cline, and D.M. Bird (eds.), Raptor management techniques manual. National Wildlife Federation, Washington, D.C. Scientific Technical Series 10.

Proudfoot, G., and S. M. Beasom. 1997. Food habits of nesting ferruginous pygmy-owls in southern Texas. Wilson Bulletin 109:741-748.

______ and R. D. Slack. 2001. Comparisons of ferruginous pygmy-owl mtDNA at local and international scales. Department of Wildlife and Fisheries Sciences, Texas A & M University. A Report for Pima County. 11 pp.

Pyle, P. 1997. Identification guide to North American birds. Part I Columbidae to Ploceidae. Slate Creek Press, Bolinas, CA.

Reichenbacher, F.W. and R.B. Duncan. 1992. Diet of Mexican spotted owls on National Forest system lands in Arizona and New Mexico. Final report to USDA, Forest Service, Southwestern regional Office, Albuquerque, NM.

Richardson, W. S., Jean-Luc E. Cartron, D. J. Krueper., L. Turner, and T. H. Skinner. 2000. The status of the cactus ferruginous pygmy-owl in Arizona: Population surveys and habitat assessment. Pages 27-39 *in:* Jean-Luc E. Cartron and D. M. Finch, eds. Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona. General Technical Report, RMRS-GTR-43, Ogden, Utah. U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 68 pp.

Ricklefs, R.E. 1990. Ecology. 3rd ed. W.H. Freeman Co., New York.

Ridgely, R. S. And G. Tudor. 1994. The birds of South America: suboscine passerines. University of Texas Press, Austin, Texas.

Rogers, G. F. and J. Steele. 1980. Sonoran desert fire ecology. Pages 15 -16 *in* M. A. Stokes and J. H. Dieterich, technical coordinators. Proceedings of the fire history workshop. United States Forest Service General Technical Report RM-81.

Roller, P.S. 1996. Distribution, Growth and Reproduction of Pima Pineapple Cactus *(Coryphantha scheeri* Kuntz var. *robustispina* Schott). M. S. Thesis, University of Arizona.

Rosen, P.C., C.R. Schwalbe, D.A. Parizek, P.A. Holm, and C.H. Lowe. 1994. Introduced aquatic vertebrates in the Chiricahua region: effects on declining native ranid frogs. Pages 251-261 *in* L.F. DeBano, G.J. Gottfried, R.H. Hamre, C.B. Edminster, P.F. Ffolliott, and A. Ortega-Rubio (tech. coords.), Biodiversity and management of the Madrean Archipelago. USDA Forest Service, General Technical Report RM-GTR-264.

______, ______, and S.S. Sartorius. 1996a. Decline of the Chiricahua leopard frog in Arizona mediated by introduced species. Report to Heritage program, Arizona Game and Fish Department, Phoenix, AZ. IIPAM Project No. I92052.

______, S. S. Sartorius, C. R. Schwalbe, P. A. Holm, and C. H. Lowe. 1996b. Draft annotated checklist of the amphibians and reptiles of the Sulphur Springs Valley, Cochise County, Arizona. Final Report, part 1, to the Arizona game and Fish Department, Phoenix. Heritage Program, IIPAM Project No. I92052.

Rostagno, C. M. 1989. Infiltration and sediment production as affected by soil surface conditions in a shrubland of Patagonia, Argentina. Journal of Range Management 2: 382-385.

Rudis, V.A. 1995. Regional forest fragmentation effects on bottomland hardwood community types and resource values. Landscape Ecology. 10(5): 291-307.

San Diego Natural History Museum. 1995. *Empononax traillii extimus* in California. The willow flycatcher workshop. 17 November 1995. 66 pp.

Salazar, L.A.; Gonzalez-Caban, A. 1987. Spatial relationship of a wildfire, fuelbreaks, and recently burned areas . Western Journal of Applied Forestry. 2(2): 55-58.

Schoenherr, A. A. 1974. Life history of the topminnow, *Poeciliopsis occidentalis* (Baird and Girard) in Arizona, and an analysis of its interaction with the mosquitofish *Gambusia affinis* (Baird and Girard). Ph.D. Dissertation, Arizona State University, Tempe.

______. 1977. Density dependent and density independent regulation of reproduction in the Gila topminnow, *Poeciliopsis occidentalis* (Baird and Girard). Ecology 58:438-444.

Schultz, R. J. 1961. Reproductive mechanism of unisexual and bisexual strains of the viviparous fish *Poeciliopsi*s. Evolution 15:302-325.

Secretaria de Desarrollo Social. 1994. NORMA oficial Mexicana NOM-059-ECOL01994, que determina las especies y subespecies de flora y fauna silvestres y acuatics en peligro de extincion, amenazadas, raras y sujetas a proteccion especial, y que establece especificaciones para su proteccion. Diaro Oficial 488(10): 2-60.

Sferra, S. J., R. A. Meyer, and T. E. Corman. 1995. Arizona Partners in Flight 1994 southwestern willow flycatcher survey. Final Technical Report 69. Arizona

Game and Fish Department, Nongame and Endangered Wildlife Program, Phoenix, AZ. 46 pp.

______., Corman, T. E., C. E. Paradzick, J. W. Rourke, J. A. Spencer, and M. W. Sumner. 1997. Arizona Partners in Flight southwestern willow flycatcher survey 1993-1996 summary report. Technical Report. Nongame and Endangered Wildlife Program. Arizona Game and Fish Department, Phoenix, AZ. 97 pp.

Simms, J. K., and K. M. Simms. 1992. What constitutes quality habitat for Gila topminnow *(Poeciliopsis occidentali*s)? An overview of habitat parameters supporting a robust population at Cienega Creek, Pima, Co., Arizona. Abstract. Proceedings of the Desert Fishes Council 22-23:82.

Simons, L. H. 1987. Status of the Gila topminnow *(Poeciliopsis o. occidentali*s) in the United States. Special Report on Project E-1, Title VI of the Endangered Species Act of 1973, Arizona Game and Fish Department, Phoenix.

Smith, A. B., C. E Paradzick, A. A. Woodward, P. E. T. Dockens, and T. D. McCarthey. 2002. Southwestern willow flycatcher 2001 survey and nest monitoring report. Technical Report 191, Nongame and Endangered Wildlife Program. Arizona Game and Fish Department, Phoenix. 63 pp.

Sogge, M. K. 1995a. Southwestern willow flycatcher (*Empidonax trailli extimus*) monitoring at Tuxigoot National Monument. 1995 progress report to the National Park Service National Biological Service, Colorado Plateau Research Station, Northern Arizona University, Flagstaff, Arizona. 20 pp.

______. 1995b. Southwestern willow flycatchers in the Grand Canyon. Pages 89-91 *In* E. T. L. Roe, G. S. Farris, C. E. Puckett, P. D. Doram, and M. J. Mac [Eds.]. Our living Resources: a report to the Nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. USDI, National Biological Service, Washington. DC.

______ and T. J. Tibbitts. 1992. Southwestern willow flycatcher (*Empidonax trailli extimus*) surveys along the Colorado River in Grand Canyon National Park and Glen Canyon National Recreation Area. NPS CPSU/N. Arizona University, Flagstaff, Arizona. 43 pp.

______, ______, and S. J. Sferra. 1993. Status of the southwestern willow flycatcher along the Colorado River between Glen Canyon Dam and Lake Mead – 1993. Summary Report. National Park Service Cooperative Park Studies Unit/N. Arizona University, U. S. Fish and Wildlife Service, and Arizona Game and Fish Department, Flagstaff, Arizona. 69 pp.

______ and ______. 1994. Distribution and status of the southwestern willow flycatcher along the Colorado River in the Grand Canyon – 1994. Summary Report. National Biological Service, Colorado Plateau Research Station/Northern Arizona University, Flagstaff, Arizona. 37 pp.

______, R. M. Marshall, S. J. Sferra, and T. J. Tibbitts. 1997. A southwestern willow flycatcher survey protocol and breeding ecology summary. National Park Service/Colorado Plateau Research Station/N. Arizona University, Technical Report NRTR-97/12. 37 pp.

Soule, M. E. 1986. Conservation biology. The science of scarcity and diversity. Sinauer Association, Inc. Sinderland, MA 584 pp.

Speare, R., and L. Berger. 2000. Global distribution of chytridiomycosis in amphibians. Http://www.jcu.edu.au/school/phtm/PHTM/frogs/chyglob.htm.11 November 2000.

Spencer, J. A., S. J. Sferra, T. E. Corman. J. W. Rourke, and M. W. Sumner. 1996. Arizona Partners in flight 1995 southwetern willow flycatcher survey. Technical Report 97, March 1996. Arizona Game and Fish Department, Phoenix, AZ. 69 pp.

Spencer, J. A. and D. P. Humphrey. 1999. Species of concern at the Arizona Army National Guard's Florence Military Reservation, Pinal County, Arizona. Arizona Army National Guard. 32 pp.

Sredl, M.J., and J.M. Howland. 1994. Conservation and management of madrean populations of the Chiricahua leopard frog, *Rana chiricahuensi*s. Arizona Game and Fish Department, Nongame Branch, Phoenix, AZ.

______., ______, J.E. Wallace, and L.S. Saylor. 1997. Status and distribution of Arizona's native ranid frogs. Pages 45-101 *in* M.J. Sredl (ed). Ranid frog conservation and management. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program, Technical Report 121.

______., and L.S. Saylor. 1998. Conservation and management zones and the role of earthern cattle tanks in conserving Arizona leopard frogs on large landscapes. Pages 211-225 *in* Proceedings of Symposium on Environmental, Economic, and Legal Issues Related to Rangeland Water Developments. November 13-15, 1997, Tempe, AZ.

______., and D. Caldwell. 2000. Wintertime populations surveys - call for volunteers. Sonoran Herpetologist 13:1.

State of Arizona. 1990. Final report and recommendations of the Governor's riparian habitat task force. Executive Order 89-16. Streams and riparian resources. October 1990. Phoenix, AZ. 28 pp.

Stiles, F. G. And A. F. Skutch. 1989. A guide to the birds of Costa Rica. Comstock, Ithaca, New York. 364 pp.

Stouffer, P.C., and R.T. Chesser. 1998. Tropical Kingbird (*Tyrannus melancholicus*) *In* The Birds of North America, No. 358 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Stromberg, J. C., J. A. Tress, J. D. Wilkins, and S. D. Clark. 1992. Response of velvet mesquite to groundwater decline. Journal of Arid Environments, 23:45-58.

______. 1993a. Fremont cottonwood-Goodding willow riparian forests: a review of their ecology, threats, and recovery potential. Journal of the Arizona-Nevada Academy of Science 26(3):97-110.

______. 1993b. Fremont cottonwood-Goodding willow riparian forests: a review of their ecology, threats, and recovery potential. Journal of the Arizona-Nevada Academy of Science 27(1):111-124.

Swank, W.G. and J.G. Teer. 1989. Status of the jaguar-1987. Oryx 23:14-21.

Tetra Tech, Inc. 2002. Draft TEP Sahuarita - Nogales Transmission Line Environmental Impact Statement.

Thiel, R.P. 1985. The relationship between road densities and wolf habitat suitability in Wisconsin. American Midland Naturalist. 113(2): 404-407.

Thomas, P. A. 1991. Response of Succulents to Fire: A Review. International Journal of Wildland Fire 1(1): 11 – 22.

Tibbitts, T. J. 1991. Thick-billed kingbird (*Tyrannus crassirostris*). Wildlife Views, Arizona Game and Fish Department. Pp. 17.

Unitt, P. 1987. *Empidonax traillii extimus*: An endangered subspecies. Western Birds 18:137-162.

URS. 2003. Tucson Electric Power Sahuarita-Nogales transmission line project - roads analysis.

U. S. Census Bureau. 2000. Arizona state and county facts, deprived from population estimates, 2000 census of population and housing, 1990 census of population and housing, small area income and poverty estimates, county business patterns, and 1997 census of governments. http://quickfacts.census.gov/qfd/states/04/04023.html

U.S. Department of the Interior. 1967. Native fish and wildlife. Endangered Species. Federal Register 32(48):4001.

U.S. Fish and Wildlife Service. 1982. Mexican Wolf Recovery Plan. USFWS, Albuquerque, NM. 103 pp.

______. 1984. Gila and Yaqui Topminnow Recovery Plan. USFWS, Albuquerque, NM.

______. 1988. Endangered and threatened wildlife and plants; determination of endangered status for two long-nosed bats. Federal Register 53(190):38456-38460.

______. 1990. Listed cats of Texas and Arizona recovery plan (with emphasis on the ocelot). U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 131 pp.

______. 1993a. Endangered and threatened wildlife and plants; final rule to list the Mexican spotted owl as a threatened species. Federal Register 58: 14248-14271.

______. 1993b. Determination of endangered status for the plant Pima pineapple cactus *(Coryphantha scheeri* var. *robustispin*a). Federal Register 58 (158): 49875-49880.

______. 1995a. Recovery plan for the Mexican spotted owl (*Strix occidentalis lucida*) Vols 1 & 2. USFWS New Mexico Field Office, Albuquerque, NM. 169 pp.

______. 1995b. Determination of critical habitat for the Mexican spotted owl; final rule. Federal Register 60: 29913-29951.

______. 1997. Endangered and threatened wildlife and plants: determination of endangered status for the cactus ferruginous pygmy-owl in Arizona. Federal Register 62:10730-10747.

______. 1997b. Final determination of critical habitat for the southwestern willow flycatcher. Federal Register 62 (140):39129-39146.

______. 1998b. Endangered and threatened wildlife and plants; revocation of critical habitat for the Mexican spotted owl, loach minnow, and spikedace. Federal Register 63: 14378-14379.

______. 1999. Endangered and threatened wildlife and plants; Final Rule: designation of critical habitat for the cactus ferruginous pygmy-owl. Federal Registrar 64:37419-37440.

______. 2000a. Endangered and threatened wildlife and plants; proposed designation of critical habitat for the Mexican spotted owl. Federal Register 65: 45336-45353.

______. 2000b. Recommended guidance for private landowners concerning the cactus ferruginous pygmy-owl: and the cactus ferruginous pygmy-owl survey protocol. Federal Register 65:14999-15000.

______. 2001a. Endangered and threatened wildlife and plants; Final designation of critical habitat for the Mexican spotted owl. Federal Register 66: 8530-8553.

______. 2001b. Biological Opinion on the effects of proposed livestock grazing and management on the Montana Allotment on the Nogales Ranger District, Santa Cruz County, Arizona. 51 pp.

______. 2001c. Biological Opinion on the effects of the proposed construction of Madera Highlands east of Green Valley in Pima County, Arizona. 18 pp.

______. 2001d. Biological Opinion on the effects of the Scour Protection Project on I-19 and Frontage Road Bridges Over Peck Canyon Near Santa Cruz River Confluence in Santa Cruz County, Arizona. 38 pp.

______. 2001e. Mexican gray wolf (Canis lupus baileyi). Unpublished abstract, U. S. Fish and Wildlife Sevice, Arizona Ecological Services. 1p.

______. 2002a. Biological Opinion on the effects of the Thornydale Road Improvement Project in Pima County, Arizona. 66 pp.

______. 2002b. Biological Opinion on the effects of the proposed Pueblo Oasis Developent in Pima County, Arizona. 60 pp.

______. 2002c. Endangered and threatened wildlife and plants; Listing of the Chiricahua leopard frog (*Rana chiricahuensis*); Final Rule. Federal Register 67:40790-40811.

______. 2002d. Biological Opinion on the effects of the proposed issuance of a NPDES permit for ASARCO's Mission Mine Complex in Pima County, Arizona. 15 pp.

U.S. Forest Service. 2002. Scoping Report: noxious weed and invasive exotic plant management program. Coronado National Forest, Pima County, Arizona. 29 pp.

U.S. Geoligical Survey. 2003. Northern Prairie Wildlife Research Center. North Dakota's federally listed endangered, threatened, and candidate species – 1995: Western burrowing owl *(Athene cunicularia hypugea*). http://www.npwrc.usgs.gov/resource/distr/others/nddanger/species/athecuni.htm. 28 March 2003.

Ward, J.P. and W.E. Block. 1995. Mexican spotted owl prey ecology. Chapter 5 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

______, A.B. Franklin, S.E. Rinkevich, and Fernando Clemente. 1995. Distribution and abundance of Mexican spotted owls. Chapter 1 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

Webb, R. G. and R. H. Baker. 1984. Terrestrial vertebrates of the Cerro Mohinora region, Chihuahua, Mexico. Southwestern Naturalist 29:243-246.

Weedman, D. A., and K. L. Young. 1997. Status of the Gila topminnow and desert pupfish in Arizona. Arizona Game and Fish Department, Phoenix.

White, G.C., A.B. Franklin, and J.P. Ward. 1995. Population biology. Chapter 2 in Recovery plan for the Mexican spotted owl: Vol. II. U.S. Fish and Wildl. Serv., Albuquerque, NM.

Whitfield, M. J. and K. M. Enos. 1996. A brown-headed cowbird control program and monitoring for the Southwestern willow flycatcher, South Fork Kern River, California, 1996. Final report to the U.S. Army Corps of Engineers, Contract DACW05-96-P-0900. Weldon, California: Kern River Research Center; 1996. 16 pp.

Wilcox, R., W. S. Richardson, and D. Abbate. 2000. Habitat selection by cactus ferruginous pygmy-owls in southern Arizona: Preliminary results. Arizona Game and Fish Department, Phoenix, Arizona. 43 pp.

Wood, T. 1991. Results of 1991 amphibian monitoring of the Coronado National Forest. Report to the Coronado National Forest and the Nature Conservancy, Tucson, AZ.

7.0 LIST OF ACRONYMS

ACC	Arizona Corporation Commission
ADEQ	Arizona Department of Environmental Quality
AGFD	Arizona Game and Fish Department
AOU	American Ornithologists' Union
ASLD	Arizona State Land Department
AUM	Animal Unit per Month
BA	Biological Assessment
BLM	Bureau of Land Management
BO	Biological Opinion
CFPO	Cactus Ferruginous Pygmy Owl
Citizens	Citizens Communications
CLF	Chiricahua Leopard Frog
CNF	Coronado National Forest
DBH	Diameter Breast Height
DOE	Department of Energy
EMA	Ecosystem Management Area
ESA	Endangered Species Act
GPS	Global Positioning System
HDMS	Heritage Data Management System
HEG	Harris Environmental Group, Inc.
I-19	Interstate 19
IRA	Inventoried Roadless Area
LLNB	Lesser Long-nosed Bat
MOA	Memorandum of Agreement
MSO	Mexican Spotted Owl
NPDES	National Pollutant Discharge Elimination System

OHV	Off-highway vehicle
PAC	Protected Activity Center
PPC	Pima Pineapple Cactus
RA	Roads Analysis
RNA	Research Natural Area
ROW	Right-of-way
RU	Recovery Units
SL	Standard Length
SWFL	Southwestern Willow Flycatcher
TEP	Tucson Electric Power
USDOI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
USFS	United States Department of Agriculture Forest Service
YOY	Young-of-the-year

APPENDIX A

Plants documented along proposed ROW of the TEP Citizens Interconnect Project, July to October 2002.

SPECIES			Family
	Scientific Name	**Common Name**	
CACTUS & SUCCULENTS	*Agave parryi*	century plant	Agavaceae
	Agave schottii	shindagger	Agavaceae
	Coryphantha scheeri var. *robustispina*	Pima pineapple cactus	Cactaceae
	Dasylirion wheeleri	sotol	Agavaceae
	Echinocereus spp.	hedgehog cactus	Cactaceae
	Echinocereus pectinatus var. *rigidissimus*	Arizona rainbow cactus	Cactaceae
	Ferocactus wislizenii	fishhook barrel cactus	Cactaceae
	Fouquieria splendens	ocotillo	Fouquieriaceae
	Mammillaria spp.	pincushion cactus	Cactaceae
	Nolina microcarpa	beargrass	Agavaceae
	Opuntia spp.	cholla	Cactaceae
	Opuntia spp.	prickly pear	Cactaceae
	Opuntia spinosior	walkingstick cactus	Cactaceae
	Yucca elata	soaptree yucca	Agavaceae
GRASSES	*Bouteloua barbata* or *B. rothrockii*	six-weeks or Rothrock grama	Poaceae
	Bothriochloa barbinodis	cane beard grass	Poaceae
	Bouteloua curtipendula	side oats grama	Poaceae
	Bouteloua gracilis	blue grama	Poaceae
	Bouteloua hirsuta	hairy grama	Poaceae
	Bouteloua parryi	Parry grama	Poaceae
	Bouteloua repens	slender grama	Poaceae
	Digitaria californica	Arizona cottontop	Poaceae
	Erioneuron pulchellum	fluffgrass	Poaceae
	Hilaria belangeri	curly mesquite	Poaceae
	Leptochloa dubia	green sprangletop	Poaceae
	Muhlenbergia emersleyi	bull grass	Poaceae
	Muhlenbergia rigens	deer grass	Poaceae
	Piptochaetium fimbriatum	pinyon rice grass	Poaceae
	Sporobolus spp.	dropseed	Poaceae

SPECIES			Family
	Scientific Name	**Common Name**	
FORBS	*Abutilon incanum*	Indian mallow	Malvaceae
	Allionia incarnata	trailing windmills	Nyctaginaceae
	Ambrosia confertiflora	weakleaf burr ragweed	Asteraceae
	Amoreuxia palmatiflida	Arizona yellow show	Cochlospermaceae
	Argemone sp.	prickly poppy	Papaveraceae
	Artemisia ludoviciana		Asteraceae
	Asclepias asperula	antelope horns	Asclepiadaceae
	Asclepias nummularia	tufted milkweed	Asclepiadaceae
	Asclepias tuberosa	butterfly milkweed	Asclepiadaceae
	Aspicarpa hirtella	aspicarpa	Malpighiaceae
	Boerhaavia coccinea	red spiderling	Nyctaginaceae
	Bouchea prismatica	bouchea	Verbenaceae
	Bouvardia glaberrima	smooth bouvardia	Rubiaceae
	Brickellia spp.	brickellbush	Asteraceae
	Chamaecrista serpens var. *wrightii*	sensitive pea	Fabaceae
	Cheilanthes fendleri	cloak fern	Pteridaceae
	Cheilanthes spp.	claok fern	Pteridaceae
	Chenopodium fremontii	lamb's quarter	Chenopodiaceae
	Clitoria mariana	butterfly pea	Fabaceae
	Cnidosculus angustidens	mala mujer	Euphorbiaceae
	Cologania longifolia	narrowleaf tick clover	Fabaceae
	Commelina dianthifolia	western dayflower	Commelinaceae
	Cucurbita digitata	coyote gourd	Cucurbitaceae
	Datura metaloides	sacred datura	Solanaceae
	Eleocharis spp.	spikerush	Cyperaceae
	Eriogonum wrightii	buckwheat	Polygonaceae
	Eryngium heterophylla	button snakeroot	Apiaceae
	Evolvulus alsinoides		Convolvulaceae

SPECIES	Scientific Name	Common Name	Family
Forbs (Cont.)	*Evolvulus arizonicus*	Arizona blue eyes	Convolvulaceae
	Galium wrightii	northern bedstraw	Rubiaceae
	Glandularia gooddingii	verbena	Verbenaceae
	Gnaphalium leucocephalum	white cudweed	Asteraceae
	Gnaphalium wrightii	cudweed	Asteraceae
	Gomphrena sp.	globe amaranth	Amarnathaceae
	Gutierrezia spp.	snakeweed	Asteraceae
	Ipomoea barbatisepala	morning glory	Convolvulaceae
	Ipomoea coccinea	scarlet creeper	Convolvulaceae
	Ipomoea hirsutula	wooly morning glory	Convolvulaceae
	Ipomoea leptotoma	bird's foot morning glory	Convolvulaceae
	Ipomoea longifolia	long leaf morning glory	Convolvulaceae
	Isocoma tenuisecta	burroweed	Asteraceae
	Jatropha macrorhiza	Arizona desert potato	Euphorbiaceae
	Kallstroemia grandiflora	Arizona caltrop	Zygophyllaceae
	Krameria parvifolia	range ratany	Krameriaceae
	Machaeranthera spp.	spiny aster	Asteraceae
	Macroptilium gibbosifolium	variableleaf bushbean	Fabaceae
	Milla biflora	Mexican star	Liliaceae
	Oenothera rosea	evening primrose	Onagraceae
	Oxalis albicans	wild oxalis	Oxalidaceae
	Penstemon linarioides	linear leaf penstemmon	Scrophulariaceae
	Phaseolus ritensus	eggleaf stringbean	Fabaceae
	Phaseolus sp.	stringbean	Fabaceae
	Portulaca suffrutescens	portulaca	Portulacaceae
	Portulaca umbraticola	portulaca	Portulacaceae
	Proboscidea sp.	unicorn plant, devil's claw	Pedaliaceae

SPECIES			Family
	Scientific Name	**Common Name**	
Forbs (Cont.)	*Salvia subincisa*	sawtooth sage	Lamiaceae
	Schoenocrambe linearifolia	schoenocrambe	Brassicaceae
	Scirpus sp.	bulrush	Cyperaceae
	Senna covesii	desert senna	Fabaceae
	Senna hirsuta	woolly senna	Fabaceae
	Solanum douglassii	greenspot nightshade	Solanaceae
	Solanum elaeagnifolium	silverleaf nightshade	Solanaceae
	Sphaeralcea spp.	globe mallow	Malvaceae
	Tagetes sp.	marigold	Asteraceae
	Talinum angustissimum	talinum	Portulacaceae
	Talinum aurantiacum	orange fameflower	Portulacaceae
	Tetramerium hispidum	tetramerium	Acanthatceae
	Thalictrum fendleri	Fendler's meadow rue	Ranunculaceae
	Vitis arizonica	Arizona grape	Vitaceae
	Zinnia acerosa	desert zinnia	Asteraceae

SPECIES			Family
	Scientific Name	**Common Name**	
TREES & SHRUBS	*Acacia angustissima*	white ball acacia	Fabaceae
	Acacia constricta	whitethorn acacia	Fabaceae
	Acacia greggii	catclaw acacia	Fabaceae
	Aloysia wrightii	oreganillo	Verbenaceae
	Arctostaphylos sp.	manzanita	Ericaceae
	Baccharis salicifolia	seep willow	Asteraceae
	Baccharis sarothroides	desert broom	Asteraceae
	Calliandra eriophylla	fairyduster	Fabaceae
	Celtis pallida	desert hackberry	Ulmaceae
	Celtis reticulata	netleaf hackberry	Ulmaceae
	Chrysothamnus teretifolius	green rabbitbrush	Asteraceae
	Dodonaea viscosa	hopbush	Sapindaceae
	Ericameria laricifolia	turpentine bush	Asteraceae
	Erythrina flabelliformis	coral bean	Fabaceae
	Eysenhardtia orthocarpa	kidney wood	Fabaceae
	Fraxinus velutina	velvet ash; Arizona ash	Oleaceae
	Gossypium thurberi	desert cotton	Malvaceae
	Guardiola platyphylla	Apache plant	Asteraceae
	Hibiscus coulteri	desert rosemallow	Malvaceae
	Indigofera spaerocarpa	Sonoran Indigo	Fabaceae
	Juglans major	Arizona walnut	Juglandaceae
	Juniperus deppeana	alligator juniper	Cupressaceae
	Lasianthaea podocephala	San Pedro daisy	Asteraceae
	Lycium spp.	wolfberry	Solanaceae
	Mimosa biuncifera	catclaw mimosa	Fabaceae
	Mimosa dysocarpa	velvet pod mimosa	Fabaceae

	SPECIES		Family
	Scientific Name	Common Name	
TREES & SHRUBS	*Parkinsonia microphylla*	yellow palo verde	Fabaceae
	Populus fremontii	Fremont cottonwood	Salicaceae
	Prosopis velutina	velvet mesquite	Fabaceae
	Q. arizonica	Arizona white oak	Fagaceae
	Q. garrya	silktassel	Fagaceae
	Quercus emoryii	Emory oak	Fagaceae
	Rhus aromatica	skunkbush	Anacardiaceae
	Rhus choriophylla	sumac	Anacardiaceae
	Salix exigua	coyote willow	Salicaceae
	Tamarix pentandra	salt cedar	Tamaricaceae
	Ziziphus obtusifolia	graythorn	Rhamnaceae

APPENDIX B

TEP-Citizen's Interconnect Project

Environmental Training Guidelines for Construction Supervisors

- Stay in the designated work areas. Approved work areas, access roads, and staging areas will be clearly marked. All project activities must remain in these areas. Do not work or trespass beyond the signed or fenced restricted work areas.
- Restrict vehicle access to public roadways and designated access roads. Cross-country driving is prohibited.
- No driving or parking within 100 feet of ponds and tanks.
- Do not transfer water from one pond or tank to another or between any other bodies of water.
- No in-stream activity or disposal of construction debris or fill is allowed.
- Store topsoil and trench spoils behind sediment control structures at least 20 feet from any stream bank, including dry washes.
- Check equipment for leaks or heavy surface oil build-up before working in streams or washes.
- The use or transfer of hazardous materials will not be allowed within 100 feet of any stream or wash is prohibited.
- Do not litter. Dispose of trash in designated containers. Uncontained trash can attract wildlife and unwanted pests. Cigarette butts are considered litter, and should be extinguished and disposed of appropriately. All litter and construction debris must be removed from the job site daily.
- No pets or firearms. They are prohibited for job-site protection and protection of wildlife.
- Hunting is prohibited.
- Clearing will be limited to the minimum required to provide a safe construction area. Make sure you know the clearing limit, and if possible, leave plant root systems in place when clearing vegetation.
- It is illegal to harm, harass, pursue, hunt, shoot, wound, trap, kill capture, or collect wildlife officially listed as threatened or endangered. Violation of threatened and endangered special laws can result in penalties of up to $100,000 and/or one year in jail.
- Do not approach or feed wildlife. Keep away form their burrows and nests. Do not harm or kill any wildlife encountered.
- If animal is harmed or found harmed, contact your Construction Supervisor or the Environmental Inspector. Do not attempt to move the animal yourself.

APPENDIX C

Natural Resource Agencies Correspondence.

1. U. S. Fish and Wildlife Service, dated 14 May 2002.

2. Arizona Game and Fish Department, dated 25 April 2002.

APPENDIX D

APPENDIX D. Federally Listed, Proposed, and Candidate Species under jurisdiction of the U.S. Fish and Wildlife Service in Pima County, Arizona as of 14 August 2002, excluded from further consideration.

COMMON NAME	SCIENTIFIC NAME	STATUS	Habitat	JUSTIFICATION
PLANTS				
Canelo Hills ladies' tresses	Spiranthes delitescens	Endangered	Finely grained, highly organic, saturated soils of cienegas. Potential habitat occurs in Sonora, Mexico, but no populations have been found.	No habitat present.
Huachuca water umbel	*Lilaeopsis schaffneriana* ssp. *recurva*	Endangered	An emergent aquatic plant that requires marshy wetlands.	No habitat present.
Kearney's blue star	*Amsonia kearneyana*	Endangered	Known only from the Baboquivari Mountains.	ROW is outside of known range.
Nichol's Turk's head cactus	*Echinocactus horizonthalonius* var. *nicholii*	Endangered	Dependent on limestone substrates in desert hills.	No habitat present.
FISH				
Desert pupfish	*Cyprinodon macularius*	Endangered	Shallow springs, small streams, and marshes. Tolerates saline and warm water.	No habitat present in area.
Gila chub	*Gila intermedia*	Proposed Endangered	Small streams and cienegas; prefer deeper pools with cover.	No habitat present in area.
Loach minnow	*Tiaroga cobitis*	Threatened	Requires perennial streams with swift water over cobble or gravel	No habitat present in area.
Sonoran Chub	*Gila ditaenia*	Threatened	Most commonly found in deep, permanent pools with bedrock-sand substrates and free of floating algae.	In U.S, limited to Sycamore Canyon and its tributaries.
Spikedace	*Meda fulgida*	Threatened	Requires perennial streams with swift velocities over sand and gravel.	No habitat present in area.
AMPHIBIANS				
Sonoran tiger salamander	*Ambystoma tigrinum stebbinsi*	Endangered	Stock tanks and impounded cienegas in San Rafael Valley, Huachuca Mountains at 4000-6300 ft.	ROW is outside of known range. This species is not known to occur in the

APPENDIX D. Federally Listed, Proposed, and Candidate Species under jurisdiction of the U.S. Fish and Wildlife Service in Pima County, Arizona as of 14 August 2002, excluded from further consideration.				
COMMON NAME	**SCIENTIFIC NAME**	**STATUS**	Habitat	**JUSTIFICATION**
BIRDS				
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.	Winter surveys of Peña Blanca and Arivaca Lakes were conducted in 1994, 1995, 1996, 1998, 2000, 2001, and 2002. No bald eagles have been observed.
California brown pelican	*Pelecanus occidentalis californicus*	Endangered	Coastal land and islands; species is found around many Arizona lakes and rivers.	No habitat present in area.
Masked bobwhite	*Colinus virginianus ridgewayi*	Endangered	Only known Arizona population has been re-introduced on Buenos Aires Natl. Wildl. Refuge	ROW is outside of known range.
Mountain plover	*Charadrius montanus*	Proposed	Open arid plains, short grass prairies, and cultivated farms.	No habitat present in area.
Northern apolomado falcon	*Falco femoralis septentrionalis*	Endangered	Grassland and savannah habitats.	No recent confirmed reports for Arizona.
MAMMALS				
Ocelot	*Felis pardalis*	Endangered	Prefers humid tropical & sub-tropical habitats; typically found at higher elevations.	ROW is outside of known range.
Jaguarundi	*Felis yagouaroundi tolteca*	Endangered	Deciduous forests, riparian areas, swampy grasslands, upland drysavannahs, etc.	ROW is outside of known range.
Sonoran pronghorn	*Antilocapra americana sonoriensis*	Endangered	Grassy desertscrub in northwestern Sonora and adjacent Arizona borderlands, mainly Yuma Co.	ROW is outside of known range.

STATUS DEFINITIONS: ENDANGERED SPECIES ACT
Endangered: Imminent jeopardy of extinction.
Threatened: Imminent jeopardy of becoming endangered.
Proposed: Proposed Rule has been published in Federal Register to list as Threatened or Endangered.

THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
2221 WEST GREENWAY ROAD, PHOENIX, AZ 85023-4399
(602) 942-3000 • WWW.AZGFD.COM

April 25, 2002

Mr. Colby Henley
Harris Environmental Group Inc.
1749 E. 10th St.
Tucson, AZ 85719

Re: Special Status Species Information for **Tucson Electric Power Transmission Line Corridor, Sahuarita South to Nogales.**

Dear Mr. Henley:

The Arizona Game and Fish Department (Department) has reviewed your request, dated April 16, 2002, regarding special status species information associated with the above-referenced project area. The Department's Heritage Data Management System (HDMS) has been accessed and current records show that the special status species listed on the attachment have been documented as occurring in the project area (3-mile buffer). In addition, this project does not occur in the vicinity of any proposed or designated Critical Habitats.

The Department's HDMS data are not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity.

Making available this information does not substitute for the Department's review of project proposals, and should not decrease our opportunities to review and evaluate new project proposals and sites. The Department is also concerned about other resource values, such as other wildlife, including game species, and wildlife-related recreation. The Department would appreciate the opportunity to provide an evaluation of impacts to wildlife or wildlife habitats associated with project activities occurring in the subject area, when specific details become available.

If you have any questions regarding the attached species list, please contact me at (602) 789-3618. General status information, state-wide and county distribution lists, and abstracts for some special status species are also available on our web site at: http://www.azgfd.com/frames/fishwild/hdms_site/Home.htm.

Sincerely,

Sabra S. Schwartz

Sabra S. Schwartz
Heritage Data Management System, Coordinator

SSS:ss

Attachment

cc: Bob Broscheid, Project Evaluation Program Supervisor
Joan Scott, Habitat Program Manager, Region V

AGFD #4-17-02(11)

6

Special Status Species within 3 Miles of T16S,13E Sec 31-36; T17S,R12E Sec 22, 23, 26, 27, 34, 35; T17S,R13E Sec 3, 4; T18S,R12E Sec 2, 3, 10, 11, 14, 15, 20-23, 26-35; T19S,R12E Sec 2-8, 17-20, 29-32

Arizona Game and Fish Department, Heritage Data Management System

April 25, 2002

Scientific Name	Common Name	ESA	USFS	BLM	WSCA	NPL
TOWNRANGE: T16.0S,R13.0E						
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS
TOWNRANGE: T17.0S,R12.0E						
MACROTUS CALIFORNICUS	CALIFORNIA LEAF-NOSED BAT	SC		S	WC	
MYOTIS VELIFER	CAVE MYOTIS	SC		S		
GOPHERUS AGASSIZII (SONORAN POPULATION)	SONORAN DESERT TORTOISE	SC			WC	
SONORELLA EREMITA	SAN XAVIER TALUSSNAIL	SC				
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS
TOWNRANGE: T17.0S,R13.0E						
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS
TOWNRANGE: T18.0S,R12.0E						
GOPHERUS AGASSIZII (SONORAN POPULATION)	SONORAN DESERT TORTOISE	SC			WC	
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS
TOWNRANGE: T19.0S,R12.0E						
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS
TOWNRANGE: T20.0S,R11.0E						
CARACARA CHERIWAY	CRESTED CARACARA				WC	
TOWNRANGE: T20.0S,R12.0E						
ASTURINA NITIDA MAXIMA	NORTHERN GRAY HAWK	SC	S	S	WC	
COCCYZUS AMERICANUS	YELLOW-BILLED CUCKOO	C	S		WC	
TYRANNUS MELANCHOLICUS	TROPICAL KINGBIRD				WC	

No Critical Habitats in project area. AGFD #4-17-02(11), TEP Transmission Corridor, Pima County.

Special Status Species within 3 Miles of T20S,R12E Sec 5-8, 17-20, 29-32; T21S,R12E Sec 5-8; 17-20, 29-32; T22S,R11E Sec 35, 36; T22S,R12E Sec 7, 18, 19; T23S,R11E Sec 1, 2, 11-13, 24; T23S,R12E Sec 31-34; T24S,R12E Sec 1-3; T24S,R13E Sec 1-6, 11-14; T24S,R14E Sec 6, 7, 18

Arizona Game and Fish Department, Heritage Data Management System

April 25, 2002

Scientific Name	Common Name	ESA	USFS	BLM	WSCA	NPL
TOWNRANGE: T20.0S,R11.0E						
CARACARA CHERIWAY	CRESTED CARACARA				WC	
TOWNRANGE: T20.0S,R12.0E						
ASTURINA NITIDA MAXIMA	NORTHERN GRAY HAWK	SC	S	S	WC	
COCCYZUS AMERICANUS	YELLOW-BILLED CUCKOO	C	S		WC	
TYRANNUS MELANCHOLICUS	TROPICAL KINGBIRD				WC	
TOWNRANGE: T21.0S,R11.0E						
ASTURINA NITIDA MAXIMA	NORTHERN GRAY HAWK	SC	S	S	WC	
TOWNRANGE: T21.0S,R12.0E						
CAPSICUM ANNUUM VAR GLABRIUSCULUM	CHILTEPIN		S			
CHOISYA MOLLIS	SANTA CRUZ STAR LEAF	SC	S			
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS
MUHLENBERGIA XEROPHILA	WEEPING MUHLY		S			
PASSIFLORA FOETIDA	FOETID PASSIONFLOWER		S			
TYRANNUS CRASSIROSTRIS	THICK-BILLED KINGBIRD				WC	
TOWNRANGE: T22.0S,R10.0E						
PENSTEMON DISCOLOR	CATALINA BEARDTONGUE		S			HS
TOWNRANGE: T22.0S,R11.0E						
AMSONIA GRANDIFLORA	LARGE-FLOWERED BLUE STAR	SC	S			
CHOISYA MOLLIS	SANTA CRUZ STAR LEAF	SC	S			
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
GASTROPHRYNE OLIVACEA	GREAT PLAINS NARROWMOUTH TOAD				WC	
IPOMOEA THURBERI	THURBER'S MORNING-GLORY		S			
LAENNECIA ERIOPHYLLA	WOOLLY FLEABANE		S			
METASTELMA MEXICANUM	WIGGINS MILKWEED VINE	SC	S			
MYOTIS VELIFER	CAVE MYOTIS	SC		S		
OXYBELIS AENEUS	MEXICAN VINE SNAKE				WC	
PENSTEMON DISCOLOR	CATALINA BEARDTONGUE		S			HS
RANA CHIRICAHUENSIS	CHIRICAHUA LEOPARD FROG	PT	S		WC	
TRAGIA LACINIATA	SONORAN NOSEBURN		S			
TOWNRANGE: T22.0S,R12.0E						
AGOSIA CHRYSOGASTER	LONGFIN DACE	SC		S		
CAPSICUM ANNUUM VAR GLABRIUSCULUM	CHILTEPIN		S			
CHOISYA MOLLIS	SANTA CRUZ STAR LEAF	SC	S			
PENSTEMON SUPERBUS	SUPERB BEARDTONGUE		S			
RANA CHIRICAHUENSIS	CHIRICAHUA LEOPARD FROG	PT	S		WC	
TOWNRANGE: T23.0S,R11.0E						
ACACIA SMALLII	SWEET ACACIA		S			
AGAVE PARVIFLORA SSP PARVIFLORA	SANTA CRUZ STRIPED AGAVE	SC	S	S		HS
AIMOPHILA QUINQUESTRIATA	FIVE-STRIPED SPARROW		S			
AMSONIA GRANDIFLORA	LARGE-FLOWERED BLUE STAR	SC	S			
CALEPHELIS RAWSONI ARIZONENSIS	ARIZONA METALMARK		S			
CAPSICUM ANNUUM VAR GLABRIUSCULUM	CHILTEPIN		S			
CAREX CHIHUAHUENSIS	A SEDGE		S			

TOWNRANGE: T23.0S,R11.0E

Scientific Name	Common Name	ESA	USFS	BLM	WSCA	NPL
CAREX ULTRA	ARIZONA GIANT SEDGE		S	S		
CHOERONYCTERIS MEXICANA	MEXICAN LONG-TONGUED BAT	SC		S	WC	
CHOISYA MOLLIS	SANTA CRUZ STAR LEAF	SC	S			
CNEMIDOPHORUS BURTI STICTOGRAMMUS	GIANT SPOTTED WHIPTAIL	SC	S	S		
COCCYZUS AMERICANUS	YELLOW-BILLED CUCKOO	C	S		WC	
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
DALEA TENTACULOIDES	GENTRY INDIGO BUSH	SC	S	S		HS
ERIGERON ARISOLIUS			S			
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	SC	S		WC	
GASTROPHRYNE OLIVACEA	GREAT PLAINS NARROWMOUTH TOAD				WC	
GILA DITAENIA	SONORA CHUB	LT			WC	
GLAUCIDIUM BRASILIANUM CACTORUM	CACTUS FERRUGINOUS PYGMY-OWL	LE			WC	
GRAPTOPETALUM BARTRAMII	BARTRAM STONECROP	SC	S	S		SR
HEDEOMA DENTATUM	MOCK-PENNYROYAL		S			
LAENNECIA ERIOPHYLLA	WOOLLY FLEABANE		S			
LOBELIA LAXIFLORA	MEXICAN LOBELIA					SR
LOTUS ALAMOSANUS	ALAMOS DEER VETCH		S			
MACROPTILIUM SUPINUM	SUPINE BEAN	SC	S			SR
METASTELMA MEXICANUM	WIGGINS MILKWEED VINE	SC	S			
MUHLENBERGIA XEROPHILA	WEEPING MUHLY		S			
MYOTIS VELIFER	CAVE MYOTIS	SC		S		
OXYBELIS AENEUS	MEXICAN VINE SNAKE				WC	
PACHYRAMPHUS AGLAIAE	ROSE-THROATED BECARD				WC	
PASPALUM VIRLETII	VIRLET PASPALUM		S			
PASSIFLORA FOETIDA	FOETID PASSIONFLOWER		S			
PSILOTUM NUDUM	WHISK FERN					HS
RANA CHIRICAHUENSIS	CHIRICAHUA LEOPARD FROG	PT	S		WC	
RANA YAVAPAIENSIS	LOWLAND LEOPARD FROG	SC	S		WC	
SAMOLUS VAGANS	CHIRICAHUA MOUNTAIN BROOKWEED		S			
SENECIO CARLOMASONII	SEEMANN GROUNDSEL		S			
SISYRINCHIUM CERNUUM	NODDING BLUE-EYED GRASS		S			
SOLANUM LUMHOLTZIANUM	LUMHOLTZ NIGHTSHADE		S			
STRIX OCCIDENTALIS LUCIDA	MEXICAN SPOTTED OWL	LT	S		WC	
TEPHROSIA THURBERI	THURBER HOARY PEA		S			
TRAGIA LACINIATA	SONORAN NOSEBURN		S			
TROGON ELEGANS	ELEGANT TROGON				WC	
TYRANNUS CRASSIROSTRIS	THICK-BILLED KINGBIRD				WC	

TOWNRANGE: T23.0S,R12.0E

Scientific Name	Common Name	ESA	USFS	BLM	WSCA	NPL
AGAVE PARVIFLORA SSP PARVIFLORA	SANTA CRUZ STRIPED AGAVE	SC	S	S		HS
AMSONIA GRANDIFLORA	LARGE-FLOWERED BLUE STAR	SC	S			
CAREX ULTRA	ARIZONA GIANT SEDGE		S	S		
CHOERONYCTERIS MEXICANA	MEXICAN LONG-TONGUED BAT	SC		S	WC	
CHOISYA MOLLIS	SANTA CRUZ STAR LEAF	SC	S			
COCCYZUS AMERICANUS	YELLOW-BILLED CUCKOO	C	S		WC	
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
ELEUTHERODACTYLUS AUGUSTI CACTORUM	WESTERN BARKING FROG		S		WC	
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	SC	S		WC	
GASTROPHRYNE OLIVACEA	GREAT PLAINS NARROWMOUTH TOAD				WC	
GRAPTOPETALUM BARTRAMII	BARTRAM STONECROP	SC	S	S		SR
HEDEOMA DENTATUM	MOCK-PENNYROYAL		S			
IPOMOEA THURBERI	THURBER'S MORNING-GLORY		S			
LOTUS ALAMOSANUS	ALAMOS DEER VETCH		S			
MACROPTILIUM SUPINUM	SUPINE BEAN	SC	S			SR
METASTELMA MEXICANUM	WIGGINS MILKWEED VINE	SC	S			
MYOTIS VELIFER	CAVE MYOTIS	SC		S		
NOTHOLAENA LEMMONII	LEMMON CLOAK FERN	SC				
OXYBELIS AENEUS	MEXICAN VINE SNAKE				WC	
PANDION HALIAETUS	OSPREY				WC	
PECTIS IMBERBIS	BEARDLESS CHINCH WEED	SC	S			
RANA CHIRICAHUENSIS	CHIRICAHUA LEOPARD FROG	PT	S		WC	
STRIX OCCIDENTALIS LUCIDA	MEXICAN SPOTTED OWL	LT	S		WC	

Scientific Name	Common Name	ESA	USFS	BLM	WSCA	NPL
TOWNRANGE: T23.0S,R12.0E						
TEPHROSIA THURBERI	THURBER HOARY PEA		S			
THOMOMYS UMBRINUS INTERMEDIUS	SOUTHERN POCKET GOPHER		S			
TRAGIA LACINIATA	SONORAN NOSEBURN		S			
TROGON ELEGANS	ELEGANT TROGON				WC	
TOWNRANGE: T23.0S,R13.0E						
AMSONIA GRANDIFLORA	LARGE-FLOWERED BLUE STAR	SC	S			
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
DENDROCYGNA AUTUMNALIS	BLACK-BELLIED WHISTLING-DUCK				WC	
ERIGERON ARISOLIUS			S			
GASTROPHRYNE OLIVACEA	GREAT PLAINS NARROWMOUTH TOAD				WC	
HEDEOMA DENTATUM	MOCK-PENNYROYAL		S			
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
TRAGIA LACINIATA	SONORAN NOSEBURN		S			
TOWNRANGE: T23.0S,R14.0E						
ASTURINA NITIDA MAXIMA	NORTHERN GRAY HAWK	SC	S	S	WC	
CNEMIDOPHORUS BURTI STICTOGRAMMUS	GIANT SPOTTED WHIPTAIL	SC	S	S		
DENDROCYGNA AUTUMNALIS	BLACK-BELLIED WHISTLING-DUCK				WC	
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
THAMNOPHIS EQUES MEGALOPS	MEXICAN GARTER SNAKE	SC	S		WC	
TOWNRANGE: T24.0S,R11.0E						
CHOISYA MOLLIS	SANTA CRUZ STAR LEAF	SC	S			
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
TOWNRANGE: T24.0S,R12.0E						
AGAVE PARVIFLORA SSP PARVIFLORA	SANTA CRUZ STRIPED AGAVE	SC	S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
GRAPTOPETALUM BARTRAMII	BARTRAM STONECROP	SC	S	S		SR
LEPTONYCTERIS CURASOAE YERBABUENAE	LESSER LONG-NOSED BAT	LE	S		WC	
MACROPTILIUM SUPINUM	SUPINE BEAN	SC	S			SR
MYOTIS VELIFER	CAVE MYOTIS	SC		S		
OXYBELIS AENEUS	MEXICAN VINE SNAKE				WC	
PECTIS IMBERBIS	BEARDLESS CHINCH WEED	SC	S			
RANA CHIRICAHUENSIS	CHIRICAHUA LEOPARD FROG	PT	S		WC	
RANA YAVAPAIENSIS	LOWLAND LEOPARD FROG	SC	S		WC	
STRIX OCCIDENTALIS LUCIDA	MEXICAN SPOTTED OWL	LT	S		WC	
TROGON ELEGANS	ELEGANT TROGON				WC	
TOWNRANGE: T24.0S,R13.0E						
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
TOWNRANGE: T24.0S,R14.0E						
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS
MACROPTILIUM SUPINUM	SUPINE BEAN	SC	S			SR

No Critical Habitats in project area. AGFD #4-17-02(11), TEP Transmission Corridor, Santa Cruz County.

GUIDELINES FOR HANDLING SONORAN DESERT TORTOISES ENCOUNTERED ON DEVELOPMENT PROJECTS

Arizona Game and Fish Department
Revised January 17, 1997

The Arizona Game and Fish Department (Department) has developed the following guidelines to reduce potential impacts to desert tortoises, and to promote the continued existence of tortoises throughout the state. These guidelines apply to short-term and/or small-scale projects, depending on the number of affected tortoises and specific type of project.

Desert tortoises of the Sonoran population are those occurring south and east of the Colorado River. Tortoises encountered in the open should be moved out of harm's way to adjacent appropriate habitat. If an occupied burrow is determined to be in jeopardy of destruction, the tortoise should be relocated to the nearest appropriate alternate burrow or other appropriate shelter, as determined by a qualified biologist. Tortoises should be moved less than 48 hours in advance of the habitat disturbance so they do not return to the area in the interim. Tortoises should be moved quickly, kept in an upright position at all times and placed in the shade. Separate disposable gloves should be worn for each tortoise handled to avoid potential transfer of disease between tortoises. Tortoises must not be moved if the ambient air temperature exceeds 105 degrees fahrenheit unless an alternate burrow is available or the tortoise is in imminent danger.

A tortoise may be moved up to two miles, but no further than necessary from its original location. If a release site, or alternate burrow, is unavailable within this distance, and ambient air temperature exceeds 105 degrees fahrenheit, the Department should be contacted to place the tortoise into a Department-regulated desert tortoise adoption program. Tortoises salvaged from projects which result in substantial permanent habitat loss (e.g. housing and highway projects), or those requiring removal during long-term (longer than one week) construction projects, will also be placed in desert tortoise adoption programs. *Managers of projects likely to affect desert tortoises should obtain a scientific collecting permit from the Department to facilitate temporary possession of tortoises.* Likewise, if large numbers of tortoises (>5) are expected to be displaced by a project, the project manager should contact the Department for guidance and/or assistance.

6

Please keep in mind the following points:

- These guidelines do not apply to the Mohave population of desert tortoises (north and west of the Colorado River). Mohave desert tortoises are specifically protected under the Endangered Species Act, as administered by the U.S. Fish and Wildlife Service.

- These guidelines are subject to revision at the discretion of the Department. We recommend that the Department be contacted during the planning stages of any project that may affect desert tortoises.

- Take, possession, or harassment of wild desert tortoises is prohibited by state law. Unless specifically authorized by the Department, or as noted above, project personnel should avoid disturbing any tortoise.

RAC:NLO:rc

United States Department of the Interior
U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513

In Reply Refer to:
AESO/SE
2-21-00-I-427

May 14, 2002

Mr. Colby Henley
Harris Environmental
1749 East 10th Street
Tucson, Arizona 85719

RE: Tucson Electric Power Company Transmission Line Corridor

Dear Mr. Colby:

This letter responds to your April 16, 2002, request for an inventory of threatened or endangered species, or those that are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in your project areas (Pima and Santa Cruz Counties). The enclosed lists may include candidate species as well. We hope the enclosed county lists of species will be helpful. In future communications regarding this project, please refer to consultation number 2-21-00-I-427.

The enclosed lists of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where your project occurs. Please note that your project areas may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the enclosed lists are the Code of Federal Regulations (CFR) citation for each list and is available at most public libraries. This information should assist you in determining which species may or may not occur within your project areas. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed critical habitat, the action agency must enter into a section 7 conference with the Service. Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

Additional information regarding critical habitat designation for the cactus ferruginous pygmy-owl is also enclosed.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in your project area.

The Service appreciates your efforts to identify and avoid impacts to listed and sensitive species in your project area. If we may be of further assistance, please feel free to contact Sherry Barrett at (520) 670-4617.

Sincerely,

Jacqueline Hanson

David L. Harlow
Field Supervisor

Enclosures

cc: Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ

W:\Cathy Gordon\species list letters\harris env electric power co transmission line corridor.wpd:cgg

Scientific Name	Common Name	ESA	USFS	BLM	WSCA	NPL
TOWNRANGE: T23.0S,R13.0E						
GASTROPHRYNE OLIVACEA	GREAT PLAINS NARROWMOUTH TOAD				WC	
HEDEOMA DENTATUM	MOCK-PENNYROYAL		S			
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
TRAGIA LACINIATA	SONORAN NOSEBURN		S			
TOWNRANGE: T23.0S,R14.0E					9	
ASTURINA NITIDA MAXIMA	NORTHERN GRAY HAWK	SC	S	S	WC	
ASTURINA NITIDA MAXIMA	NORTHERN GRAY HAWK	SC	S	S	WC	
DENDROCYGNA AUTUMNALIS	BLACK-BELLIED WHISTLING-DUCK				WC	
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
THAMNOPHIS EQUES MEGALOPS	MEXICAN GARTER SNAKE	SC	S		WC	
TOWNRANGE: T24.0S,R12.0E						
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
TOWNRANGE: T24.0S,R13.0E						
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
CORYPHANTHA RECURVATA	SANTA CRUZ BEEHIVE CACTUS		S	S		HS
SIGMODON OCHROGNATHUS	YELLOW-NOSED COTTON RAT	SC				
TOWNRANGE: T24.0S,R14.0E						
CORYPHANTHA SCHEERI VAR ROBUSTISPINA	PIMA PINEAPPLE CACTUS	LE				HS

No Critical Habitats in the project area. AGFD #4-24-02(13), TEP Transmission Corridor, Santa Cruz County.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

1)LISTED

TOTAL= 19

NAME: **HUACHUCA WATER UMBEL** *LILAEOPSIS SCHAFFNERIANA ssp RECURVA*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: No CFR: 62 FR 665, 01-06-97

DESCRIPTION: HERBACEOUS, SEMI-AQUATIC PERENNIAL IN THE PARSLEY FAMILY (UMBELLIFERAE) WITH SLENDER ERECT, HOLLOW, LEAVES THAT GROW FROM THE NODES OF CREEPING RHIZOMES. FLOWER: 3 TO 10 FLOWERED UMBELS ARISE FROM ROOT NODES.

ELEVATION RANGE: 3500-6500 FT.

COUNTIES: PIMA, SANTA CRUZ, COCHISE

HABITAT: CIENEGAS, PERENNIAL LOW GRADIENT STREAMS, WETLANDS

AND IN ADJACENT SONORA, MEXICO, WEST OF THE CONTINENTAL DIVIDE. POPULATIONS ALSO ON FORT HUACHUCA MILITARY RESERVATION. CRITICAL HABITAT IN COCHISE AND SANTA CRUZ COUNTIES (63 FR 37441)

NAME: **KEARNEY'S BLUE STAR** *AMSONIA KEARNEYANA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 54 FR 2131, 01-19-1989

DESCRIPTION: A HERBACEOUS PERENNIAL IN THE DOGBANE FAMILY (APOCYNACEAE). THICKENED WOODY ROOT AND MANY PUBESCENT (HAIRY) STEMS THAT RARELY BRANCH. FLOWERS:WHITE TERMINAL INFLORESCENCE IN APRIL & MAY.

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ELEVATION RANGE: 3600-3800 FT

COUNTIES: PIMA

HABITAT: WEST-FACING DRAINAGES IN THE BABOQUIVARI MOUNTAINS.

PLANTS GROW IN STABLE, PARTIALLY SHADED, COARSE ALLUVIUM ALONG A DRY WASH IN THE BABOQUIVARI MOUNTAINS. RANGE IS EXTREMELY LIMITED. PROTECTED BY ARIZONA NATIVE PLANT LAW.

NAME: **NICHOL'S TURK'S HEAD CACTUS** *ECHINOCACTUS HORIZONTHALONIUS VAR NICHOLII*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 44 FR 61927, 10-26-1979

DESCRIPTION: BLUE-GREEN TO YELLOWISH-GREEN, COLUMNAR, 18 INCHES TALL, 8 INCHES IN DIAMETER. SPINE CLUSTERS HAVE 5 RADIAL & 3 CENTRAL SPINES; ONE DOWNWARD SHORT; 2 SPINES UPWARD AND RED OR BASALLY GRAY. FLOWER:PINK FRUIT:WOOLLY WHITE

ELEVATION RANGE: 2400-4100 FT.

COUNTIES: PINAL, PIMA

HABITAT: SONORAN DESERTSCRUB

FOUND IN UNSHADED MICROSITES IN SONORAN DESERTSCRUB ON DISSECTED ALLUVIAL FANS AT THE FOOT OF LIMESTONE MOUNTAINS AND ON INCLINED TERRACES AND SADDLES ON LIMESTONE MOUNTAINSIDES.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

NAME: **PIMA PINEAPPLE CACTUS** *CORYPHANTHA SCHEERI ROBUSTISPINA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 57 FR 14374, 04-20-1992

DESCRIPTION: HEMISHPERICAL STEMS 4-7 INCHES TALL 3-4 INCHES DIAMETER. CENTRAL SPINE 1 INCH LONG STRAW COLORED HOOKED SURROUNDED BY 6-15 RADIAL SPINES. FLOWER: YELLOW SALMON OR RARELY WHITE NARROW FLORAL TUBE.

ELEVATION RANGE: 2300-5000 FT.

COUNTIES: PIMA, SANTA CRUZ

HABITAT: SONORAN DESERTSCRUB OR SEMI-DESERT GRASSLAND COMMUNITIES

OCCURS IN ALLUVIAL VALLEYS OR ON HILLSIDES IN ROCKY TO SANDY OR SILTY SOILS. THIS SPECIE CAN BE CONFUSED WITH JUVENILLE BARREL CACTUS (FEROCACTUS). HOWEVER, THE SPINES OF THE LATER ARE FLATTENED, IN CONTRAST WITH THE ROUND CROSS-SECTION OF THE CORYPHANTHA SPINES. ALSO THE AREOLES (SPINE CLUSTERS) OF CORYPHANTHA ARE ON TUBERCULES (BUMPS), WHILE THE AREOLES OF FEROCACTUS ARE ON RIDGES (RIBS). 80-90% OF INDIVIDUALS ON STATE AND PRIVATE LAND.

NAME: **LESSER LONG-NOSED BAT** *LEPTONYCTERIS CURASOAE YERBABUENAE*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 53 FR 38456. 09-30-88

DESCRIPTION: ELONGATED MUZZLE, SMALL LEAF NOSE, AND LONG TONGUE. YELLOWISH BROWN OR GRAY ABOVE AND CINNAMON BROWN BELOW. TAIL MINUTE AND APPEARS TO BE LACKING. EASILY DISTURBED.

ELEVATION RANGE: <6000 FT.

COUNTIES: COCHISE, GILA, GRAHAM, GREENLEE, MARICOPA, PIMA, PINAL, SANTA CRUZ, YAVAPAI

HABITAT: DESERT SCRUB HABITAT WITH AGAVE AND COLUNMNAR CACTI PRESENT AS FOOD PLANTS

DAY ROOSTS IN CAVES AND ABANDONED TUNNELS. FORAGES AT NIGHT ON NECTAR, POLLEN, AND FRUIT OF PANICULATE AGAVES AND COLUMNAR CACTI. THIS SPECIES IS MIGRATORY AND IS PRESENT IN ARIZONA , USUALLY FROM APRIL TO SEPTMBER AND SOUTH OF THE BORDER THE REMAINDER OF THE YEAR.

NAME: **MEXICAN GRAY WOLF** *CANIS LUPUS BAILEYI*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 43 FR 1912, 03-09-78

DESCRIPTION: LARGE DOG-LIKE CARNIVORE WITH VARYING COLOR, BUT USUALLY A SHADE OF GRAY. DISTINCT WHITE LIP LINE AROUND MOUTH. WEIGH 60-90 POUNDS.

ELEVATION RANGE: 4,000-12,00 FT.

COUNTIES: APACHE, COCHISE, GREENLEE, PIMA, SANTA CRUZ, COCONINO

HABITAT: CHAPPARAL, WOODLAND, AND FORESTED AREAS. MAY CROSS DESERT AREAS

HISTORIC RANGE IS CONSIDERED TO BE LARGER THAN THE COUNTIES LISTED ABOVE. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE (COCHISE, PIMA, SANTA CRUZ) CONTINUE TO BE RECEIVED. INDIVIDUALS MAY STILL PERSIST IN MEXICO. EXPERIMENTAL NONESSENTIAL POPULATION INTRODUCED IN THE BLUE PRIMITIVE AREA OF GREENLEE, APACHE, AND COCONINO COUNTIES.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

NAME: **OCELOT** *LEOPARDUS (=FELIS) PARDALIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 47 FR 31670: 07-21-82

DESCRIPTION: MEDIUM-SIZED SPOTTED CAT WHOSE TAIL IS ABOUT 1/2 THE LENGTH OF HEAD AND BODY. YELLOWISH WITH BLACK STREAKS AND STRIPES RUNNING FROM FRONT TO BACK. TAIL IS SPOTTED AND FACE IS LESS HEAVILY STREAKED THAN THE BACK AND SIDES.

ELEVATION RANGE: <8000 FT

COUNTIES: SANTA CRUZ, PIMA, COCHISE

HABITAT: HUMID TROPICAL & SUB-TROPICAL FORESTS, SAVANNAHS, AND SEMI-ARID THORNSCRUB.

MAY PERSIST IN PARTLY-CLEARED FORESTS, SECOND-GROWTH WOODLAND, AND ABANDONED CULTIVATION REVERTED TO BRUSH. UNIVERSAL COMPONENT IS PRESENCE OF DENSE COVER. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE CONTINUE TO BE RECEIVED.

NAME: **SONORAN PRONGHORN** *ANTILOCAPRA AMERICANA SONORIENSIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67

DESCRIPTION: BUFF ON BACK AND WHITE BELOW, HOOFED WITH SLIGHTLY CURVED BLACK HORNS HAVING A SINGLE PRONG. SMALLEST AND PALEST OF THE PRONGHORN SUBSPECIES.

ELEVATION RANGE: 2000-4000 FT

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COUNTIES: PIMA, YUMA, MARICOPA

HABITAT: BROAD, INTERMOUNTAIN ALLUVIAL VALLEYS WITH CREOSOTE-BURSAGE & PALO VERDE-MIXED CACTI ASSOCIATIONS

TYPICALLY, BAJADAS ARE USED AS FAWNING AREAS AND SANDY DUNE AREAS PROVIDE FOOD SEASONALLY. HISTORIC RANGE WAS PROBABLY LARGER THAN EXISTS TODAY. THIS SUBSPECIES ALSO OCCURS IN MEXICO.

NAME: **DESERT PUPFISH** *CYPRINODON MACULARIUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 10842, 03-31-1986

DESCRIPTION: SMALL (2 INCHES) SMOOTHLY ROUNDED BODY SHAPE WITH NARROW VERTICAL BARS ON THE SIDES. BREEDING MALES BLUE ON HEAD AND SIDES WITH YELLOW ON TAIL. FEMALES & JUVENILES TAN TO OLIVE COLORED BACK AND SILVERY SIDES.

ELEVATION RANGE: <5000 FT.

COUNTIES: LA PAZ, PIMA, GRAHAM, MARICOPA, PINAL, YAVAPAI, SANTA CRUZ

HABITAT: SHALLOW SPRINGS, SMALL STREAMS, AND MARSHES. TOLERATES SALINE & WARM WATER

CRITICAL HABITAT INCLUDES QUITOBAQUITO SPRING, PIMA COUNTY, PORTIONS OF SAN FELIPE CREEK, CARRIZO WASH, AND FISH CREEK WASH, IMPERIAL COUNTY, CALIFORNIA. TWO SUBSPECIES ARE RECOGNIZED: DESERT PUPFISH (C. m. macularis) AND QUITOBAQUITO PUPFISH (C. m. eremus).

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

NAME: **GILA TOPMINNOW** *POECILIOPSIS OCCIDENTALIS OCCIDENTALIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-1967

DESCRIPTION: SMALL (2 INCHES), GUPPY-LIKE, LIVE BEARING, LACKS DARK SPOTS ON ITS FINS. BREEDING MALES ARE JET BLACK WITH YELLOW FINS.

ELEVATION RANGE: <4500 FT.

COUNTIES: GILA, PINAL, GRAHAM, YAVAPAI, SANTA CRUZ, PIMA, MARICOPA, LA PAZ

HABITAT: SMALL STREAMS, SPRINGS, AND CIENEGAS VEGETATED SHALLOWS

SPECIES HISTORICALLY OCCURRED IN BACKWATERS OF LARGE RIVERS BUT IS CURRENTLY ISOLATED TO SMALL STREAMS AND SPRINGS

NAME: **LOACH MINNOW** *TIAROGA COBITIS*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 39468 10-28-1986, 59 FR 10898, 03-08-1994,

DESCRIPTION: SMALL (<3 INCHES LONG) SLENDER, ELONGATED FISH, OLIVE COLORED WITH DIRTY WHITE SPOTS AT THE BASE OF THE DORSAL AND CAUDAL FINS. BREEDING MALES VIVID RED ON MOUTH AND BASE OF FINS

ELEVATION RANGE: <8000 FT.

COUNTIES: PINAL, GRAHAM, GREENLEE, GILA, APACHE, NAVAJO, *YAVAPAI, *COCHISE, *PIMA

HABITAT: BENTHIC SPECIES OF SMALL TO LARGE PERENNIAL STREAMS WITH SWIFT SHALLOW WATER OVER COBBLE& GRAVEL. RECURRENT FLOODING AND NATURAL HYDROGRAPH IMPORTANT.

PRESENTLY FOUND IN ARAVAIPA CREEK, BLUE RIVER, CAMPBELL BLUE CREEK, SAN FRANCISCO RIVER, DRY BLUE CREEK, TULAROSA RIVER, EAST-WEST-AND MIDDLE FORKS OF THE GILA RIVER, EAGLE CREEK, EAST FORK, BLACK RIVER, AND THE MAINSTEM UPPER GILA RIVER. CRTITICAL HABITAT WAS REMOVED IN MARCH 1998; BUT RE-PROPOSED DEC 1999 AND FINALIZED APRIL 2000. SPECIES ALSO FOUND IN CATRON, GRANT, AND HIDALGO COUNTIES IN NEW MEXICO. *COUNTIES WITH CRITICAL HABITAT PRESENTLY CONTAIN NO KNOWN EXISTING POPULATIONS OF LOACH MINNOW.

NAME: **SPIKEDACE** *MEDA FULGIDA*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 23769,07-01-1986; 65 FR 24327, 04-25-2000

DESCRIPTION: SMALL (<3 INCHES) SLIM WITH SLIVERY SIDES & 'SPINE" ON DORSAL FIN. BREDING MALES BRASSY GOLDEN COLOR

ELEVATION RANGE: <6000 FT

COUNTIES: GRAHAM, PINAL, GREENLEE, YAVAPAI, APACHE*, COCHISE*, GILA*, NAVAJO, PIMA*

HABITAT: MODERATE TO LARGE PERENNIAL STREAMS WITH GRAVEL COBBLE SUBSTRATES AND MODERATE TO SWIFT VELOCITIES OVER SAND AND GRAVEL SUBSTRATES. RECURRENT FLOODING AND NATURAL

PRESENTLY FOUND IN ARAVAIPA CREEK, EAGLE CREEK, VERDE RIVER, EAST-WEST- MAIN AND MIDDLE FORKS OF THE GILA RIVER IN NEW MEXICO, AND GILA RIVER FROM SAN PEDRO RIVER TO ASHURST HAYDEN DAM. CRITICAL HABITAT WAS REMOVED IN MARCH 1998, BUT RE-PROPOSED DEC 1999 AND FINALIZED IN APRIL 2000. SPECIES ALSO FOUND IN CATRON, GRANT, AND HIDALGO COUNTIES IN NEW MEXICO. *COUNTIES WITH CRITICAL HABITAT PRESENTLY CONTAIN NO KNOWN EXISTING POPULATIONS OF SPIKEDACE.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

NAME: **BALD EAGLE** *HALIAEETUS LEUCOCEPHALUS*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 60 FR 35999, 07-12-95

DESCRIPTION: LARGE, ADULTS HAVE WHITE HEAD AND TAIL. HEIGHT 28 - 38"; WINGSPAN 66 - 96". 1-4 YRS DARK WITH VARYING DEGREES OF MOTTLED BROWN PLUMAGE. FEET BARE OF FEATHERS.

ELEVATION RANGE: VARIES FT.

COUNTIES: YUMA, LA PAZ, MOHAVE, YAVAPAI, MARICOPA, PINAL, COCONINO, NAVAJO, APACHE, SANTA CRUZ, PIMA, GILA, GRAHAM, COCHISE

HABITAT: LARGE TREES OR CLIFFS NEAR WATER (RESERVOIRS, RIVERS AND STREAMS) WITH ABUNDANT PREY

SOME BIRDS ARE NESTING RESIDENTS WHILE A LARGER NUMBER WINTERS ALONG RIVERS AND RESERVOIRS. AN ESTIMATED 200 TO 300 BIRDS WINTER IN ARIZONA. ONCE ENDANGERED (32 FR 4001, 03-11-1967; 43 FR 6233, 02-14-78) BECAUSE OF REPRODUCTIVE FAILURES FROM PESTICIDE POISONING AND LOSS OF HABITAT, THIS SPECIES WAS DOWN LISTED TO THREATENED ON AUGUST 11, 1995. ILLEGAL SHOOTING, DISTURBANCE, LOSS OF HABITAT CONTINUES TO BE A PROBLEM. SPECIES HAS BEEN PROPOSED FOR DELISTING (64 FR 36454) BUT STILL RECEIVES FULL PROTECTION UNDER ESA.

NAME: **BROWN PELICAN** *PELECANUS OCCIDENTALIS CALIFORNICUS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 35 FR 16047, 10-13-70; 35 FR 18320, 12-02-70

DESCRIPTION: LARGE DARK GRAY-BROWN WATER BIRD WITH A POUCH UNDERNEATH LONG BILL AND WEBBED FEET. ADULTS HAVE A WHITE HEAD AND NECK, BROWNISH BLACK BREAST, AND SILVER GRAY UPPER PARTS.

ELEVATION RANGE: VARIES FT.

COUNTIES: APACHE, COCHISE, COCONINO, GILA, GRAHAM, GREENLEE LA PAZ, MARICOPA, MOHAVE, NAVAJO, PIMA, PINAL, SANTA CRUZ, YAVAPAI, YUMA

HABITAT: COASTAL LAND AND ISLANDS; ARIZONA LAKES AND RIVERS

SUBSPECIES IS FOUND ON PACIFIC COAST AND IS ENDANGERED DUE TO PESTICIDES. IT IS AN UNCOMMON TRANSIENT IN ARIZONA ON MANY ARIZONA LAKES AND RIVERS. INDIVIDUALS WANDER UP FROM MEXICO IN SUMMER AND FALL. NO BREEDING RECORDS IN ARIZONA.

NAME: **CACTUS FERRUGINOUS PYGMY-OWL** *GLAUCIDIUM BRASILIANUM CACTORUM*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 10730, 3-10-97

DESCRIPTION: SMALL (APPROX. 7"), DIURNAL OWL REDDISH BROWN OVERALL WITH CREAM-COLORED BELLY STREAKED WITH REDDISH BROWN. SOME INDIVIDUALS ARE GRAYISH BROWN

ELEVATION RANGE: <4000 FT.

COUNTIES: MARICOPA, YUMA, SANTA CRUZ, GRAHAM, GREENLEE, PIMA, PINAL, GILA, COCHISE

HABITAT: MATURE COTTONWOOD/WILLOW, MESQUITE BOSQUES, AND SONORAN DESERTSCRUB

RANGE LIMIT IN ARIZONA IS FROM NEW RIVER (NORTH) TO GILA BOX (EAST) TO CABEZA PRIETA MOUNTAINS (WEST). ONLY A FEW DOCUMENTED SITES WHERE THIS SPECIES PERSISTS ARE KNOWN, ADDITIONAL SURVEYS ARE NEEDED. CRITICAL HABITAT WAS VACATED BY THE U.S. DISTRICT COURT FOR THE DISTRICT OF ARIZONA (9/19/01) AND REMANDED TO THE SERVICE FOR FURTHER CONSIDERATION.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

NAME: **MASKED BOBWHITE** *COLINUS VIRGINIANUS RIDGEWAYI*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 35 FR 4001, 03-11-1967; 35 FR 8495, 06-02-70

DESCRIPTION: MALES BRICK-RED BREAST AND BLACK HEAD AND THROAT. FEMALES ARE GENERALLY NONDESCRIPT BUT RESEMBLE OTHER RACES SUCH AS THE TEXAS BOBWHITE.

ELEVATION RANGE: 1000-4000 FT.

COUNTIES: PIMA

HABITAT: DESERT GRASSLANDS WITH DIVERSITY OF DENSE NATIVE GRASSES, FORBS AND BRUSH

SPECIES IS CLOSELY ASSOCIATED WITH ACACIA ANGUSTISSIMA. FORMERLY OCCURRED IN ALTAR AND SANTA CRUZ VALLEYS, AS WELL AS SONORA, MEXICO. PRESENTLY ONLY KNOWN FROM REINTRODUCED POPULATION ON BUENOS AIRES.

NAME: **MEXICAN SPOTTED OWL** *STRIX OCCIDENTALIS LUCIDA*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91 66 FR 8530, 2/1/01

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND HEAVILY SPOTTED WITH WHITE OR BEIGE.

ELEVATION RANGE: 4100-9000 FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA, PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDERSA PINE/GAMBEL OAK TYPE, IN CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE OF IMPORTANCE OR ARE PREFERED. CRITICAL HABITAT WAS REMOVED IN 1998 BUT RE-PROPOSED IN JULY 2000 AND FINALIZED IN FEB 2001 FOR APACHE, COCHISE, COCONINO, GRAHAM, MOHAVE, PIMA COUNTIES; ALSO IN NEW MEXICO, UTAH, AND COLORADO.

NAME: **SOUTHWESTERN WILLOW FLYCATCHER** *EMPIDONAX TRAILLII EXTIMUS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS, WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH BELLY. TWO WINGBARS VISIBLE. EYE-RING FAINT OR ABSENT.

ELEVATION RANGE: <8500 FT

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM, YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOOD/WILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS. CRITICAL HABITAT WAS SET ASIDE BY THE 10TH CIRCUIT COURT OF APPEALS (5/17/01).

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **PIMA**

6/4/2002

NAME: **JAGUAR** *PANTHERA ONCA*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 39147, 07-22-97; 37 FR 6476, 03- 30-72

DESCRIPTION: LARGEST SPECIES OF CAT NATIVE TO SOUTHWEST. MUSCULAR, WITH RELATIVELY SHORT, MASSIVE LIMBS, AND A DEEP-CHESTED BODY. USUALLY CINNAMON-BUFF IN COLOR WITH MANY BLACK SPOTS. WEIGHT RANGES FROM 40-135 KG (90-300 LBS).

ELEVATION RANGE: 1,600 - >9,8 FT.

COUNTIES: COCHISE, SANTA CRUZ, AND PIMA

HABITAT: FOUND IN SONORAN DESERTSCRUB UP THROUGH SUBALPINE

ALSO OCCURS IN NEW MEXICO. A JAGUAR CONSERVATION TEAM IS BEING FORMED THAT IS BEING LED BY ARIZONA AND NEW MEXICO STATE ENTITIES ALONG WITH PRIVATE ORGANIZATIONS.

6

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

2) PROPOSED TOTAL= 2

NAME: **MOUNTAIN PLOVER** *CHARADRIUS MONTANUS*

STATUS: PROPOSED THREATENED CRITICAL HAB No RECOVERY PLAN: No CFR: 64 FR 7587: 02-16-1999

DESCRIPTION: IN BREEDING SEASON WITH WHITE FOREHEAD AND LINE OVER THE EYE; CONTRASTING WITH DARK CROWN; NONDESCRIPT IN WINTER. VOICE IS LOW, VARIABLE WHISTLE.

ELEVATION RANGE: VARIABLE FT.

COUNTIES: YUMA, PIMA, COCHISE, PINAL, APACHE

HABITAT: OPEN ARID PLAINS, SHORT-GRASS PRAIRIES, AND CULTIVATED FORMS.

SPECIES PRIMARILY FOUND IN ROCKY MOUNTAIN STATES FROM CANADA TO MEXICO. AZ PRIMARILY PROVIDES WITNERING HABITAT. BREEDING HAS BEEN DOCUMENTED, BUT IS RARE, AND IS LIKELY RESTRICTED TO TRIBAL AND STATE LANDS IN APACHE COUNTY.

NAME: **CHIRICAHUA LEOPARD FROG** *RANA CHIRICAHUENSIS*

6

STATUS: PROPOSED CRITICAL HAB No RECOVERY PLAN: No CFR: 65 FR 37343, 6-14-2000

DESCRIPTION: CREAM COLORED TUBERCULES (spots) ON A DARK BACKGROUND ON THE REAR OF THE THIGH, DORSOLATERAL FOLDS THAT ARE INTERRUPTED AND DEFLECTED MEDIALLY, AND A CALL GIVEN OUT OF WATER DISTINGUISH THIS SPOTTED FROG FROM OTHER LEOPRD

ELEVATION RANGE: 3300-8900 FT.

COUNTIES: SANTA CRUZ, APACHE, GILA, PIMA, COCHISE, GREENLEE, GRAHAM, YAVAPAI, COCONINO, NAVAJO

HABITAT: STREAMS, RIVERS, BACKWATERS, PONDS, AND STOCK TANKS THAT ARE MOSTLY FREE FROM INTRODUCED FISH, CRAYFISH, AND BULLFROGS

REQUIRE PERMANENT OR NEARLY PERMANENT WATER SOURCES. POPULATIONS NORTH OF THE GILA RIVER MAY BE CLOSELY-RELATED, BUT DISTINCT, UNDESCRIBED SPECIES.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

3) CANDIDATE TOTAL= 4

NAME: **ACUNA CACTUS** *ECHINOMASTUS ERECTOCENTRUS ACUNENSIS*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: <12 INCHES HIGH SPINE CLUSTERS BORNE ON TUBERCLES, EACH WITH A GROOVE ON THE UPPER SURFACE. 2-3 CENTRAL SPINES AND 12 RADIAL SPINES. FLOWERS PINK TO PURPLE

ELEVATION RANGE: 1300-2000 FT

COUNTIES: PINAL, PIMA

HABITAT: WELL DRAINED KNOLLS AND GRAVEL RIDGES IN SONORAN DESERT SCRUB

IMMATURE PLANTS DISTINCTLY DIFFERENT FROM MATURE PLANTS. THEY ARE DISC-SHAPED OR SPHERICAL AND HAVE NO CENTRAL SPINES UNTIL THEY ARE ABOUT 1.5 INCHES . RADIAL SPINES ARE DIRTY WHITE WITH MAROON TIPS.

NAME: **GILA CHUB** *GILA INTERMEDIA*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: DEEP COMPRESSED BODY, FLAT HEAD. DARK OLIVE-GRAY COLOR ABOVE, SILVER SIDES. ENDEMIC TO GILA RIVER BASIN.

ELEVATION RANGE: 2000 - 3500 FT.

COUNTIES: SANTA CRUZ, GILA, GREENLEE, PIMA, COCHISE, GRAHAM, YAVAPAI

HABITAT: POOLS, SPRINGS, CIENEGAS, AND STREAMS

MULTIPLE PRIVATE LANDOWERS, INCLUDING THE NATURE CONSERVANCY, THE AUDUBON SOCIETY, AND OTHERS. ALSO FT. HUACHUCA. SPECIES ALSO FOUND IN SONORA, MEXICO.

NAME: **YELLOW-BILLED CUCKOO** *COCCYZUS AMERICANUS*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR: 66 FR 38611; 07-25-01

DESCRIPTION: MEDIUM-SIZED BIRD WITH A SLENDER, LONG-TAILED PROFILE, SLIGHTLY DOWN-CURVED BILL, WHICH IS BLUE-BLACK WITH YELLOW ON THE LOWER HALF OF THE BILL. PLUMAGE IS GRAYISH-BROWN ABOVE AND WHITE BELOW, WITH RUFOUS PRIMARY FLIGHT FEATHERS.

ELEVATION RANGE: <6,500 FT.

COUNTIES: APACHE, COCHISE, COCONINO, GILA, GRAHAM, GREENLEE, LA PAZ, MARICOPA, MOHAVE, NAVAJO, PIMA, PINAL, SANTA CRUZ, YAVAPAI, YUMA

HABITAT: LARGE BLOCKS OF RIPARIAN WOODLANDS (COTTONWOOD, WILLOW, OR TAMARISK GALLERIES)

SPECIES WAS FOUND WARRANTED, BUT PRECLUDED FOR LISTING AS A DISTINCT VERTEBRATE POPULATION SEGMENT IN THE WESTERN U.S. ON JULY 25, 2001. THIS FINDING INDICATES THAT THE SERVICE HAS SUFFICIENT INFORMATION TO LIST THE BIRD, BUT OTHER, HIGHER PRIORITY LISTING ACTIONS PREVENT THE SERVICE FROM ADDRESSING THE LISTING OF THE CUCKOO AT THIS TIME.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: PIMA

6/4/2002

NAME: **SONOYTA MUD TURTLE** *KINOSTERNON SONORIENSE LONGIFEMORALE*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: PRIMARILY A POND TURTLE, PREFERS MUD OR SANDY BOTTOMS. BODY 3 1/2 TO 6 1/2. HEAD AND NECK MOTTLED WITH CONTRASTING LIGHT AND DARK MARKINGS. FOUND IN QUITOBAQUITO SPRINGS.

ELEVATION RANGE: 1,100 FEET FT

COUNTIES: PIMA

HABITAT: PONDS AND STREAMS.

SPECIES ALSO FOUND IN RIO SONOYTA, SONORA, MEXICO.

6

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: SANTA CRUZ

6/4/2002

1)LISTED TOTAL= 17

NAME: **CANELO HILLS LADIES' TRESSES** *SPIRANTHES DELITESCENS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 665, 01-06-97

DESCRIPTION: SLENDER ERECT MEMBER OF THE ORCHID FAMILY (ORCHIDACEAE). FLOWER: STALK 50 CM TALL, MAY CONTAIN 40 WHITE FLOWERS SPIRALLY ARRANGED ON THE FLOWERING STALK.

ELEVATION RANGE: about 5000 FT.

COUNTIES: COCHISE, SANTA CRUZ

HABITAT: FINELY GRAINED, HIGHLY ORGANIC, SATURATED SOILS OF CIENEGAS

POTENTIAL HABITAT OCCURS IN SONORA, MEXICO, BUT NO POPULATIONS HAVE BEEN FOUND.

NAME: **HUACHUCA WATER UMBEL** *LILAEOPSIS SCHAFFNERIANA ssp RECURVA*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: No CFR: 62 FR 665, 01-06-97

DESCRIPTION: HERBACEOUS, SEMI-AQUATIC PERENNIAL IN THE PARSLEY FAMILY (UMBELLIFERAE) WITH SLENDER ERECT, HOLLOW, LEAVES THAT GROW FROM THE NODES OF CREEPING RHIZOMES. FLOWER: 3 TO 10 FLOWERED UMBELS ARISE FROM ROOT NODES.

ELEVATION RANGE: 3500-6500 FT

COUNTIES: PIMA, SANTA CRUZ, COCHISE

HABITAT: CIENEGAS, PERENNIAL LOW GRADIENT STREAMS, WETLANDS

AND IN ADJACENT SONORA, MEXICO, WEST OF THE CONTINENTAL DIVIDE. POPULATIONS ALSO ON FORT HUACHUCA MILITARY RESERVATION. CRITICAL HABITAT IN COCHISE AND SANTA CRUZ COUNTIES (63 FR 37441)

NAME: **PIMA PINEAPPLE CACTUS** *CORYPHANTHA SCHEERI ROBUSTISPINA*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 57 FR 14374, 04-20-1992

DESCRIPTION: HEMISHPERICAL STEMS 4-7 INCHES TALL 3-4 INCHES DIAMETER. CENTRAL SPINE 1 INCH LONG STRAW COLORED HOOKED SURROUNDED BY 6-15 RADIAL SPINES. FLOWER: YELLOW SALMON OR RARELY WHITE NARROW FLORAL TUBE.

ELEVATION RANGE: 2300-5000 FT

COUNTIES: PIMA, SANTA CRUZ

HABITAT: SONORAN DESERTSCRUB OR SEMI-DESERT GRASSLAND COMMUNITIES

OCCURS IN ALLUVIAL VALLEYS OR ON HILLSIDES IN ROCKY TO SANDY OR SILTY SOILS. THIS SPECIE CAN BE CONFUSED WITH JUVENILLE BARREL CACTUS (FEROCACTUS). HOWEVER, THE SPINES OF THE LATER ARE FLATTENED, IN CONTRAST WITH THE ROUND CROSS-SECTION OF THE CORYPHANTHA SPINES. ALSO THE AREOLES (SPINE CLUSTERS) OF CORYPHANTHA ARE ON TUBERCULES (BUMPS), WHILE THE AREOLES OF FEROCACTUS ARE ON RIDGES (RIBS). 80-90% OF INDIVIDUALS ON STATE AND PRIVATE LAND.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: SANTA CRUZ

6/4/2002

NAME: **LESSER LONG-NOSED BAT** *LEPTONYCTERIS CURASOAE YERBABUENAE*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 53 FR 38456, 09-30-88

DESCRIPTION: ELONGATED MUZZLE, SMALL LEAF NOSE, AND LONG TONGUE. YELLOWISH BROWN OR GRAY ABOVE AND CINNAMON BROWN BELOW. TAIL MINUTE AND APPEARS TO BE LACKING. EASILY DISTURBED.

ELEVATION RANGE: <6000 FT.

COUNTIES: COCHISE, GILA, GRAHAM, GREENLEE, MARICOPA, PIMA, PINAL, SANTA CRUZ, YAVAPAI

HABITAT: DESERT SCRUB HABITAT WITH AGAVE AND COLUNMNAR CACTI PRESENT AS FOOD PLANTS

DAY ROOSTS IN CAVES AND ABANDONED TUNNELS. FORAGES AT NIGHT ON NECTAR, POLLEN, AND FRUIT OF PANICULATE AGAVES AND COLUMNAR CACTI. THIS SPECIES IS MIGRATORY AND IS PRESENT IN ARIZONA USUALLY FROM APRIL TO SEPTMBER AND SOUTH OF THE BORDER THE REMAINDER OF THE YEAR.

NAME: **MEXICAN GRAY WOLF** *CANIS LUPUS BAILEYI*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 43 FR 1912, 03-09-78

DESCRIPTION: LARGE DOG-LIKE CARNIVORE WITH VARYING COLOR, BUT USUALLY A SHADE OF GRAY. DISTINCT WHITE LIP LINE AROUND MOUTH. WEIGH 60-90 POUNDS.

ELEVATION RANGE: 4,000-12,00 FT.

COUNTIES: APACHE, COCHISE, GREENLEE, PIMA, SANTA CRUZ, COCONINO

HABITAT: CHAPPARAL, WOODLAND, AND FORESTED AREAS. MAY CROSS DESERT AREAS

HISTORIC RANGE IS CONSIDERED TO BE LARGER THAN THE COUNTIES LISTED ABOVE. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE (COCHISE, PIMA, SANTA CRUZ) CONTINUE TO BE RECEIVED. INDIVIDUALS MAY STILL PERSIST IN MEXICO. EXPERIMENTAL NONESSENTIAL POPULATION INTRODUCED IN THE BLUE PRIMITIVE AREA OF GREENLEE, APACHE, AND COCONINO COUNTIES.

NAME: **OCELOT** *LEOPARDUS (=FELIS) PARDALIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 47 FR 31670; 07-21-82

DESCRIPTION: MEDIUM-SIZED SPOTTED CAT WHOSE TAIL IS ABOUT 1/2 THE LENGTH OF HEAD AND BODY. YELLOWISH WITH BLACK STREAKS AND STRIPES RUNNING FROM FRONT TO BACK. TAIL IS SPOTTED AND FACE IS LESS HEAVILY STREAKED THAN THE BACK AND SIDES.

ELEVATION RANGE: <8000 FT.

COUNTIES: SANTA CRUZ, PIMA, COCHISE

HABITAT: HUMID TROPICAL & SUB-TROPICAL FORESTS, SAVANNAHS, AND SEMI-ARID THORNSCRUB.

MAY PERSIST IN PARTLY-CLEARED FORESTS, SECOND-GROWTH WOODLAND, AND ABANDONED CULTIVATION REVERTED TO BRUSH. UNIVERSAL COMPONENT IS PRESENCE OF DENSE COVER. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE CONTINUE TO BE RECEIVED.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: SANTA CRUZ

6/4/2002

NAME: **DESERT PUPFISH** *CYPRINODON MACULARIUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 10842, 03-31-1986

DESCRIPTION: SMALL (2 INCHES) SMOOTHLY ROUNDED BODY SHAPE WITH NARROW VERTICAL BARS ON THE SIDES. BREEDING MALES BLUE ON HEAD AND SIDES WITH YELLOW ON TAIL. FEMALES & JUVENILES TAN TO OLIVE COLORED BACK AND SILVERY SIDES.

ELEVATION RANGE: <5000 FT.

COUNTIES: LA PAZ, PIMA, GRAHAM, MARICOPA, PINAL, YAVAPAI, SANTA CRUZ

HABITAT: SHALLOW SPRINGS, SMALL STREAMS, AND MARSHES. TOLERATES SALINE & WARM WATER

CRITICAL HABITAT INCLUDES QUITOBAQUITO SPRING, PIMA COUNTY, PORTIONS OF SAN FELIPE CREEK, CARRIZO WASH, AND FISH CREEK WASH, IMPERIAL COUNTY, CALIFORNIA. TWO SUBSPECIES ARE RECOGNIZED: DESERT PUPFISH (C. m. macularis) AND QUITOBAQUITO PUPFISH (C. m. eremus).

NAME: **GILA TOPMINNOW** *POECILIOPSIS OCCIDENTALIS OCCIDENTALIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-1967

DESCRIPTION: SMALL (2 INCHES), GUPPY-LIKE, LIVE BEARING, LACKS DARK SPOTS ON ITS FINS. BREEDING MALES ARE JET BLACK WITH YELLOW FINS.

ELEVATION RANGE: <4500 FT

COUNTIES: GILA, PINAL, GRAHAM, YAVAPAI, SANTA CRUZ, PIMA, MARICOPA, LA PAZ

HABITAT: SMALL STREAMS, SPRINGS, AND CIENEGAS VEGETATED SHALLOWS

SPECIES HISTORICALLY OCCURRED IN BACKWATERS OF LARGE RIVERS BUT IS CURRENTLY ISOLATED TO SMALL STREAMS AND SPRINGS

NAME: **SONORA CHUB** *GILA DITAENIA*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 51 FR 16042, 04-30-1986

DESCRIPTION: MINNOW (<5 INCHES LONG) MODERATELY CHUBBY, DARK-COLORED FISH WITH TWO PROMINENT BLACK LATERAL BANDS ON THE SIDES AND A DARK OVAL SPOT AT THE BASE OF THE TAIL. BREEDING MALES HAVE RED LOWER FINS AND A ORANGE BELLY

ELEVATION RANGE: 3900 FT.

COUNTIES: SANTA CRUZ

HABITAT: PERENNIAL & INTERMITTENT SMALL TO MODERATE STREAMS WITH BOULDERS & CLIFFS

CRITICAL HABITAT IN SYCAMORE CREEK (SANTA CRUZ COUNTY). YANK SPRING TO INTERNATIONAL BORDER, 2.0 Km OF PENASCO CREEK, AND LOWER HALF OF UNNAMED STREAM ENTERING SYSCAMORE CREEK ABOUT 2.4 Km DOWNSTREAM FROM YANKS SPRING. SPECIES EXTENDS INTO MEXICO (ALTAR & MAGDELENA RIVERS).

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: SANTA CRUZ

6/4/2002

NAME: **BALD EAGLE** *HALIAEETUS LEUCOCEPHALUS*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 60 FR 35999, 07-12-95

DESCRIPTION: LARGE, ADULTS HAVE WHITE HEAD AND TAIL. HEIGHT 28 - 38"; WINGSPAN 66 - 96". 1-4 YRS DARK WITH VARYING DEGREES OF MOTTLED BROWN PLUMAGE. FEET BARE OF FEATHERS.

ELEVATION RANGE: VARIES FT.

COUNTIES: YUMA, LA PAZ, MOHAVE, YAVAPAI, MARICOPA, PINAL, COCONINO, NAVAJO, APACHE, SANTA CRUZ, PIMA, GILA, GRAHAM, COCHISE

HABITAT: LARGE TREES OR CLIFFS NEAR WATER (RESERVOIRS, RIVERS AND STREAMS) WITH ABUNDANT PREY

SOME BIRDS ARE NESTING RESIDENTS WHILE A LARGER NUMBER WINTERS ALONG RIVERS AND RESERVOIRS. AN ESTIMATED 200 TO 300 BIRDS WINTER IN ARIZONA. ONCE ENDANGERED (32 FR 4001, 03-11-1967. 43 FR 6233. 02-14-78) BECAUSE OF REPRODUCTIVE FAILURES FROM PESTICIDE POISONING AND LOSS OF HABITAT, THIS SPECIES WAS DOWN LISTED TO THREATENED ON AUGUST 11, 1995. ILLEGAL SHOOTING, DISTURBANCE, LOSS OF HABITAT CONTINUES TO BE A PROBLEM. SPECIES HAS BEEN PROPOSED FOR DELISTING (64 FR 36454) BUT STILL RECEIVES FULL PROTECTION UNDER ESA.

NAME: **BROWN PELICAN** *PELECANUS OCCIDENTALIS CALIFORNICUS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 35 FR 16047, 10-13-70, 35 FR 18320, 12-02-70

DESCRIPTION: LARGE DARK GRAY-BROWN WATER BIRD WITH A POUCH UNDERNEATH LONG BILL AND WEBBED FEET. ADULTS HAVE A WHITE HEAD AND NECK, BROWNISH BLACK BREAST, AND SILVER GRAY UPPER PARTS.

ELEVATION RANGE: VARIES FT.

COUNTIES: APACHE, COCHISE, COCONINO, GILA, GRAHAM, GREENLEE LA PAZ, MARICOPA, MOHAVE, NAVAJO, PIMA, PINAL, SANTA CRUZ, YAVAPAI, YUMA

HABITAT: COASTAL LAND AND ISLANDS; ARIZONA LAKES AND RIVERS

SUBSPECIES IS FOUND ON PACIFIC COAST AND IS ENDANGERED DUE TO PESTICIDES. IT IS AN UNCOMMON TRANSIENT IN ARIZONA ON MANY ARIZONA LAKES AND RIVERS. INDIVIDUALS WANDER UP FROM MEXICO IN SUMMER AND FALL. NO BREEDING RECORDS IN ARIZONA.

NAME: **CACTUS FERRUGINOUS PYGMY-OWL** *GLAUCIDIUM BRASILIANUM CACTORUM*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 10730, 3-10-97

DESCRIPTION: SMALL (APPROX. 7"), DIURNAL OWL REDDISH BROWN OVERALL WITH CREAM-COLORED BELLY STREAKED WITH REDDISH BROWN. SOME INDIVIDUALS ARE GRAYISH BROWN

ELEVATION RANGE: <4000 FT.

COUNTIES: MARICOPA, YUMA, SANTA CRUZ, GRAHAM, GREENLEE, PIMA, PINAL, GILA, COCHISE

HABITAT: MATURE COTTONWOOD/WILLOW, MESQUITE BOSQUES, AND SONORAN DESERTSCRUB

RANGE LIMIT IN ARIZONA IS FROM NEW RIVER (NORTH) TO GILA BOX (EAST) TO CABEZA PRIETA MOUNTAINS (WEST). ONLY A FEW DOCUMENTED SITES WHERE THIS SPECIES PERSISTS ARE KNOWN, ADDITIONAL SURVEYS ARE NEEDED. CRITICAL HABITAT WAS VACATED BY THE U.S. DISTRICT COURT FOR THE DISTRICT OF ARIZONA (9/19/01) AND REMANDED TO THE SERVICE FOR FURTHER CONSIDERATION.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: SANTA CRUZ

6/4/2002

NAME: **MEXICAN SPOTTED OWL** *STRIX OCCIDENTALIS LUCIDA*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91 66 FR 8530, 2/1/01

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND HEAVILY SPOTTED WITH WHITE OR BEIGE.

ELEVATION RANGE: 4100-9000 FT

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDERSA PINE/GAMBEL OAK TYPE, IN CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE OF IMPORTANCE OR ARE PREFERED. CRITICAL HABITAT WAS REMOVED IN 1998 BUT RE-PROPOSED IN JULY 2000 AND FINALIZED IN FEB 2001 FOR APACHE, COCHISE, COCONINO, GRAHAM, MOHAVE, PIMA COUNTIES; ALSO IN NEW MEXICO, UTAH, AND COLORADO.

NAME: **NORTHERN APLOMADO FALCON** *FALCO FEMORALIS SEPTENTRIONALIS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 51 FR 6686, 01-25-86

DESCRIPTION: RUFOUS UNDERPARTS, GRAY BACK, LONG BANDED TAIL, AND A DISTINCT BLACK AND WHITE FACIAL PATTERN. SMALLER THAN PEREGRINE LARGER THAN KESTREL. BREEDS BETWEEN MARCH- JUNE

ELEVATION RANGE: 3500-9000 FT

COUNTIES: COCHISE, SANTA CRUZ

HABITAT: GRASSLAND AND SAVANNAH

SPECIES FORMERLY NESTED IN SOUTHWESTERN US. NOW OCCURS AS AN ACCIDENTAL. GOOD HABITAT HAS LOW GROUND COVER AND MESQUITE OR YUCCA FOR NESTING PLATFORMS. CONTINUED USE OF PESTICIDES IN MEXICO ENDANGERS THIS SPECIES. NO RECENT CONFIRMED REPORTS FOR ARIZONA.

NAME: **SOUTHWESTERN WILLOW FLYCATCHER** *EMPIDONAX TRAILLII EXTIMUS*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS, WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH BELLY. TWO WINGBARS VISIBLE. EYE-RING FAINT OR ABSENT.

ELEVATION RANGE: <8500 FT

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM, YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOOD/WILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS. CRITICAL HABITAT WAS SET ASIDE BY THE 10TH CIRCUIT COURT OF APPEALS (5/17/01).

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: SANTA CRUZ

6/4/2002

NAME: **SONORA TIGER SALAMANDER** *AMBYSTOMA TIGRINUM STEBBINSI*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 665, 01-06-97

DESCRIPTION: 2.6 TO 4.9" SNOUT-VENT LENGTH WITH LIGHT-COLORED BANDS ON A DARK BACKGROUND. AQUATIC LARVAE ARE UNIFORM DARK COLOR WITH PLUME-LIKE GILLS AND TAIN FINS.

ELEVATION RANGE: 4000-6300 FT.

COUNTIES: SANTA CRUZ, COCHISE

HABITAT: STOCK TANKS AND IMPOUNDED CIENEGAS IN SAN RAFAEL VALLEY, HUACHUCA MOUNTAINS

ALSO OCCURS IN THE FOOTHILLS OF THE EAST SLOPE OF THE PATAGONIA AND HUACHUCA MOUNTAINS POPULATIONS ALSO ON FORT HUACHUCA.

NAME: **JAGUAR** *PANTHERA ONCA*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: No CFR: 62 FR 39147, 07-22-97; 37 FR 6476, 03- 30-72

DESCRIPTION: LARGEST SPECIES OF CAT NATIVE TO SOUTHWEST. MUSCULAR, WITH RELATIVELY SHORT, MASSIVE LIMBS, AND A DEEP-CHESTED BODY. USUALLY CINNAMON-BUFF IN COLOR WITH MANY BLACK SPOTS. WEIGHT RANGES FROM 40-135 KG (90-300 LBS).

ELEVATION RANGE: 1,600 - >9,8 FT.

COUNTIES: COCHISE, SANTA CRUZ, AND PIMA

HABITAT: FOUND IN SONORAN DESERTSCRUB UP THROUGH SUBALPINE

ALSO OCCURS IN NEW MEXICO. A JAGUAR CONSERVATION TEAM IS BEING FORMED THAT IS BEING LED BY ARIZONA AND NEW MEXICO STATE ENTITIES ALONG WITH PRIVATE ORGANIZATIONS.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **SANTA CRUZ**

6/4/2002

2) PROPOSED TOTAL= 1

NAME: **CHIRICAHUA LEOPARD FROG** *RANA CHIRICAHUENSIS*

STATUS: PROPOSED CRITICAL HAB No RECOVERY PLAN: No CFR: 65 FR 37343, 6-14-2000

DESCRIPTION: CREAM COLORED TUBERCULES (spots) ON A DARK BACKGROUND ON THE REAR OF THE THIGH, DORSOLATERAL FOLDS THAT ARE INTERRUPTED AND DEFLECTED MEDIALLY, AND A CALL GIVEN OUT OF WATER DISTINGUISH THIS SPOTTED FROG FROM OTHER LEOPRD

ELEVATION RANGE: 3300-8900 FT.

COUNTIES: SANTA CRUZ, APACHE, GILA, PIMA, COCHISE, GREENLEE, GRAHAM, YAVAPAI, COCONINO, NAVAJO

HABITAT: STREAMS, RIVERS, BACKWATERS, PONDS, AND STOCK TANKS THAT ARE MOSTLY FREE FROM INTRODUCED FISH, CRAYFISH, AND BULLFROGS

REQUIRE PERMANENT OR NEARLY PERMANENT WATER SOURCES. POPULATIONS NORTH OF THE GILA RIVER MAY BE CLOSELY-RELATED, BUT DISTINCT, UNDESCRIBED SPECIES.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: SANTA CRUZ

6/4/2002

3) CANDIDATE TOTAL= 3

NAME: **GILA CHUB** *GILA INTERMEDIA*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: DEEP COMPRESSED BODY, FLAT HEAD. DARK OLIVE-GRAY COLOR ABOVE, SILVER SIDES. ENDEMIC TO GILA RIVER BASIN.

ELEVATION RANGE: 2000 - 3500 FT. 9

COUNTIES: SANTA CRUZ, GILA, GREENLEE, PIMA, COCHISE, GRAHAM, YAVAPAI

HABITAT: POOLS, SPRINGS, CIENEGAS, AND STREAMS

MULTIPLE PRIVATE LANDOWERS, INCLUDING THE NATURE CONSERVANCY, THE AUDUBON SOCIETY, AND OTHERS. ALSO FT. HUACHUCA. SPECIES ALSO FOUND IN SONORA, MEXICO.

NAME: **YELLOW-BILLED CUCKOO** *COCCYZUS AMERICANUS*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR: 66 FR 38611; 07-25-01

DESCRIPTION: MEDIUM-SIZED BIRD WITH A SLENDER, LONG-TAILED PROFILE, SLIGHTLY DOWN-CURVED BILL, WHICH IS BLUE-BLACK WITH YELLOW ON THE LOWER HALF OF THE BILL. PLUMAGE IS GRAYISH-BROWN ABOVE AND WHITE BELOW, WITH RUFOUS PRIMARY FLIGHT FEATHERS.

ELEVATION RANGE: <6,500 FT.

COUNTIES: APACHE, COCHISE, COCONINO, GILA, GRAHAM, GREENLEE, LA PAZ, MARICOPA, MOHAVE, NAVAJO, PIMA, PINAL, SANTA CRUZ, YAVAPAI, YUMA

HABITAT: LARGE BLOCKS OF RIPARIAN WOODLANDS (COTTONWOOD, WILLOW, OR TAMARISK GALLERIES)

SPECIES WAS FOUND WARRANTED, BUT PRECLUDED FOR LISTING AS A DISTINCT VERTEBRATE POPULATION SEGMENT IN THE WESTERN U.S. ON JULY 25, 2001. THIS FINDING INDICATES THAT THE SERVICE HAS SUFFICIENT INFORMATION TO LIST THE BIRD, BUT OTHER, HIGHER PRIORITY LISTING ACTIONS PREVENT THE SERVICE FROM ADDRESSING THE LISTING OF THE CUCKOO AT THIS TIME.

NAME: **HUACHUCA SPRINGSNAIL** *PYRGULOPSIS THOMPSONI*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: VERY SMALL (1.7-3.2mm) CONICAL SHELL. IDENTIFICATION MUST BE VERIFIED BY CHARARCTERISTICS OF REPRODUCTIVE ORGANS.

ELEVATION RANGE: 4500-6000 FT

COUNTIES: COCHISE, SANTA CRUZ

HABITAT: AQUATIC AREAS, SMALL SPRINGS WITH VEGETATION SLOW TO MODERATE FLOW.

INDIVIDUALS FOUND ON FIRM SUBSTANCES (ROOTS, WOOD, AND ROCKS) OTHER POPULATIONS FOUND ON FORT HUACHUCA MILITARY PROPERTY

Appendix G

NEPA Disclosure Statement for Preparation of the Tucson Electric Power Company Sahuarita-Nogales Transmission Line Draft Environmental Impact Statement

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE *TUCSON ELECTRIC POWER COMPANY SAHUARITA-NOAGLES TRANSMISSION LINE ENVIRONMENTAL IMPACT STATEMENT*

CEQ Regulations at 40 CFR 1506.5(c), which have been adopted by the DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project" for purposes of this disclosure is defined in the March 23, 1981 guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 8026-18038 at Question 17a and b.

"Financial or other interest in the outcome of the project" includes "any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)." 46 FR 18026-18038 at 18031.

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows: (check either (a) or (b) to assure consideration of your proposal).

(a) __√__ Offeror and any proposed subcontractor have no financial or other interest in the outcome of the project.

(b) _____ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests

1.

2.

3.

Certified by:

Oleg B. Lysyj

Signature

Oleg B. Lysyj Geotechnical Services Manager

Printed Name and Title

Terracon Consultants

Company

7-11-03

Date

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE *TUCSON ELECTRIC POWER COMPANY SAHUARITA-NOAGLES TRANSMISSION LINE ENVIRONMENTAL IMPACT STATEMENT*

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(a) _X_ Offeror and any proposed subcontractor have no financial or other interest in the outcome of the project.

(b) ____ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests

1.

2.

3.

Certified by:

Thomas Furgason

Signature

Thomas Furgason / Project Manager

Printed Name and Title

SWCA, Inc.

Company

July 14, 2003

Date

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF THE *TUCSON ELECTRIC POWER COMPANY SAHUARITA-NOAGLES TRANSMISSION LINE ENVIRONMENTAL IMPACT STATEMENT*

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(b) _____ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests

1.

2.

3.

Certified by:

Signature

Mark E. Smith
Program Manager

Printed Name and Title

Tetra Tech, Inc.

Company

7·14·03

Date