

**DOE/EIS - 0427**

**Draft Environmental Impact Statement  
Grapevine Canyon Wind Project**

**July 2010**

**Volume II**



**Lead Agency:**

**U.S. Department of Energy,  
Western Area Power Administration**

**Cooperating Agencies:**

**U.S. Department of Agriculture,  
Forest Service, Coconino National Forest**

**Arizona State Land Department**



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Dear Reader Letter

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Appendix A.1 Western Area Power Administration's Construction Standard 13



**APPENDIX A.1**

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WESTERN AREA POWER ADMINISTRATION'S CONSTRUCTION STANDARD 13

Available online at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)



# CONSTRUCTION STANDARDS

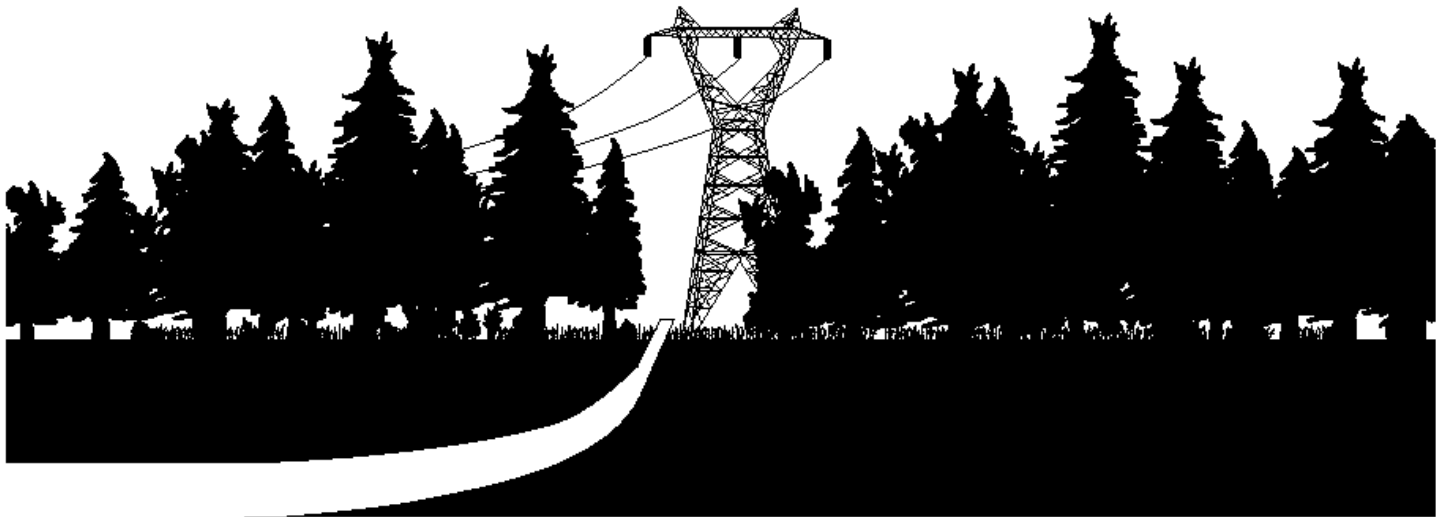
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## STANDARD 13 ENVIRONMENTAL QUALITY PROTECTION

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July 2009

**SAFETY**  
A HABIT TO LIVE BY

## STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION

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### SECTION 13.1--CONTRACTOR FURNISHED DATA

1. RECYCLED MATERIALS QUANTITY REPORT: Submit quantities of recycled materials listed in Section 13.6, "Recycled Materials Quantities", to the COR prior to submittal of final invoice.
2. RECOVERED AND BIOBASED MATERIAL PRODUCTS REPORT: Provide the COR the following information for purchases of items listed in Section 13.7, "Use of Recovered and Biobased Material Products".
  - (1) Quantity and cost of listed items with recovered or biobased material content and quantity and cost of listed items without recovered or biobased material content prior to submittal of final invoice.
  - (2) Written justification of listed items if recovered material or biobased material products are not available: 1) competitively within a reasonable time frame; 2) meeting reasonable performance standards as defined in the Standards or Project Specifications; or 3) at a reasonable price.
3. RECLAIMED REFRIGERANT RECEIPT: A receipt from the reclaimer stating that the refrigerant was reclaimed, the amount and type of refrigerant, and the date shall be submitted to the COR prior to submittal of final invoice in accordance with Section 13.8.5, "Refrigerants and Receipts".
4. WASTE MATERIAL QUANTITY REPORT: Submit quantities of total project waste material disposal as listed below to the COR prior to submittal of final invoice in accordance with Section 13.8.8, "Waste Material Quantity Report".
  - (1) Unregulated Wastes (i.e., trash): Volume in cubic yards or weight in pounds.
  - (2) Hazardous or Universal Wastes: Weight in pounds.
  - (3) PCB Wastes: Weight in pounds.
  - (4) Other regulated wastes (e.g., lead-based paint or asbestos): Weight in pounds (specify type of waste in report).
5. SPILL PREVENTION NOTIFICATION AND CLEANUP PLAN (Plan): Submit the Plan as described in Section 13.10.2, "Spill Prevention Notification and Cleanup Plan", to the COR for review and comment 14 days prior to start of work. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.
6. TANKER OIL SPILL PREVENTION AND RESPONSE PLAN: Submit the Plan as described in Section 13.10.3, "Tanker Oil Spill Prevention and Response Plan", to the COR for review and comment 14 days prior to start of work. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.
7. PESTICIDE USE PLAN: Submit a plan as described in Section 13.11.3, "Pesticide Use Plan", to the COR for review and comment 14 days prior to the date of intended pesticide application. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Within seven days after application, submit a written report in accordance with Standard 2 – Sitework, Section 2.1.1\_5, "Soil-Applied Herbicide".

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8. TREATED WOOD UTILITY POLES AND CROSSARMS RECYCLING - CONSUMER INFORMATION SHEET RECEIPT: Submit treated wood utility poles and crossarms - consumer information sheet receipts to the COR prior to submittal of final invoice (see 13.12, "Treated Wood Utility Poles and Crossarms Recycling or Disposal").
9. PREVENTION OF AIR POLLUTION: Submit a copy of permits, if required, as described in 13.13, "Prevention of Air Pollution" to the COR 14 days prior to the start of work.
10. ASBESTOS LICENSES OR CERTIFICATIONS: Submit a copy of licenses, certifications, Demolition and Renovation Notifications and Permits for asbestos work as described in 13.14, "Handling and Management of Asbestos Containing Material" to the COR 14 days prior to work. Submit copies of certificates of disposal and/or receipts for waste to the COR prior to submittal of final invoice.
11. LEAD PAINT NOTICES: Submit a copy of lead paint notices with contractor and recipient signatures as described in 13.15, "Material with Lead-based Paint" to the COR prior to submittal of final invoice. Submit copies of certificates of disposal and/or receipts for waste to the COR prior to submittal of final invoice.
12. WATER POLLUTION PERMITS: Submit copies of any water pollution permits as described in 13.16, "Prevention of Water Pollution" to the COR 14 days prior to start of work.
13. PCB TEST REPORT: Submit a PCB test report as described in 13.17, "Testing, Draining, Removal, and Disposal of Oil-filled Electrical Equipment", prior to draining, removal, or disposal of oil or oil-filled equipment that is designated for disposal.
14. OIL AND OIL-FILLED ELECTRICAL EQUIPMENT RECEIPT: Obtain and submit a receipt for oil and oil-filled equipment transported and disposed, recycled, or reprocessed as described in 13.17, "Testing, Draining, Removal, and Disposal of Oil-filled Electrical Equipment", to the COR prior to submittal of final invoice.
15. OSHA PCB TRAINING RECORDS: Submit employee training documentation records to the COR 14 days prior to the start of work as described in 13.18.1.
16. CLEANUP WORK MANAGEMENT PLAN: Submit a Cleanup Work Management Plan as described in 13.18, "Removal of Oil-contaminated Material" to the COR for review and comment 14 days prior to the start of work. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.
17. POST CLEANUP REPORT: Submit a Post-Cleanup Report as described in 13.18, "Removal of Oil-contaminated Material" to the COR prior to submittal of final invoice.

### **SECTION 13.2--ENVIRONMENTAL REQUIREMENTS**

Comply with Federal, State, and local environmental laws and regulations. The sections in this Standard further specify the requirements.

### **SECTION 13.3--LANDSCAPE PRESERVATION**

1. GENERAL: Preserve landscape features in accordance with the contract clause titled "Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements."
2. CONSTRUCTION ROADS: Location, alignment, and grade of construction roads shall be subject to the COR's approval. When no longer required, surfaces of construction roads shall be scarified to

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facilitate natural revegetation, provide for proper drainage, and prevent erosion. If re-vegetation is required, use seed mixtures as recommended by Natural Resources Conservation Service or other land managing agency as appropriate.

3. **CONSTRUCTION FACILITIES:** Shop, office, and yard areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent and prevent impact on sensitive riparian areas and flood plains. Storage and construction buildings, including concrete footings and slabs, shall be removed from the site prior to contract completion. The area shall be re-graded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion or transport of sediment and pollutants. If re-vegetation is required, use seed mixtures as recommended by Natural Resources Conservation Service or other land managing agency as appropriate.

### SECTION 13.4--PRESERVATION OF CULTURAL AND PALEONTOLOGICAL RESOURCES

1. **GENERAL:** Do not remove or alter cultural artifacts or paleontological resources (fossils). Cultural artifacts may be of scientific or cultural importance and includes, but is not limited to bones, pottery, glass, projectile points (arrowheads), other stone or metal tools, historic buildings, and features. Paleontological resources can be of scientific importance and include mineralized animals and plants or trace fossils such as footprints. Both cultural and paleontological resources are protected by Federal Regulations during Federal construction projects. Contractor shall restrict all ground disturbing activities to areas that have been surveyed by Western for cultural or paleontological resources and as specified in accordance with Standard 1 – General Requirements, Sections 1.3.1 Rights-of-way and 1.3.2 Access to the Work and Haul Routes.
2. **KNOWN CULTURAL OR PALEONTOLOGICAL SITES:** Following issuance of notice to proceed, Western will provide drawings or maps showing sensitive areas located on or immediately adjacent to the transmission line right-of-way and/or facility. These areas shall be considered avoidance areas. Prior to any construction activity, the avoidance areas shall be marked on the ground in a manner approved by the COR. Instruct employees, subcontractors, and others that vehicular or equipment access to these areas is prohibited. If access is absolutely necessary, first obtain approval from the COR. Western will remove the markings during or following final cleanup. For some project work, Western will require an archaeological, paleontological or tribal monitor at or near cultural or paleontological site locations. The contractor, contractor's employees, and subcontractors shall work with the monitor to insure that sensitive areas are avoided. Where monitors are required, the monitor shall meet with the crew each morning to go over the day's work. The monitor will also conduct awareness training for all contractors prior to any work in the field. Untrained personnel shall not be allowed in the construction area. For sensitive areas requiring a monitor, the contractor may not access those areas without a monitor being present.
3. **UNKNOWN CULTURAL OR PALEONTOLOGICAL SITES:** On rare occasions cultural or paleontological sites may be discovered during excavation or other earth-moving activities.
  - (1) **Reporting:** If evidence of a cultural or paleontological site is discovered, cease work in the area immediately and notify the COR of the location and nature of the findings. If a monitor is present, the monitor should also be notified. Stop all activities within a 200-foot radius of the discovery and do not proceed with work within that radius until directed to do so by the COR.
  - (2) **Care of Evidence:** Protect the area. Do not remove, handle, alter, or damage artifacts or fossils uncovered during construction.



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### SECTION 13.5--NOXIOUS WEED CONTROL

Comply with Federal, State, and local noxious weed control regulations. Provide a "clean vehicle policy" while entering and leaving construction areas to prevent transport of noxious weed plants and/or seed. Transport only construction vehicles that are free of mud and vegetation debris to staging areas and the project right-of-way.

### SECTION 13.6--RECYCLED MATERIALS QUANTITIES

1. GENERAL: Record quantities of material by category that is salvaged, recycled, reused, or reprocessed, including:
  - (1) Transformers, Breakers: Weight without oil.
  - (2) Aluminum Conductor – Steel Reinforced (ACSR): Weight in pounds or tons.
  - (3) Steel: Weight in pounds or tons.
  - (4) Aluminum: Weight in pounds or tons.
  - (5) Copper: Weight in pounds or tons.
  - (6) Other Metals: Weight in pounds or tons.
  - (7) Oil: Gallons (separate by type - less than 2 ppm PCB, 2 to 50 ppm PCB, and 50 or greater ppm PCB).
  - (8) Gravel, Asphalt, Or Concrete: Weight in pounds or tons.
  - (9) Batteries: Weight in pounds.
  - (10) Treated Wood Utility Poles and Crossarms: Weight in pounds.
  - (11) Wood construction material: Weight in pounds.
  - (12) Cardboard: Weight in pounds.
  - (13) Porcelain Insulators: Weight in pounds.
2. RECYCLED MATERIAL QUANTITY REPORT: Submit quantities of recycled material by category to the COR prior to submittal of final invoice.

### SECTION 13.7--USE OF RECOVERED MATERIAL AND BIOBASED MATERIAL PRODUCTS

1. RECOVERED MATERIAL PRODUCTS: If the products listed below or other products listed at <http://www.epa.gov/epawaste/conservation/tools/cpg/products/index.htm> are obtained as part of this project, purchase the items with the highest recovered material content possible unless recovered material products are not available: 1) competitively within a reasonable time frame; 2) meeting reasonable performance standards as defined in the Standards or Project Specifications; or 3) at a reasonable price.

Construction Products:

- Building Insulation Products

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- Carpet
- Carpet cushion
- Cement and concrete containing coal fly ash, ground granulated blast furnace slag, cenospheres, or silica fume
- Consolidated and reprocessed latex paint
- Floor Tiles
- Flowable fill
- Laminated Paperboard
- Modular threshold ramps
- Nonpressure pipe
- Patio Blocks
- Railroad grade crossing surfaces
- Roofing materials
- Shower and restroom dividers/partitions
- Structural Fiberboard

2. **BIOBASED MATERIAL PRODUCTS:** If the products listed at <http://www.biobased.oce.usda.gov> are obtained as part of this project, purchase the items with the highest biobased content possible and no less than the percent indicated for each product unless biobased material products are not available: 1) competitively within a reasonable time frame, 2) meeting reasonable performance standards as defined in the Standards or Project Specifications, or 3) at a reasonable price.

**NOTE:** Western exempts purchase of bio-based transformers rated above 1 MVA until May 13, 2011 for performance reasons.

3. **RECOVERED MATERIAL AND BIOBASED MATERIAL PRODUCTS REPORT:** Provide the COR the following information for purchases of those items listed above:

Quantity and cost of listed items with recovered or biobased material content and quantity and cost of listed items without recovered or biobased material content prior to submittal of final invoice.

Written justification of listed items if recovered material or biobased material products are not available: 1) competitively within a reasonable time frame; 2) meeting reasonable performance standards as defined in the Standards or Project Specifications; or 3) at a reasonable price.

### SECTION 13.8--DISPOSAL OF WASTE MATERIAL

1. **GENERAL:** Dispose or recycle waste material in accordance with applicable Federal, State and local regulations and ordinances. In addition to the requirements of the Contract Clause "Cleaning Up", remove all waste material from the construction site. No waste shall be left on Western property, right-of-way, or easement. Burning or burying of waste material is not permitted.
2. **HAZARDOUS, UNIVERSAL, AND NON-HAZARDOUS WASTES:** Manage hazardous, universal, and non-hazardous wastes in accordance with State and Federal regulations.
3. **USED OIL:** Used oil generated from the Contractor activities shall be managed in accordance with used oil regulations.
4. **RECYCLABLE MATERIAL:** Reduce wastes, including excess Western material, by recycling, reusing, or reprocessing. Examples of recycling, reusing, or reprocessing includes, but is not limited to, reprocessing of solvents; recycling cardboard; and salvaging scrap metals.
5. **REFRIGERANTS AND RECEIPTS:** Refrigerants from air conditioners, water coolers, refrigerators, ice machines and vehicles shall be reclaimed with certified equipment operated by certified technicians if the item is to be disposed. Refrigerants shall be reclaimed and not vented to the

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atmosphere. A receipt from the reclaimer stating that the refrigerant was reclaimed, the amount and type of refrigerant, and the date shall be submitted to the COR prior to submittal of final invoice.

6. HALONS: Equipment containing halons that must be tested, maintained, serviced, repaired, or disposed must be handled according to EPA requirements and by technicians trained according to those requirements.
7. SULFUR HEXAFLUORIDE (SF6): SF6 shall be reclaimed and not vented to the atmosphere.
8. WASTE MATERIAL QUANTITY REPORT: Submit quantities of total project waste material disposal as listed below to the COR prior to submittal of final invoice.
  - (1) Unregulated Wastes (i.e., trash): Volume in cubic yards or weight in pounds.
  - (2) Hazardous or Universal Wastes: Weight in pounds.
  - (3) PCB Wastes: Weight in pounds.
  - (4) Other regulated wastes (e.g., lead-based paint or asbestos): Weight in pounds (specify type of waste in report).

### **SECTION 13.9--CONTRACTOR'S LIABILITY FOR REGULATED MATERIAL INCIDENTS**

1. GENERAL: The Contractor is solely liable for all expenses related to spills, mishandling, or incidents of regulated material attributable to his actions or the actions of his subcontractors. This includes all response, investigation, cleanup, disposal, permitting, reporting, and requirements from applicable environmental regulation agencies.
2. SUPERVISION: The actions of the Contractor employees, agents, and subcontractors shall be properly managed at all times on Western property or while transporting Western's (or previously owned by Western) regulated material and equipment.

### **SECTION 13.10--POLLUTANT SPILL PREVENTION, NOTIFICATION, AND CLEANUP**

1. GENERAL: Provide measures to prevent spills of pollutants and respond appropriately if a spill occurs. A pollutant includes any hazardous or non-hazardous substance that when spilled, will contaminate soil, surface water, or ground water. This includes any solvent, fuel, oil, paint, pesticide, engine coolants, and similar substances.
2. SPILL PREVENTION NOTIFICATION AND CLEANUP PLAN (Plan): Provide the Plan to the COR for review and comment 14 days prior to start of work. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Include the following in the Plan:
  - (1) Spill Prevention measures. Describe the work practices or precautions that will be used at the job site to prevent spills. These may include engineered or manufactured techniques such as installation of berms around fuel and oil tanks; Storage of fuels, paints, and other substances in spill proof containers; and management techniques such as requiring workers to handle material in certain ways.
  - (2) Notification. Most States and the Environmental Protection Agency require by regulation, that anyone who spills certain types of pollutants in certain quantities notify them of the spill within a specific time period. Some of these agencies require written follow up reports and cleanup

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reports. Include in the Plan, the types of spills for which notification would be made, the agencies notified, the information the agency requires during the notification, and the telephone numbers for notification.

- (3) Employee Awareness Training. Describe employee awareness training procedures that will be implemented to ensure personnel are knowledgeable about the contents of the Plan and the need for notification.
  - (4) Commitment of Manpower, Equipment and Material. Identify the arrangements made to respond to spills, including the commitment of manpower, equipment and material.
  - (5) If applicable, address all requirements of 40CFR112 pertaining to Spill Prevention, Control and Countermeasures Plans.
3. TANKER OIL SPILL PREVENTION AND RESPONSE PLAN: Provide a Tanker Oil Spill Prevention and Response Plan as required by the Department of Transportation if oil tankers with volume of 3,500 gallons or more are used as part of the project. Submit the Tanker Oil Spill Prevention and Response Plan to the COR for review and comment 14 days prior to start of work. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations.

### **SECTION 13.11--PESTICIDES**

1. GENERAL: The term "pesticide" includes herbicides, insecticides, rodenticides and fungicides. Pesticides shall only be used in accordance with their labeling and applied by appropriately certified applicators.
2. ENVIRONMENTAL PROTECTION AGENCY REGISTRATION: Use EPA registered pesticides that are approved for the intended use.
3. PESTICIDE USE PLAN: Provide a pesticide use plan that contains: 1) a description of the pesticide to be used, 2) where it is to be applied, 3) the application rate, 4) a copy of the label, and 5) a copy of required applicator certifications. Submit the pesticide use plan to the COR for review and comment 14 days prior to the date of intended application. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. Within seven days after application, submit a written final report to the COR, including the pesticide applicators report, in accordance with Standard 2 – Sitework, Section 2.1.1\_5. "Soil-Applied Herbicide, (4) Final Report".

### **SECTION 13.12--TREATED WOOD UTILITY POLES AND CROSSARMS RECYCLING OR DISPOSAL**

Whenever practicable, treated wood utility poles and crossarms removed during the project shall be recycled or transferred to the public for some uses. Treated wood utility poles and crossarms transferred to a recycler, landfill, or the public shall be accompanied by a written consumer information sheet for treated wood as provided by Western. Obtain a receipt, part of the consumer information sheet, from the recipient indicating that they have received, read, and understand the consumer information sheet. Treated wood products transferred to right-of-way landowners shall be moved off the right-of-way. Treated wood product scrap, poles, and crossarms that cannot be donated or reused shall be properly disposed in a landfill that accepts treated wood and has signed Western's consumer information sheet receipt. Submit treated wood utility poles and crossarms consumer information receipts to the COR prior to submittal of final invoice.

## **STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION**

### **SECTION 13.13--PREVENTION OF AIR POLLUTION**

1. **GENERAL:** Ensure that construction activities and the operation of equipment are undertaken to reduce the emission of air pollutants. Submit a copy of permits for construction activities, if required (e.g., "non-attainment" areas, state implementation plans, or Class I air-sheds), from Federal, State, or local agencies to the COR 14 days prior to the start of work.
2. **MACHINERY AIR EMISSIONS:** The Contractor and subcontractor machinery shall have, and shall use the air emissions control devices required by Federal, State or Local Regulation or ordinance.
3. **DUST ABATEMENT:** Dust shall be controlled. Oil shall not be used as a dust suppressant. Dust suppressants shall be approved by the COR prior to use.

### **SECTION 13.14--HANDLING AND MANAGEMENT OF ASBESTOS CONTAINING MATERIAL**

1. **GENERAL:** Obtain the appropriate Federal, State, Tribal or local licenses or certifications prior to disturbing any regulated asbestos-containing material. If a building or portion of a building will be demolished or renovated, obtain an Asbestos Notice of and Permit for Demolition and Renovation from the State or Tribal Department of Environmental Quality, Division of Air Quality (or equivalent). The building(s) shall be inspected by a State-Certified or Tribal accepted Asbestos Building Inspector. The inspector shall certify the presence and condition of asbestos, or non-presence of asbestos, on site as directed on the State or Tribal Demolition and Renovation Notice/Permit. The inspections shall be performed and notifications shall be submitted whether asbestos is present or not. Submit a copy of licenses, certifications, Demolition and Renovation Notifications and Permits for asbestos work to the COR 14 days prior to work. Ensure: 1) worker and public safety requirements are fully implemented and 2) proper handling, transportation, and disposal of asbestos containing material.
2. **TRANSPORTATION OF ASBESTOS WASTE:** Comply with Department of Transportation, Environmental Protection Agency, and State and Local requirements when transporting asbestos wastes.
3. **CERTIFICATES OF DISPOSAL AND RECEIPTS:** Obtain certificates of disposal for waste if the waste is a hazardous waste or receipts if the waste is a non-hazardous waste. Submit copies to the COR prior to submittal of final invoice.

### **SECTION 13.15--MATERIAL WITH LEAD-BASED PAINT**

1. **GENERAL:** Comply with all applicable Federal, State and local regulations concerning work with lead-based paint, disposal of material painted with lead-based paint, and management of these materials. OSHA and General Industry Standards apply to worker safety and right-to-know issues. Federal EPA and State agencies regulate waste disposal and air quality issues.
2. **TRANSFER OF PROPERTY:** If lead-based paint containing equipment or material is to be given away or sold for reuse, scrap, or reclaiming, the contractor shall provide a written notice to the recipient of the material stating that the material contains lead-based paint and the Hazardous Waste regulations may apply to the waste or the paint in some circumstances. The new owner must also be notified that they may be responsible for compliance with OSHA requirements if the material is to be cut, sanded, abraded, or stripped of paint. Submit a copy of lead paint notices with contractor and recipient signatures to the COR prior to submittal of final invoice.
3. **CERTIFICATES OF DISPOSAL AND RECEIPTS:** Obtain certificates of disposal for waste if the waste is a hazardous waste or receipts if the waste is a non-hazardous waste. Submit copies to the COR prior to submittal of final invoice.

## STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION

### SECTION 13.16--PREVENTION OF WATER POLLUTION

1. GENERAL: Ensure that surface and ground water is protected from pollution caused by construction activities and comply with applicable regulations and requirements. Ensure that streams, waterways and other courses are not obstructed or impaired unless the appropriate Federal, State or local permits have been obtained.
2. PERMITS: Ensure that:
  - (1) A National Pollutant Discharge Elimination System (NPDES) permit is obtained from the US Environmental Protection Agency or State as appropriate if the disturbed construction area equals 1 acre or more. Disturbed areas include staging, parking, fueling, stockpiling, and any other construction related activities. Refer to [www.epa.gov/npdes/stormwater](http://www.epa.gov/npdes/stormwater) for directions and forms.
  - (2) A dewatering permit is obtained from the appropriate agency if required for construction dewatering activities.
  - (3) Copies of permits and plans, approved by the appropriate regulating agencies, are submitted to the COR 14 days prior to start of work.
3. EXCAVATED MATERIAL AND OTHER CONTAMINANT SOURCES: Control runoff from excavated areas and piles of excavated material, construction material or wastes (to include truck washing and concrete wastes), and chemical products such as oil, grease, solvents, fuels, pesticides, and pole treatment compounds. Excavated material or other construction material shall not be stockpiled or deposited near or on streambanks, lake shorelines, ditches, irrigation canals, or other areas where run-off could impact the environment.
4. MANAGEMENT OF WASTE CONCRETE OR WASHING OF CONCRETE TRUCKS: Do not permit the washing of concrete trucks or disposal of excess concrete in any ditch, canal, stream, or other surface water. Concrete wastes shall be disposed in accordance with all Federal, State, and local regulations. Concrete wastes shall not be disposed of on any Western property, right-of-way, or easement; or on any streets, roads, or property without the owner's consent.
5. STREAM CROSSINGS: Crossing of any stream or other waterway shall be done in compliance with Federal, State, and local regulations. Crossing of some waterways may be prohibited by landowners, Federal or State agencies or require permits.

### SECTION 13.17--TESTING, DRAINING, REMOVAL, AND DISPOSAL OF OIL-FILLED ELECTRICAL EQUIPMENT

1. SAMPLING AND TESTING OF INSULATING OIL FOR PCB CONTENT: Sample and analyze the oil of electrical equipment (which includes storage tanks) for PCB's. Use analytical methods approved by EPA and applicable State regulations. Decontaminate sampling equipment according to documented good laboratory practices (these can be contractor developed or EPA standards). Use only laboratories approved by Western. The COR will furnish a list of approved laboratories.
2. PCB TEST REPORT: Provide PCB test reports that contain the information below for disposing of oil-filled electrical equipment. Submit the PCB test report prior to draining, removal, or disposal of oil or oil-filled equipment that is designated for disposal.
  - Name and address of the laboratory
  - Description of the electrical equipment (e.g. transformer, breaker)

## STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION

- Serial number for the electrical equipment.
  - Date sampled
  - Date tested
  - PCB contents in parts per million (ppm)
  - Unique identification number of container into which the oil was drained (i.e., number of drum, tank, tanker, etc.)
3. OIL CONTAINING PCB: Comply with the Federal regulations pertaining to PCBs found at Title 40, Part 761 of the U.S. Code of Federal Regulations (40 CFR 761).
  4. REMOVAL AND DISPOSAL OF INSULATING OIL AND OIL-FILLED ELECTRICAL EQUIPMENT: Once the PCB content of the oil has been identified from laboratory results, the oil shall be transported and disposed, recycled, or reprocessed according to 40 CFR 761 (if applicable), Resource Conservation and Recovery Act (RCRA) "used oil", and other applicable regulations. Used oil may be transported only by EPA-registered used oil transporters. The oil must be stored in containers that are labeled "Used Oil." Use only transporters and disposal sites approved by Western.
  5. OIL AND OIL-FILLED ELECTRICAL EQUIPMENT RECEIPT: Obtain and submit a receipt for oil and oil-filled equipment transported and disposed, recycled, or reprocessed to the COR prior to submittal of final invoice.

### SECTION 13.18--REMOVAL OF OIL-CONTAMINATED MATERIAL

1. GENERAL: Removing oil-contaminated material includes excavating, stockpiling, testing, transporting, cleaning, and disposing of these material. Personnel working with PCBs shall be trained in accordance with OSHA requirements. Submit employee training documentation records to the COR 14 days prior to the start of work.
2. CLEANUP WORK MANAGEMENT PLAN: Provide a Cleanup Work Management Plan that has been approved by applicable Federal, State, or Local environmental regulation agencies. Submit the plan to the COR for review and comment 14 days prior to the start of work. Review of the plan is for the purpose of determining compliance with the specifications only and shall not relieve the Contractor of the responsibility for compliance with all Federal, State, and Local regulations. The plan shall address on-site excavation of contaminated soil and debris and include the following:
  - Identification of contaminants and areas to be excavated
  - Method of excavation
  - Level of personnel/subcontractor training
  - Safety and health provisions
  - Sampling requirements including quality control, laboratory to be used
  - Management of excavated soils and debris
  - Disposal methods, including transportation to disposal
3. EXCAVATION AND CLEANUP: Comply with the requirements of Title 40, Part 761 of the U.S. Code of Federal Regulations (40 CFR 761).
4. TEMPORARY STOCKPILING: Excavated material, stockpiled on site during construction, shall be stored on heavy plastic and covered to prevent wind and rain erosion at a location designated by the COR.
5. SAMPLING AND TESTING: Sample contaminated debris and areas of excavation to ensure that contamination is removed. Use personnel with experience in sampling and, in particular, with

## STANDARD 13 - ENVIRONMENTAL QUALITY PROTECTION

experience in PCB cleanup if PCBs are involved. Use analytical methods approved by EPA and applicable State regulations.

6. **TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIAL:** The Contractor shall be responsible and liable for the proper loading, transportation, and disposal of contaminated material according to Federal, State, and local requirements. Use only transporters and disposal sites approved by Western.
7. **POST CLEANUP REPORT:** Provide a Post-Cleanup Report that describes the cleanup of contaminated soils and debris. Submit the report to the COR prior to submittal of final invoice. The report shall contain the following information:
  - Site map showing the areas cleaned
  - Description of the operations involved in excavating, storing, sampling, and testing, and disposal
  - Sampling and analysis results including 1) Name and address of the laboratory, 2) sample locations, 3) sample dates, 4) analysis dates, 5) contents of contaminant (e.g. PCB or total petroleum hydrocarbons) in parts per million (ppm)
  - Certification by the Contractor that the cleanup requirements were met
  - Copies of any manifests, bills of lading, and disposal certificates
  - Copies of correspondence with regulatory agencies that support completion of the cleanup

### SECTION 13.19—CONSERVATION OF NATURAL RESOURCES

1. **GENERAL:** Federal law prohibits the “take” of endangered, threatened, proposed or candidate wildlife and plants, and destruction or adverse modification of designated Critical Habitat. Federal law also prohibits the “take” of birds protected by the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. “Take” means to pursue, hunt, shoot, wound, kill, trap, capture or collect a protected animal or any part thereof, or attempt to do any of those things without a permit from U.S. Fish and Wildlife Service. The Contractor will take precautions to avoid harming other wildlife species. Contractor shall restrict all ground disturbing activities to areas that have been surveyed by Western for natural resources and as specified in accordance with Standard 1 – General Requirements, Sections 1.3.1 Rights-of-way and 1.3.2 Access to the Work and Haul Routes.
2. **KNOWN OCCURRENCE OF PROTECTED SPECIES OR HABITAT:** Following issuance of the notice to proceed, and prior to the start of construction, Western will provide training to all contractor and subcontractor personnel and others involved in the construction activity if there is a known occurrence of protected species or habitat in the construction area. Untrained personnel shall not be allowed in the construction area. Western will provide drawings or maps showing sensitive areas located on or immediately adjacent to the transmission line right-of-way and/or facility. These sensitive areas shall be considered avoidance areas. Prior to any construction activity, the avoidance areas shall be marked on the ground by Western. If access is absolutely necessary, the contractor shall first obtain written permission from the COR, noting that a Western and/or other Federal or state government or tribal agency biologist may be required to accompany personnel and equipment. Ground markings shall be maintained through the duration of the contract. Western will remove the markings during or following final inspection of the project.
3. **UNKNOWN OCCURRENCE OF PROTECTED SPECIES OR HABITAT:** If evidence of a protected species is found in the project area, the contractor shall immediately notify the COR and provide the location and nature of the findings. The contractor shall stop all activity within 200 feet of the protected species or habitat and not proceed until directed to do so by the COR.



## **APPENDIX B**

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### Appendix B.1 Scoping Summary Report

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**APPENDIX B.1**  
SCOPING SUMMARY REPORT

Available online at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)

# **ENVIRONMENTAL IMPACT STATEMENT SCOPING SUMMARY REPORT**

Grapevine Canyon Wind Project

Prepared for:

U.S. Department of Energy

Western Area Power Administration

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## LIST OF ACRONYMS

AGFD	Arizona Game and Fish Department
CEQ	Council on Environmental Quality
CRSP	Colorado River Storage Project
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
Foresight	Foresight Flying M, LLC
MBTA	Migratory Bird Treaty Act
MW	megawatts
NEPA	National Environmental Policy Act
NPR	National Public Radio
NOI	Notice of Intent
Project	Grapevine Canyon Wind Project
Forest Service	U.S. Department of Agriculture, Forest Service, Coconino National Forest
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
Western	Western Area Power Administration

## **1.0 INTRODUCTION AND BACKGROUND**

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### **1.1 Introduction**

This scoping summary report has been prepared to provide a synopsis of the agency, tribal, and public scoping process that was conducted for the proposed Grapevine Canyon Wind Project (Project) in Coconino County, Arizona. Foresight Flying M, LLC (Foresight) has applied to the U.S. Department of Energy (DOE), Western Area Power Administration (Western) to interconnect the proposed Project to Western's transmission system on its Glen Canyon-Pinnacle Peak Transmission Line.

This report identifies efforts made to notify interested agencies, tribes, organizations, and individuals about the proposed Federal action and to obtain input from those entities regarding alternatives to be evaluated and issues to be addressed in the environmental impact statement (EIS) being prepared by Western. These efforts have been carried out pursuant to the "scoping process," as defined by the Council on Environmental Quality's (CEQ) regulations implementing the National Environmental Policy Act (NEPA).

The scoping process commenced on July 24, 2009, with the publication of a Notice of Intent (NOI) in the Federal Register (Appendix A) and concluded on August 28, 2009.

### **1.2 Project Description**

Foresight proposes to construct a wind energy generation project up to 500 megawatts (MW) on private, state, and Federal lands. The project is located in Coconino County, southeast of Flagstaff, Arizona (Figure 1), in Sections 1, 2, 11, and 12, T17N, R11E; Sections 3-10, 15-22, 27-31, and 33, T17N, R12E; Sections 10-19, T18N, R10E; Sections 1-16, 23-26, 35, and 36, T18N, R11E; Sections 1-11, 14-23, and 26-35, T18N, R12E; Sections 3, 10-13, and 24, T19N, R10E; Sections 19, 30, and 31, T19N, R11E; Sections 12, 13, 23-26, 34, and 35, T20N, R10E; and Sections 6, and 7, T20N, R11E (Gila and Salt River Baseline and Meridian).

The project includes three primary components described in the NOI and presented at the public scoping meetings:

- Wind Generation Facility
- 345kV Transmission Line and Switchyard
- Access Road

#### 1.2.1 Wind Generation Facility

The wind generation component of the proposed Project would be constructed on private lands and land administered by the Arizona State Land Department. The proposed Project would generate electricity

from wind turbine generators rated at 1.5 to 3.0 MW. Final turbine selection and size is subject to further wind analysis, and will determine the number of turbines. Each turbine would have three blades that would revolve at less than approximately 18 revolutions per minute. Each blade would measure 125 to 185 feet long. The single pole structures supporting each of the turbines would be up to 325 feet high and approximately 20 feet in diameter at the base. Each turbine structure would be up to approximately 500 feet high, when a blade is in the 12 o'clock position. Each would be installed on a concrete base, and would have a pad-mounted transformer near the base. Lighting would be in accordance with Federal Aviation Administration requirements.

There would be an all-weather service road constructed to each turbine location. The wind turbines would be connected by an electrical collection system, power collection circuits, and a communications network. This collection system would be buried, where feasible, in areas without major subsurface obstructions. Foresight would site the wind turbine generators to optimize wind and land resources in the area while minimizing environmental impacts to the extent practicable. Foresight would comply with local zoning requirements, including setbacks from residences, roads, and existing transmission and distribution lines. Foresight would begin construction on the proposed Project approximately fall 2010. The life of the proposed Project is anticipated to be a minimum of 20 years.

#### 1.2.2 345kV Transmission Line and Switchyard

To support delivery of the power generated by the Project, Foresight proposes to build a new 345-kV transmission tie-line, approximately 9 miles in length, to a new 345kV switchyard, located immediately adjacent to Western's existing Glen Canyon-Pinnacle Peak Transmission Line. The transmission tie-line and switchyard would cross lands administered by Coconino National Forest.

#### 1.2.3 Access Road

Scoping meetings and materials proposed the use of Forest Road 126, an existing road, 18 miles in length, as the primary access road for the Project. Subsequent to scoping, two other access routes have been identified. Both access routes originate at Meteor Crater Road. One route extends southwest from Meteor Crater Road approximately 8.5 miles. The other route utilizes the existing Chavez Pass Road, located just south of Meteor Crater Road, and extends approximately 2 miles to the wind park area.



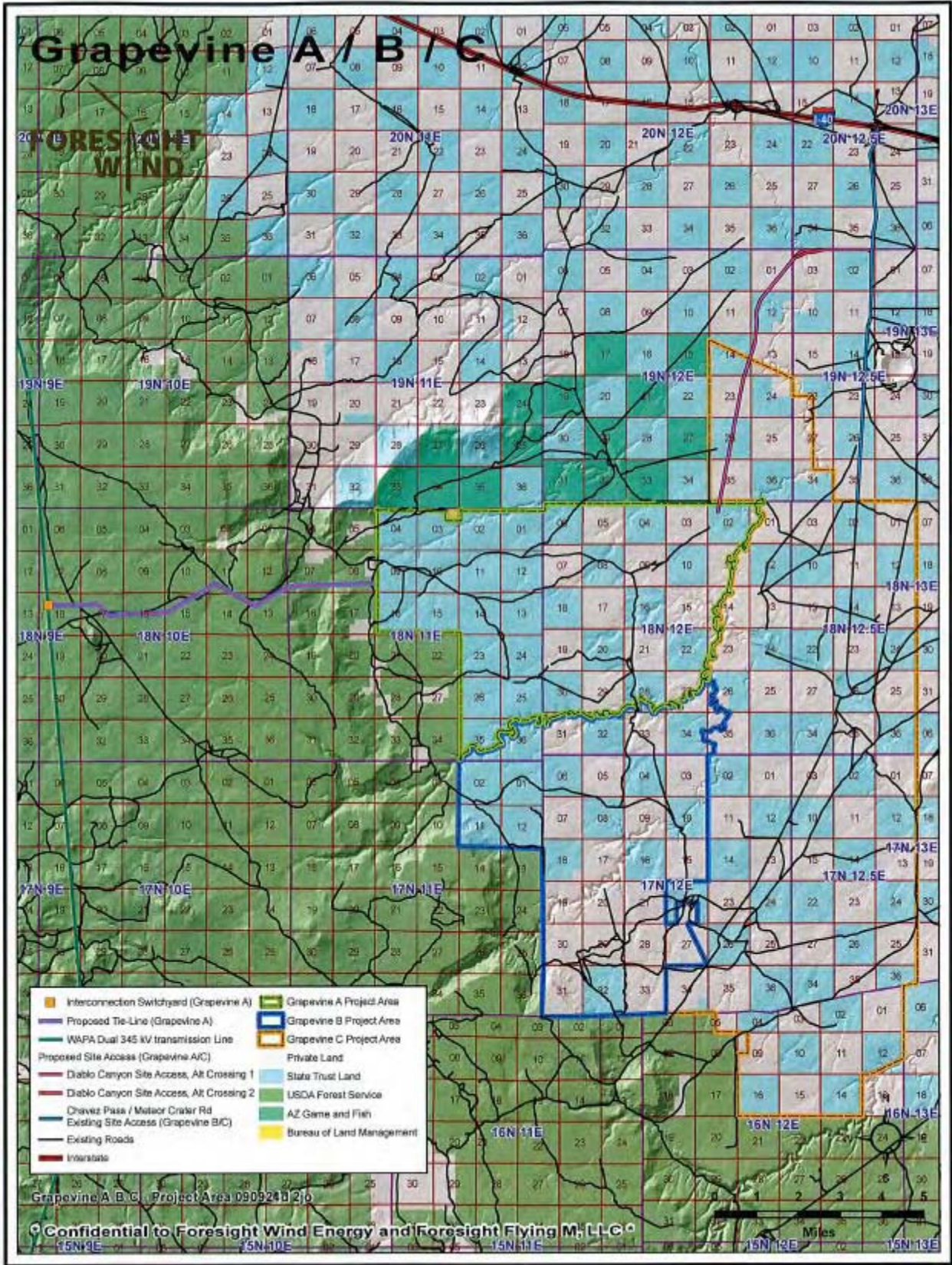


FIGURE 1



### **1.3 National Environmental Policy Act**

NEPA establishes a general framework for evaluating environmental impacts prior to undertaking a Federal action. The Project began the NEPA process in March 2007 when Foresight filed a Standard Form 299 with the U.S. Department of Agriculture, Forest Service, Coconino National Forest (Forest Service) to construct a 345kV transmission line and switchyard on Federal lands. Subsequent efforts to prepare an environmental assessment were initiated, with the Forest as the lead Federal agency. Because interconnection of the proposed Project would incorporate a major new generation resource into Western's power transmission system, Western has determined that an EIS is required under DOE NEPA implementing procedures, 10 CFR part 1021, subpart D, Appendix D, class of action D6.

### **1.4 Purpose of Scoping Process**

“Scoping” is an integral part of the NEPA process. Scoping provides *“an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.”* (40 CFR 1501.7)

The objectives of scoping for this Federal action include the following:

- Identify significant issues related to the proposed project.
- Identify social, environmental, and economic review and consultation requirements.
- Define the environmental analysis process and technical studies necessary to adequately address the impacts of the proposed project.
- Identify the interested and affected parties.
- Provide information to agencies and the public regarding the proposed project.

### **1.5 Organizational Involvement**

Roles and responsibilities for the scoping process included:

- Western – EIS Lead Agency/Applicant for Transmission Line Rights-of-Way
- Forest Service – EIS Cooperating Agency
- Foresight (Foresight Wind Energy, LLC, its Manager) – Project Proponent
- Transcon Environmental – Third Party Contractor

## **2.0 SCOPING ACTIVITIES**

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### **2.1 Notice of Intent**

The public was notified of the project and upcoming scoping meetings through the NOI published in the Federal Register on July 24, 2009 (Appendix A). The NOI announced the intent to prepare an EIS and indicated that scoping meetings would be held in Mormon Lake and Flagstaff, Arizona. The NOI provided specific dates, locations, and times for each of the scoping meetings. In addition, the NOI provided project information including a description of proposed facilities, the project location, information on how to submit comments and why they are important, and Western contact information.

### **2.2 Scoping Packet**

The public, stakeholders, and many tribes and agencies were notified of the scoping period and comment opportunities through a scoping packet (Appendix A) distributed by direct mail to nearly 400 people on July 20, 2009. The scoping packet included a letter of introduction, project flyer, comment form, and project area map. The mailing list (Appendix B) was developed by the Forest Service through the Environmental Assessment process and was supplemented for the EIS to include: 1) residents and landowners within three miles of the 345kV transmission line, five miles of Forest Road 126, and ten miles of the wind park; 2) current local elected or municipal officials; 3) Federal and state agencies; 4) potentially interested Native American tribes; and 5) other stakeholders. The mailing provided information for submitting comments via mail, fax, and e mail, and included the direct contact information for the Western NEPA Document Manager, Mary Barger. The mailing list will be supplemented throughout the project to include those who provide scoping comments, attend meetings, or express their interest to Western in the Project through the Project website or direct request.

### **2.3 E-burst**

A list of email addresses (Appendix B), including members of the public, stakeholders, tribal representatives, and media was developed through the Environmental Assessment process and updated for the EIS to include approximately 170 individual email addresses. The materials that were included in the scoping packet were sent as digital copies to this list of recipients on the week of July 27, 2009.

### **2.4 Project Flyer**

The project flyer, included as part of the scoping packet, was posted in two public libraries in Flagstaff; in commercial buildings in the Navajo Chapters of Leupp and Dilkon, Arizona; and at the Meteor Crater RV Park and Visitor Center the week of July 27, 2009. The flyer included a brief overview of the project, including a schematic map; the location, dates, and times of each of the public scoping meetings; and the direct contact information for the Western NEPA Document Manager, Mary Barger.

## **2.5 Newspaper Advertisement**

A newspaper advertisement (Appendix A) was developed and published in the Arizona Daily Sun Wednesday, July 22, 2009 and Sunday, August 9, 2009; the Arizona Daily Sun “Midweek” free-distribution edition Wednesday, July 22, 2009; and the Navajo Hopi Observer Wednesday, July 22, 2009 and Wednesday, August 5, 2009. The advertisement included a brief overview of the project, including a schematic map; the location, dates, and times of each of the public scoping meetings; the URL of the project website; and the direct contact information for the Western NEPA Document Manager, Mary Barger.

The public scoping meetings were also promoted in the Arizona Daily Sun’s calendar of events on consecutive days the week of August 2, 2009.

## **2.6 Radio Announcement**

A radio underwriting spot (Appendix A) aired on KNAU, Arizona National Public Radio (NPR). The announcement provided the location, date, and time for each of the public scoping meetings. The underwriting spot aired 12 times from August 3 – 10, 2009, the week prior to the meetings. The spot aired five times on NPR’s “Morning Edition”, two times on “All Things Considered”, three times on “Talk”, and two times on “Weekend Edition” in an effort to reach a cross-section of audiences. KNAU is northern Arizona NPR and broadcasts across northern Arizona, including to the Navajo and Hopi reservations.

## **2.7 News Release**

A news release (Appendix A) was prepared and released to the media July 24, 2009 by Western’s public affairs officer. The news release provided a brief overview of the project; announced the locations, dates, and times of each of the public scoping meetings; provided information for submitting comments via mail, fax, and e-mail; introduced the project website; and included the direct contact information for the Western NEPA Document Manager, Mary Barger. The news release triggered articles in the Arizona Daily Sun, USA Today, and industry press.

## **2.8 Project Website**

A project website was developed and included within Western’s web page at <http://www.wapa.gov/transmission/grapevine.htm>. The website provided links to the materials distributed through direct mail and e-mail, and included: a brief project overview; location, dates, and times of each of the public scoping meetings; Notice of Intent; Project Area Maps; Comment Form (Print and Online); Project Flyer; News Release; and contact information. A copy of the front page of the project website is included in Appendix A. In addition, Foresight maintained an independent project

website at <http://www.grapevinewind.com> with a link to Western’s project website. A copy of the front page of this website is also included in Appendix A.

## 2.9 Public Scoping Meetings

Two public scoping meetings were held for the proposed project. At each scoping meeting, representatives from Western, Coconino National Forest, Foresight, and Transcon Environmental (the environmental consultant assisting Western with the EIS) were present. The meetings were organized in open-house format and attendees were allowed to speak with project representatives individually. In addition, a presentation was provided on the proposed project and associated facilities, project timeline, NEPA process, and how to provide comments. Display boards were provided showing maps of the project area and each of the three project components, information on the NEPA process, and information on submitting a comment. Comment forms were available at each meeting for attendees to provide written comments at the time of the meeting or to return by mail. Copies of scoping meeting materials including the presentation, display boards, and the comment form are provided in Appendix C. Locations, dates, and attendance of each public meeting are provided in Table 1. In addition, a copy of each meeting sign-in sheet is included in Appendix C.

<b>TABLE 1</b>		
Public Scoping Meeting Attendance		
<b>Location</b>	<b>Date</b>	<b>Attendance</b>
Mormon Lake, Arizona – Mormon Lake Fire Station	August 10, 2009	22
Flagstaff, Arizona – NACET	August 11, 2009	28
<b>Total Attendance at Scoping Meetings</b>		<b>50</b>

### 3.0 RESULTS OF SCOPING PROCESS

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Comments were received at each of the public scoping meetings, held August 10 and 11, and were collected by Western's NEPA Document Manager, Mary Barger, through letters, e-mails, an electronic comment card, and phone conversations throughout the scoping period, beginning July 24, 2009 and concluding on August 28, 2009.

A total of 24 comments were received from individuals and local, state, and Federal agencies. No comments were received from Native American tribes during the scoping period. Comments are included as Appendix D. Almost all of the comments identified one or more issues. The issues were grouped into 14 categories by the project team to aid in the interpretation and analysis of comments. The specific issues identified will aid in the assessment of impacts and analysis of resources in the EIS.

#### 3.1 Summary of Issues

<b>TABLE 2</b> Summary of Issues	
<b>Main Issue</b>	<b>Total Comments</b>
Project Description	3
Alternatives	6
Mitigation	3
Process	2
Ground Disturbance	2
Cultural Resources	4
Health and Safety	4
Land Use	5
Noise and Vibration	2
Socioeconomic	5
Transportation	1
Vegetation/Wildlife	35
Visual Resources	4
Cumulative Effects	8
<b>Total Unique Comments</b>	<b>84</b>

## **3.2 Issues Identified**

The following section provides a summary of unique issues identified through comments during scoping. Issues have been grouped into one of the aforementioned 14 categories. Copies of original comments are attached in Appendix D.

### 3.2.1 Project Description

- Will the roads be upgraded to an "all weather" road?
- Arizona Game and Fish Department (AGFD) requests all permanent met towers be unguyed, free standing structures. If possible, AGFD also requests temporary met towers be unguyed, free standing structures.
- To ensure that facilities are properly sited, a number of issues need to be considered, including transmission and its impacts.

### 3.2.2 Alternatives

- Consider installing tie-line underground.
- I understand the need for the added power to the Coconino area. If you proposed in an already developed area, where the game is not affected, I would be all for it.
- Key considerations for this project should include minimizing disturbance to the land for both the turbines and the transmission line. For example, can the tie-line be sited along an existing road rather than creating new roads and new disturbance?
- Regarding any transmission line associated with the project, we ask that the line length be kept as short as possible to avoid disturbing larger areas and that the lines be designed in a manner to minimize impact on wildlife.
- Burying the tie-in lines should be considered.
- I feel the area on the other side of Grapevine Canyon should not be considered as it is too remote.

### 3.2.3 Mitigation

- Remediation of disturbed areas.
- Restoration of the disturbed area with native vegetation.
- Wind requires many gravel roads for construction and placement of the towers - these roads should be fully decommissioned and restored to natural conditions, at least on any state or public lands involved in the project. The road system should be capable of reclamation and rehabilitation, and all roads not essential for routine maintenance should be recontoured and revegetated with native seeds/plants of species that are endemic to the area.

#### 3.2.4 Process

- Our Department (AGFD) has been engaged on the Grapevine energy project, and associated personnel for several years. We have met with Foresight and WEST, Inc. many times to discuss potential wildlife issues and commented and reviewed their Final Report for Phase I of the project. Western's report and data collection for Phase I was completed prior to the finalization of the Department's Wind Energy Guidelines; therefore we look forward to meeting with Western Energy Power and Foresight to discuss how best our Guidelines can help facilitate avoiding impacts to wildlife.
- We (AGFD) would like to meet with you and your staff soon, as this project progresses through the NEPA process.

#### 3.2.5 Ground Disturbance

- Collection system will be plowed in - amount of disturbed land.
- What will be the impacts of construction?

#### 3.2.6 Cultural Resources

- How is the Hopi Tribe being informed in regards to the project since it is close to their lands?
- If impacts on cultural or historic resources affecting tribal values are found, will the tribes, in this case the Hopi Tribe, be informed and get involved?
- The project area is rich in archaeological sites in general, and rock art (petroglyph) sites in particular. These cultural resources must be located, documented, and protected.
- RE: map grid 18 N 10 E, 05-06, very fragile and sensitive native site. I (James Baker) can show you this site.

#### 3.2.7 Health and Safety

- We invite Western to review the section in our (AGFD) guidance related to met tower construction and safety to aircraft pilots.
- Low-level aerial flights can occur outside routine wildlife survey routes. GPS locations of all towers need to be provided to AGFD prior to construction to allow survey aircraft to avoid the towers. In addition, AGFD requests project proponents notify the Department when met towers are removed.
- For all monopole towers  $\geq 50$  feet tall, paint the top 30 feet of the tower in alternate orange and white paint. This does not apply to lattice towers or lit towers, both of which are more visible than monopoles.

- Low-level aerial flights can occur outside routine wildlife survey routes. Because it is known that dangerous incidents can occur between towers and aircraft, GPS locations of all towers need to be provided to the AGFD prior to construction.

### 3.2.8 Land Use

- Will firearm hunting be restricted in this area of 70 square miles?
- All weather roads to 330 turbines is a huge amount of "spider web" roads. Will the entire area be open to the public in perpetuity or fenced off?
- How close is the project to the Hopi Tribes fee lands and trust lands?
- This area is where I hunt on a daily basis.
- Would there be any closed hunting areas?

### 3.2.9 Noise and Vibration

- I am concerned about vibration from trucks.
- What are the noise impacts of the wind turbines and how will those impacts be mitigated? Outdoor recreation, particularly quiet recreation, is the major attraction for many National Forest visitors. People visit our national forests to relax, view wildlife, hike, walk, and camp. These wind turbines generate noise in frequencies from 20 - 3,600 Hz. The frequencies vary with the speed of wind, the pitch and speed of the blades. How noticeable or annoying the wind turbine noise will be depends on the level of ambient noise. The noise of the turbines relative to the ambient noise levels should be addressed in NEPA process.

### 3.2.10 Socioeconomic

- Western gives a certain percentage to the Hopi Tribe from the hydro power. Will this percentage change dollar wise?
- Would like an agreement between investors and Forest Service to maintain the improved FS Road #126. Project workers will utilize the road; therefore they should share in maintenance expense.
- Within the Socioeconomic portion of the NEPA process as portrayed at the 8/11/09 public meeting, SRP believes that Western should evaluate the potential impacts of the proposed project on existing Western customers.
- Being in a partnership with the Metzger Flying M is good for the local economy.
- As part of Western's socioeconomic evaluation of this proposal, it should evaluate the potential impacts on Western's current firm electric and transmission service customers, from operational and rates perspectives. Analysis of specific cost allocation and cost responsibility methodologies should be employed.



### 3.2.11 Transportation

- This site does not appear to be easily accessible to the heavy equipment necessary for construction and maintenance. There is also the issue of hauling the towers and the turbines to the site.

### 3.2.12 Vegetation/Wildlife

- Impacts to Wildlife, primarily antelope, deer, and elk habits need to be studied and reported.
- Are there any eagle nesting areas within the proposed wind park project area?
- Pronghorn impacts?
- Study migration/routes of travel for birds, especially in relation to Mormon Lake and Upper /Lower Lake Mary, also for wildlife/large animals.
- Your project seems to have low impact on the desert scrub juniper environment.
- The latest wind turbine development minimizes impact on birdlife.
- I would like to see the proposed area stay the same based on the wildlife impacted, mainly the elk and big game.
- I like the idea of being able to drive 45 minutes to the proposed area and see the elk and big game not be affected in any means.
- The new paved road will affect the game traveling habits. The increase of traffic and equipment will also make the game move to a less traveled area.
- The AGFD generally supports the development of wind energy as a viable source of clean and renewable energy. We believe with proper site placement and safeguards, the benefits of utilizing wind energy outweigh the potential for negative effects to wildlife populations.
- While we believe that wind can be a viable option for energy, we are concerned that specific sites may have an increased potential for negative impacts to certain breeding, migratory, and wintering species. To address these concerns and to facilitate working relationships with project partners, the Department (AGFD) has created Wind Energy Guidelines entitled Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona. These guidelines can be found on our website at <http://www.azgfd.gov/hgis/guidelines.aspx>.
- The Department (AGFD) foresees a potential first meeting as a discussion of which Category (see page 18 of the Guidelines) the Grapevine Project may fit into, and how that Category may dictate pre and post construction monitoring. Additionally, the Department would like to discuss further pre-construction data collection specifically as it relates to Phase II, which currently has not been monitored for potential wildlife impacts.
- If guy wires are present, AGFD recommends the applicant attach Bird Flight Diverters (BFDs) at 10-meter intervals along the length of each guy wire (Note: There are several manufacturers of BFDs: TYCO, Preformed Line Products, Dulmison, etc.). Research shows the attachment of BFDs

can reduce bird collisions by as much as 86-89% (Pope et al., 2006.  
[http://www.chelanpud.org/documents/Burch\\_Final\\_Report\\_V1.pdf](http://www.chelanpud.org/documents/Burch_Final_Report_V1.pdf)).

- AGFD recommends all temporary towers are only on site for the minimum amount of time needed to monitor the wind resource. If towers are on site for more than 1 year, AGFD recommends carcass searches be implemented, especially during the bird migration period (see Chapter 5, Post-construction Monitoring and Reporting).
- If a temporary tower is going to become a permanent structure for the life of the project, AGFD recommends the tower(s) be included as part of the longer term (pre-construction and post-construction) monitoring program.
- AGFD recommends the applicant place acoustic monitoring stations on met towers in the proposed project area (Note: This will help collect bat activity information needed for pre-construction analysis). Acoustic monitoring should be intensified during bat migration periods (August 16 – October 31). Acoustic data collection objectives should strive to collect as much acoustic information as is feasible across seasons with an emphasis on migration periods.
- Work with AGFD to determine the number of acoustic monitoring stations needed to adequately cover the project area. The number of acoustic stations will depend on project footprint and habitat complexity.
- When siting met towers, avoid habitat features that congregate wildlife such as water resources, habitat edges, etc.
- The Department (AGFD) has attached two wildlife lists (Appendix D) to consider during the analysis of effects from this project. The special status species list was obtained during review of Phase 1 and 2 of the Grapevine project from the Heritage Data Management System (HDMS). Because this list may be outdated, the Department recommends contacting our Phoenix Program Evaluation Program ([pep@azgfd.gov](mailto:pep@azgfd.gov)) office to obtain any additional species information that may have been reported recently. Although only Federally-listed species and state species of concern are identified within HDMS system, species protected by other Federal and state laws are applicable and need to be considered in project planning. Therefore, we are also providing a list from the Arizona Breeding Bird Atlas (ABBA) which identifies bird species in the area during their respective breeding seasons.
- The Department (AGFD) also encourages Western to contact the USFWS's Ecological Services in Flagstaff for wildlife issues that pertain to Threatened and Endangered Species.
- What are the impacts to wildlife?
- Generally with wind projects, bat and bird species are of concern. How will this project affect them, and what will be done to minimize those impacts?

- Arizona has 28 species of bats and at least some of those species inhabit the area of the proposed Grapevine Wind Project including pallid bats (*Antrozous pallidus*), big brown bats (*Eptesicus fuscus*), Allen's lappet-browed bats (*Idionycteris phyllotis*), and others. Allen's lappet-browed bat forms maternity colonies in ponderosa pine snags and the big brown bats can be found in ponderosa pine forests and pinon-juniper woodland. The NEPA analysis associated with this project should include consideration of the species of bats in the area and the potential impacts on those bats. Can impacts be mitigated and how? Studies of bat fatalities indicate that weather patterns affect them - most bats are killed on nights with lower wind speeds. More bats were killed before and after storm fronts passed through as well.
- The installation should be designed to discourage birds from landing on the towers and all other structures. Birds and bats have had major conflicts with some earlier wind projects. To what degree can these problems be solved or mitigated with new designs? Please evaluate this in the NEPA process for this project.
- Care should be taken not to promote the spread of invasive non-native plant species by ensuring that disturbed areas are revegetated and that any equipment used is cleaned thoroughly before and after entering the area.
- I am concerned about how this would affect the antelope, deer, and elk populations, and migration and birthing in this area.
- How will the improved road and powerline affect the wildlife?
- I feel the wildlife and hunting will suffer because of the environment of this area.
- Be advised that nearly all native species of birds in the United States are Federally protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712). Under this Act it is unlawful to “pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess... any migratory bird, any part, nest, or egg of any such bird...” of the species protected under the Act, unless such take is authorized by permit. A list of protected species may be found at Title 50, Code of Federal Regulations, Part 10. There is no permit available under the MBTA that authorizes incidental take of migratory birds, so it will be in the interest of Foresight Flying M, LLC to take steps to avoid take of migratory birds as much as possible.
- In order to avoid violations of the MBTA through destruction of active bird nests, habitat clearing for this project should occur outside the local avian nesting season. In this region the months September through March would constitute the non-breeding season for most species, although even in those months some nesting may occur. Once the specific region for the project is identified, this office (USFWS) (also AGFD) will be able to identify potential nesting species during the “non-breeding” months.

- An inventory of active raptor nests should be completed before construction begins to determine their locations and if there are any Golden Eagle territories in the vicinity. Golden Eagles nest throughout this region wherever there are suitable cliffs and an appropriate food supply, thus it is likely that there will be some nesting pairs either within or adjacent to the project area. Destruction of or causing abandonment of a Golden Eagle nest would constitute a violation of the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d).
- In addition to eagles, other species of raptors that may nest in or near the project area include Red-tailed, Ferruginous, and Swainson's hawks, Great Horned, Barn, and Burrowing owls, and possibly Peregrine and Prairie falcons. Turbine placement should take into account nest locations and movement patterns of these species (particularly the eagles and falcons) and avoid those areas as much as possible. Further, eagle and other raptor movements through this region during spring and fall migrations are not well known; these should be monitored through each of those seasons during the pre-construction phase to identify concentration corridors that should potentially be avoided.
- A thorough understanding of the status and distribution of all birds of conservation concern found in the project area will help to reduce impacts to declining species during the habitat-altering activities. This should include those species identified as conservation priorities in the USFWS 2008 list of Birds of Conservation Concern (<http://www.fws.gov/migratorybirds>), the Partners in Flight Species Assessments for that region (<http://www.rmbo.org/pif/pifdb.html>), and the Arizona State Wildlife Action Plan ([http://www.azgfd.gov/w\\_c/cwcs.shtml](http://www.azgfd.gov/w_c/cwcs.shtml)). One of these species of concern is the Gray Vireo, which is a specialist of the habitats described in the NOI for the project area (pinyon-juniper and associated brushlands). Impacts to this species in particular should be addressed prior to construction and Gray Vireo locations avoided if possible.
- Because bats are also an issue with wind energy facilities, seasonal and annual occurrence of bats, locations of hibernacula, breeding colonies, and roosts should be thoroughly assessed as well as locations of predictable flight lines. These assessments should include migratory bats such as those in the Lasiurine group (e.g. hoary bat, silver-haired bat), which have been shown to be particularly vulnerable to blade strikes.
- Finally, wind turbine placement and FAA-required lighting should follow the USFWS guidelines available, respectively, at:  
[http://www.fws.gov/habitatconservation/windpower/wind\\_turbine\\_advisory\\_committee.html](http://www.fws.gov/habitatconservation/windpower/wind_turbine_advisory_committee.html) and  
<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>. Although these guidelines are considered voluntary, it is important to keep these in mind to minimize impacts to birds at these facilities.

### 3.2.13 Visual Resources

- "Topographic simulations" are critical to understanding and visualizing this project. (3D Visual Models)
- Visual Impacts are also a consideration. How will this project affect the viewshed? The impact could be reduced by burying the tie-in line.
- Can the structures and visible mechanisms be painted to minimize impact on the viewshed?
- Any aircraft warning lights should be no more intrusive to the surrounding night time viewshed than is actually necessary - no strobe lights should be allowed.

### 3.2.14 Cumulative Effects

- How is the Navajo Wind Project going to effect the power distribution on the Western transmission line?
- NEPA mandates that the environmental impacts, including any cumulative impacts as well as direct and indirect impacts of the project be considered.
- How will Western ensure that there are no negative impacts resulting from the proposed project on Colorado River Storage Project (CRSP) firm electric and/or transmission service deliveries to customers?
- How will Western ensure that there are no negative impacts resulting from the proposed project on the long-standing SRP-Western 2468 agreement?
- Given the proponents stated intent to sell energy from the facility to prospective non-preference customers, how will Western ensure that the utilization of Western's facilities for this purpose will not impact preference customers holding long term CRSP contracts that extend through the year 2024?
- With respect to one of the sister agencies that you referred to during the 8/11/09 public scoping meeting, and given the challenges that Bonneville Power Administration has encountered with respect to integrating wind resources into its northwest system, SRP suggests that Western address its plan for managing the control area and associated operational challenges that are inherent to dealing with intermittent resource integration within the EIS.
- The environmental impact statement must account for the cumulative impacts of the proposal and that would obviously include transmission service. Moreover, the applicant is required to pay for a study of available transfer capability. It is our information that the Glen Canyon to Pinnacle Peak line is already a constrained path. Thus, it is vital that this study be done at this stage in order to properly assess the impacts on Western and its facilities as well as the impacts on its customers whose CRSP deliveries depend on transfer capability on this line. In short, the transmission service process cannot be bifurcated and any attempt to do so is in violation of NEPA and contrary to

Federal Energy Regulatory Commission (FERC) Orders 888 and 889 which Western has agreed to abide by.

- Western's analysis should include how the addition of this resource will affect system reliability and operational impacts, including control area and other issues associated with the integration of an intermittent resource, on an already constrained transmission path.

### **3.3 Comments Outside the Scope of the EIS**

Several comments were received that were outside the scope of the EIS or were not considered an issue. Four comments were not considered issues, including: three comments that were simple requests for further information; one comment marketing geotechnical construction work; and another comment expressing support for the project. Two comments were considered outside the scope of the EIS. One comment requested the wind turbines be built in the United States. The other comment requested information on the Hopi Project, previously proposed by Foresight.

**APPENDIX A**

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ANNOUNCEMENTS

**NOTICE OF INTENT**

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*Description:* 2009 Annual Report of Cash Out Activity of Cimarron River Pipeline, LLC.

*Filed Date:* 07/14/2009.

*Accession Number:* 20090714-5032.

*Comment Date:* 5 p.m. Eastern Time on Monday, July 27, 2009.

*Docket Numbers:* RP09-828-000.

*Applicants:* Texas Gas Transmission, LLC.

*Description:* Texas Gas Transmission, LLC submits Fourth Revised Sheet 99A to FERC Gas Tariff, Third Revised Volume 1.

*Filed Date:* 07/14/2009.

*Accession Number:* 20090714-0102.

*Comment Date:* 5 p.m. Eastern Time on Monday, July 27, 2009.

*Docket Numbers:* RP09-829-000.

*Applicants:* Midcontinent Express Pipeline LLC.

*Description:* Midcontinent Express Pipeline LLC submits two amendments to an existing negotiated rate Transportation Rate Schedule FTS Agreement between MEP and Newfield Exploration Mid-Continent Inc.

*Filed Date:* 07/14/2009.

*Accession Number:* 20090714-0101.

*Comment Date:* 5 p.m. Eastern Time on Monday, July 27, 2009.

Any person desiring to intervene or to protest in any of the above proceedings must file in accordance with Rules 211 and 214 of the Commission's Rules of Practice and Procedure (18 CFR 385.211 and 385.214) on or before 5 p.m. Eastern time on the specified comment date. It is not necessary to separately intervene again in a subdocket related to a compliance filing if you have previously intervened in the same docket. Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to the proceeding. Anyone filing a motion to intervene or protest must serve a copy of that document on the Applicant. In reference to filings initiating a new proceeding, interventions or protests submitted on or before the comment deadline need not be served on persons other than the Applicant.

The Commission encourages electronic submission of protests and interventions in lieu of paper, using the FERC Online links at <http://www.ferc.gov>. To facilitate electronic service, persons with Internet access who will eFile a document and/or be listed as a contact for an intervenor must create and validate an eRegistration account using the eRegistration link. Select the eFiling link to log on and submit the intervention or protests.

Persons unable to file electronically should submit an original and 14 copies

of the intervention or protest to the Federal Energy Regulatory Commission, 888 First St., NE., Washington, DC 20426.

The filings in the above proceedings are accessible in the Commission's eLibrary system by clicking on the appropriate link in the above list. They are also available for review in the Commission's Public Reference Room in Washington, DC. There is an eSubscription link on the Web site that enables subscribers to receive e-mail notification when a document is added to a subscribed docket(s). For assistance with any FERC Online service, please e-mail [FERCOnlineSupport@ferc.gov](mailto:FERCOnlineSupport@ferc.gov) or call (866) 208-3676 (toll free). For TTY, call (202) 502-8659.

**Nathaniel J. Davis, Sr.,**

*Deputy Secretary.*

[FR Doc. E9-17664 Filed 7-23-09; 8:45 am]

**BILLING CODE 6717-01-P**

## DEPARTMENT OF ENERGY

### Western Area Power Administration

#### Interconnection of the Grapevine Canyon Wind Project, Coconino County, AZ

**AGENCY:** Western Area Power Administration, DOE.

**ACTION:** Notice of Intent to Prepare an Environmental Impact Statement/ Environmental Impact Report and Conduct Scoping Meetings; Notice of Floodplain and Wetlands Involvement.

**SUMMARY:** The Western Area Power Administration (Western), an agency of the DOE, intends to prepare an environmental impact statement (EIS) on the interconnection of the Grapevine Canyon Wind Project (Project) in Coconino County, near Flagstaff, Arizona. Foresight Flying M, LLC (Foresight) has applied to Western to interconnect the proposed Project to Western's power transmission system on its Glen Canyon-Pinnacle Peak Transmission Line. Western is issuing this notice to inform the public and interested parties about Western's intent to prepare an EIS, conduct a public scoping process, and invite the public to comment on the scope, proposed action, alternatives, and other issues to be addressed in the EIS.

The EIS will address Western's Federal action of interconnecting the proposed Project to Western's transmission system and making any necessary modifications to Western facilities to accommodate the interconnection. The EIS will also review the potential environmental

impacts of constructing, operating, and maintaining Foresight's wind generation facility and associated facilities, including access roads, collection and feeder lines, step-up substation, communications system, transmission tie-line, and switchyard.

**DATES:** The public scoping period begins with the publication of this notice and closes on August 28, 2009. Public scoping meetings will be held on August 10 and 11, 2009.

**ADDRESSES:** Please see the **SUPPLEMENTARY INFORMATION** section for scoping meeting locations. Written comments on the scope of the EIS should be addressed to Ms. Mary Barger, National Environmental Policy Act (NEPA) Document Manager, Western Area Power Administration, Desert Southwest Region, P.O. Box 6457, 615 S. 43rd Avenue, Phoenix, AZ 85005 or [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov).

**FOR FURTHER INFORMATION CONTACT:** Ms. Mary Barger, NEPA Document Manager, Western Area Power Administration, Desert Southwest Region, P.O. Box 6457, 615 S. 43rd Avenue, Phoenix, AZ 85005, telephone (602) 605-2524, fax (602) 605-2630, or e-mail [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov). For general information on DOE's NEPA review procedures or status of a NEPA review, contact Ms. Carol M. Borgstrom, Director of NEPA Policy and Compliance, GC-20, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, telephone (202) 586-4600 or (800) 472-2756.

**SUPPLEMENTARY INFORMATION:** Western, an agency within DOE, markets Federal hydroelectric power to preference customers, as specified by law. These customers include municipalities, cooperatives, irrigation districts, Federal and State agencies, and Native American tribes. Western's service territory covers 15 western states, including Arizona. Western owns and operates more than 17,000 miles of high-voltage transmission lines.

Foresight has applied to Western to interconnect the proposed Project at a new switchyard on Western's Glen Canyon-Pinnacle Peak Transmission Line. Western offers capacity on its transmission system to deliver electricity, when such capacity is available, under Western's Open Access Transmission Service Tariff.

Foresight also has applied to the U.S. Forest Service for a permit to build, operate, and maintain a portion of the proposed project on Coconino National Forest land. Additionally, Foresight is subject to State and local approvals prior to building the proposed Project, including the following: a Certificate of

Environmental Compatibility from the Arizona Corporate Commission, right of way from the Arizona State Land Department, and a Conditional Use Permit from Coconino County.

### Project Description

Foresight proposes to construct a wind energy generation project up to 500 megawatts (MW). It would occupy approximately 55 square miles in Coconino County, Arizona. The wind generation component of the proposed Project would be located about 22 miles southeast of Flagstaff and about 18 miles south of the Twin Arrows Interstate-40 interchange. It would be located within the Pinyon-Juniper Woodland Ecozone of the Colorado Plateau Semi-Desert Province in the northeastern quarter of Arizona. The area has primarily pinyon-juniper and desert scrub vegetation types. The current land use is agricultural, primarily livestock grazing. Each wind turbine would involve the disturbance of about 1.0 to 1.6 acres.

The wind generation component of the proposed Project would be constructed on private lands and land administered by the Arizona State Land Department. The proposed Project would generate electricity from wind turbine generators rated at 1.5 to 3.0 MW. Final turbine selection and size is subject to further wind analysis, and will determine the number of turbines. Each turbine would have three blades that would revolve at less than approximately 18 revolutions per minute. Each blade would measure 125 to 185 feet long. The single pole structures supporting each of the turbines would be up to 325 feet high and approximately 20 feet in diameter at the base. Each turbine structure would be up to approximately 500 feet high, when a blade is in the 12 o'clock position. Each would be installed on a concrete base, and would have a pad-mounted transformer near the base. Lighting would be in accordance with Federal Aviation Administration requirements.

There would be an all-weather service road constructed to each turbine location. The wind turbines would be connected by an electrical collection system, power collection circuits, and a communications network. This collection system would be buried, where feasible, in areas without major subsurface obstructions. Foresight would site the wind turbine generators to optimize wind and land resources in the area while minimizing environmental impacts to the extent practicable. Foresight would comply with local zoning requirements, including setbacks from residences,

roads, and existing transmission and distribution lines. Foresight would begin construction on the proposed Project approximately fall 2010. The life of the proposed Project is anticipated to be a minimum of 30 years.

To support delivery of the power generated by the Project, Foresight proposes to build a new 345-kV transmission tie-line, approximately 9 miles in length, to a new 345-kV switchyard, located immediately adjacent to Western's existing Glen Canyon-Pinnacle Peak Transmission Line. The transmission tie-line would cross lands administered by Coconino National Forest. The right-of-way for the transmission line would be about 8.5 miles in length by 200 feet wide, for a total disturbance area of about 206 acres. The physical area affected by the new switchyard would be about 10 acres. The proposed Project area would be accessed by an existing road about 18 miles in length that would require some realignment for construction activities.

### Proposed Agency Action and Alternatives

Western's proposed action is to interconnect the proposed Project to Western's transmission system. The U.S. Forest Service's proposed action is to grant a permit for the transmission line to cross Federal lands and for associated road improvements. Any additional action alternatives identified will be analyzed in the EIS.

Western will also consider the no-action alternative in the EIS. Under the no-action alternative Western would not interconnect and/or the U.S. Forest Service would not issue a permit.

### Agency Responsibilities

Because interconnection of the proposed Project would incorporate a major new generation resource into Western's power transmission system, Western has determined that an EIS is required under DOE NEPA implementing procedures, 10 CFR part 1021, subpart D, Appendix D, class of action D6. Western will be the lead Federal agency for preparing the EIS, as defined at 40 CFR 1501.5. The proposed Project includes construction of a tie-line across Coconino National Forest land, for which the U.S. Forest Service has jurisdiction and has agreed to be a cooperating agency for preparation of the EIS. Western will invite other Federal, State, local, and tribal agencies with jurisdiction by law or special expertise with respect to environmental issues to be cooperating agencies on the EIS, as defined at 40 CFR 1501.6. Such agencies may also make a request to Western to be a cooperating agency by

contacting Ms. Barger at the address listed above in the **ADDRESSES** section.

The proposed Project may affect floodplains or wetlands. This notice also serves as notice of proposed floodplain or wetland action, in accordance with 10 CFR part 1022.

### Environmental Issues

This notice is to inform agencies and the public of Western's intent to prepare an EIS and solicit comments and suggestions for consideration in the EIS. To help the public frame its comments, the following list contains potential environmental issues preliminarily identified for analysis in the EIS:

1. Impacts on protected, threatened, endangered, or sensitive species of animals or plants.
2. Impacts on avian and bat species.
3. Impacts on land use, recreation, and transportation.
4. Impacts on cultural or historic resources and tribal values.
5. Impacts on human health and safety.
6. Impacts on air, soil, and water resources (including air quality and surface water impacts).
7. Visual impacts.
8. Socioeconomic impacts and disproportionately high and adverse impacts to minority and low-income populations.

This list is not intended to be all-inclusive or to imply any predetermination of impacts. Western invites interested parties to suggest specific issues within these general categories, or other issues not included above, to be considered in the EIS.

### Public Participation

The EIS process includes a public scoping period; public review and hearings on the draft EIS; publication of a final EIS; and publication of a record of decision (ROD). The public scoping period begins with publication of this notice and closes August 28, 2009. At the conclusion of the NEPA process, Western and the U.S. Forest Service will each prepare a ROD. Persons interested in receiving future notices, Project information, copies of the EIS, and other information on the NEPA review process should contact Ms. Barger at the address listed above in the **ADDRESSES** section.

Western will hold public scoping meetings as follows:

1. August 10, 2009, Mormon Lake Fire Station, 43 Mormon Lake Road, Mormon Lake, AZ 86038.
2. August 11, 2009, Northern Arizona Center for Emerging Technologies (NACET), 2225 N. Gemini Drive, Flagstaff, AZ 86001.

Each meeting is scheduled for 6–8 p.m. with an open-house format, during which attendees are invited to speak one-on-one with agency and Project representatives. Project presentations will be given at 6:15 and 7:30 p.m. Attendees are welcome to come and go at their convenience throughout the meeting.

The purpose of the scoping meetings is to provide information about the proposed Project, review Project maps, answer questions, and take written comments from interested parties. All meeting locations are handicapped-accessible. Anyone needing special accommodations should contact Ms. Barger to make arrangements.

The public will have the opportunity to provide written comments at the public scoping meetings, or send them to Western by fax, e-mail, or U.S. Postal Service mail. To help define the scope of the EIS, comments should be received by Western no later than August 28, 2009.

Dated: July 15, 2009.

**Timothy J. Meeks,**  
Administrator.

[FR Doc. E9–17700 Filed 7–23–09; 8:45 am]  
BILLING CODE 6450–01–P

## DEPARTMENT OF ENERGY

### National Nuclear Security Administration

#### Notice of Intent To Prepare an Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada Test Site and Off-Site Locations in the State of Nevada

**AGENCY:** U.S. Department of Energy's National Nuclear Security Administration.

**ACTION:** Notice of intent to prepare an environmental impact statement and conduct public scoping meetings.

**SUMMARY:** Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality (CEQ) and the U.S. Department of Energy (DOE) regulations implementing NEPA (40 CFR Parts 1500–1508 and 10 CFR Part 1021, respectively), the National Nuclear Security Administration (NNSA), a semi-autonomous agency within DOE, announces its intention to prepare a site-wide environmental impact statement (SWEIS) (DOE/EIS–0426) for the continued operation of DOE/NNSA activities at the Nevada Test Site (NTS)

and certain off-site locations (the Remote Sensing Laboratory at Nellis Air Force Base, Las Vegas, Nevada, the DOE/NNSA campus in North Las Vegas, and the Nevada Test and Training Range (NTTR) including activities at the Tonopah Test Range (TTR)) in the State of Nevada. The purpose of this notice is to invite individuals, organizations, and government agencies and entities to participate in developing the scope of the SWEIS.

The new SWEIS will consider a No Action Alternative, which is to continue current operations through implementation of the 1996 Record of Decision (ROD) (61 FR 65551; 12/13/96), and subsequent decisions. Three action alternatives proposed for consideration in the SWEIS would be compared to the No Action Alternative. The three action alternatives would differ by either their type or level of ongoing operations and may include proposals for new operations or the reduction or elimination of certain operations.

**DATES:** NNSA invites comments on the scope of this SWEIS. The public scoping period starts with the publication of this notice in the **Federal Register** and will continue through October 16, 2009. NNSA will consider all comments defining the scope of the SWEIS received or postmarked by this date. Comments received or postmarked after this date will be considered to the extent practicable. NNSA will conduct public scoping meetings in Las Vegas, Tonopah and Pahrump, Nevada and St. George, Utah scheduled as follows:

- Thursday, September 10, 2009—2–4 p.m. and 6–8 p.m.  
Frank H. Rogers Science & Technology Building, Desert Research Institute, 755 East Flamingo Road, Las Vegas, NV.
- Monday, September 14, 2009—5:30–7:30 p.m.  
Bob Ruud Community Center, 150 North Highway 160, Pahrump, NV.
- Wednesday, September 16, 2009—5:30–7:30 p.m.  
Tonopah Convention Center, 301 Brougner Ave., Tonopah, NV.
- Friday, September 18, 2009—5:30–7:30 p.m.  
Holiday Inn Conference Center, 850 South Bluff Street, St. George, Utah.

These scoping meetings will provide the public with an opportunity to present comments, ask questions, and discuss issues with NNSA officials regarding the SWEIS. Preparation of the SWEIS will require participation of other Federal agencies. As bordering land managers, the USAF and BLM have an inherent interest in activities at the

Nevada Test Site (NTS). The DHS and DTRA are tenant organizations with ongoing and future operations at the NTS: Therefore requests for cooperating agency participation will be extended to the DOE, Department of Defense, U.S. Air Force (USAF) and the Defense Threat Reduction Agency (DTRA), the Department of Homeland Security (DHS), and the Department of the Interior, Bureau of Land Management (BLM.)

**ADDRESSES:** To submit comments on the scope of the SWEIS, questions about the document or scoping meetings, or to be included on the document distribution list, please contact: Linda M. Cohn, NNSA Nevada Site Office, SWEIS Document Manager, P.O. Box 98518, Las Vegas, Nevada 89193–8518; telephone (702) 295–0077; fax (702) 295–5300; or e-mail address: [nepa@nv.doe.gov](mailto:nepa@nv.doe.gov).

**FOR FURTHER INFORMATION CONTACT:** For general information about the DOE NEPA process, please contact: Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (GC–20), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585; e-mail: [askNEPA@hq.doe.gov](mailto:askNEPA@hq.doe.gov); telephone: 202–586–4600, or leave a message at 1–800–472–2756; or fax: 202–586–7031. Please note that U.S. Postal Service deliveries to the Washington, DC office may be delayed by security screening. Additional information regarding DOE NEPA activities is available on the Internet through the NEPA Web site at <http://www.gc.energy.gov/nepa>.

#### SUPPLEMENTARY INFORMATION:

##### Background

The NTS occupies about 1,375 square miles (3,561 square kilometers) in southern Nevada, and is surrounded on three sides by the U.S. Air Force Nevada Test and Training Range (NTTR) (formerly the Nellis Air Force Range) and the Desert National Wildlife Refuge. The fourth boundary is shared with the Bureau of Land Management. The Nevada Site Office (NSO) operations are managed and performed for DOE/NNSA under contract by a management and operating contractor (currently National Security Technologies, LLC) which teams with personnel from Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Sandia National Laboratories as well as other governmental entities to perform NTS mission-related activities. NTS is a multi-disciplinary, multi-purpose facility primarily engaged in work that supports national security, homeland security initiatives, waste management, environmental restoration, and defense

**DIRECT MAIL PACKET**

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**Department of Energy**  
Western Area Power Administration  
Desert Southwest Customer Service Region  
P.O. Box 6457  
Phoenix, AZ 85005-6457

July 20, 2009

Dear Interested Party;

This letter is to inform you that Western Area Power Administration (Western) plans to prepare an Environmental Impact Statement (EIS) on the interconnection of the proposed Grapevine Canyon Wind Project in Coconino County.

Western is an agency of the U.S. Department of Energy and has the responsibility, under the National Environmental Policy Act (NEPA), to prepare an EIS. Western will be the lead Federal agency for preparing the EIS, and the U.S. Forest Service has agreed to be a co-operating agency. Previously, an environmental assessment was begun under the direction of the U.S. Forest Service; however, Western's involvement requires an EIS.

Western will host open-house public scoping meetings from 6:00pm to 8:00pm on August 10 and 11, 2009, in order to share information about the proposed project and get feedback on the scope of the EIS. The informal meetings will provide the public and interested parties with the opportunity to learn about the NEPA process, meet one-on-one with project team members, ask questions, and make comments. Presentations will be at 6:15pm and 7:30pm, with an open-house format from 6:00-8:00pm for both meetings.

**Meeting information:**

- **Monday, August 10, 2009, 6:00-8:00pm**
  - Mormon Lake Fire Station, 43 Mormon Lake Road, Mormon Lake, AZ
- **Tuesday, August 11, 2009, 6:00-8:00pm**
  - NACET Conference Room, 2225 N. Gemini Drive, Flagstaff, AZ

Foresight Flying M, LLC, the project proponent, proposes to construct a wind energy generation project up to 500 megawatts. The project would be located on privately owned ranch lands, and trust lands administered by the Arizona State Land Department. The project location is approximately 22 miles southeast of Flagstaff, and about 18 miles south of the I-40 Twin Arrows interchange.

To support delivery of the power generated by the project, the proponent proposes to build a new 345-kV transmission tie-line to interconnect with Western's existing Glen Canyon-Pinnacle Peak Transmission Line. The transmission tie-line would cross lands administered by Coconino National Forest.

The project area would be accessed by the existing F.S. 126 road, south of the I-40 Twin Arrows interchange, which will require some realignment for construction activities. A new switchyard at the interconnection point with the new 345-kV transmission line will be built on the Coconino National Forest.

Western would like to extend an invitation to you to provide your comments on the abovementioned proposition. Your comments will help Western define issues and alternatives for evaluation of the environmental impacts of the proposed project. Comments can be provided in person at the public meetings, by mail, e-mail, or telephone via the contact information below. A pre-addressed and stamped comment form is enclosed for your convenience. To ensure consideration as we develop the EIS, Western should receive your comments by August 28, 2009.

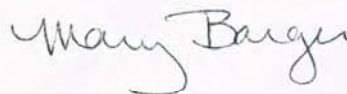
A project flyer and map are included for your review. Additional project information and directions to the public meetings are available at the project website.

**Contact information:**

Website: [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)  
E-mail: [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)  
Project phone: (602) 605-2524  
Project fax: (602) 605-2630  
Mail: Western Area Power Administration  
ATTN: Mary Barger  
P.O. Box 6457  
Phoenix, AZ 85005

On behalf of Western and the project team, I look forward to discussing the project with you and hearing any comments that you may have.

Sincerely,



Mary Barger  
NEPA Document  
Manager

Enclosures



## Your Comment is Welcome

Your comments will help define issues and alternatives for evaluation in the environmental impact statement.

The public scoping comment period closes August 28, 2009.



For more information visit the project website at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm) or contact Mary Barger Western Area Power Administration PO Box 6457 Phoenix, AZ. 85005 telephone 602-605-2524, fax 602-605-2630, email [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)

# Grapevine Canyon Wind Project

## PUBLIC SCOPING for NEPA PROCESS

Western Area Power Administration (Western) will host open house public scoping meetings August 10 and 11, 2009, to share information about the proposed Grapevine Canyon Wind Project.

Learn about the National Environmental Policy Act (NEPA) process, meet with project team members, ask questions and make comments at the informal meetings. Project presentations will be given at 6:15 and 7:30 pm, with an open house format from 6-8 pm.

## PUBLIC SCOPING MEETINGS

Monday, August 10, 6-8 pm  
Mormon Lake Fire Station  
43 Mormon Lake Rd  
Mormon Lake, AZ

Tuesday, August 11, 6-8 pm  
NACET Conference Room  
2225 N. Gemini Drive  
Flagstaff, AZ

## PROJECT INFORMATION and VICINITY MAP

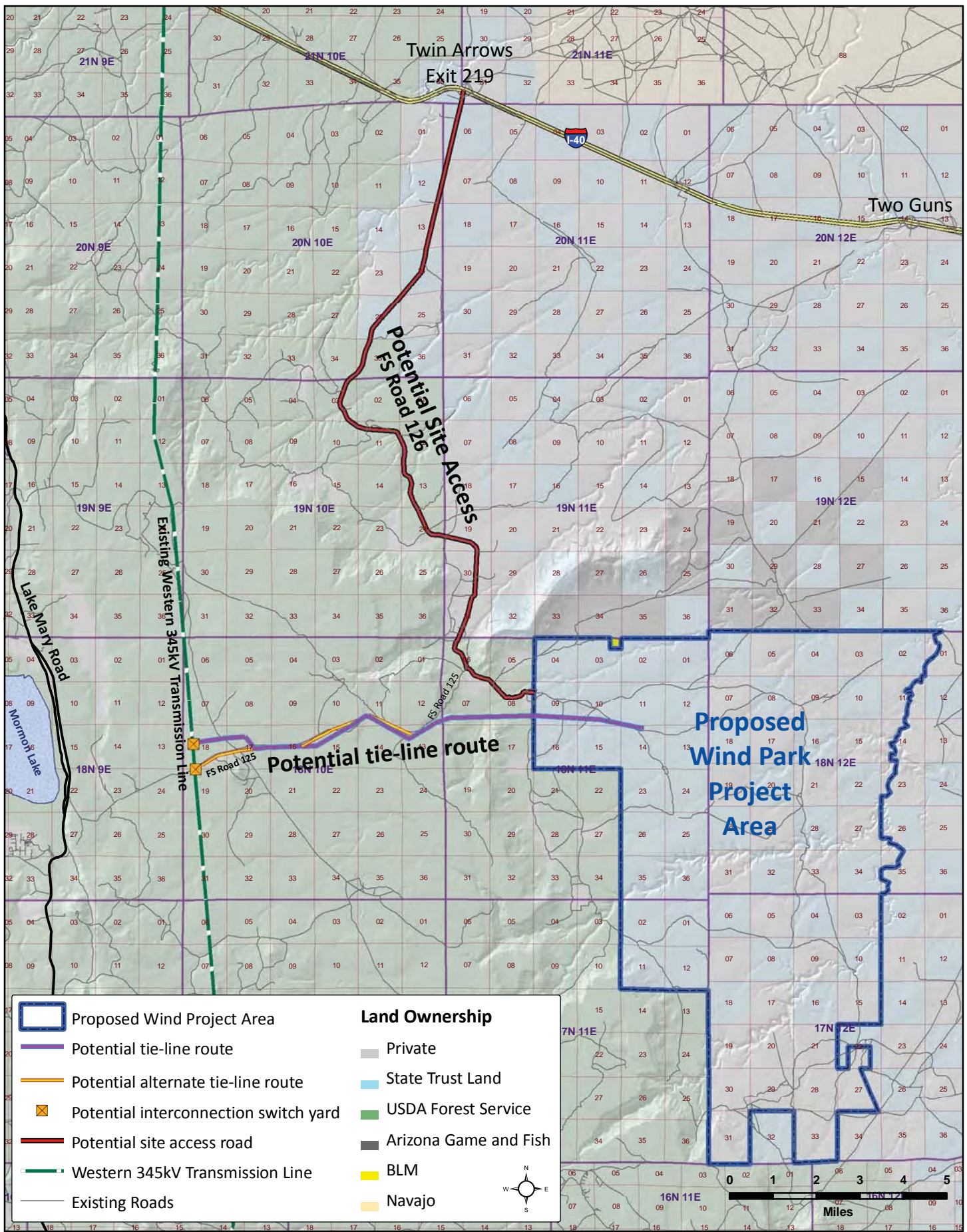
Foresight Flying M LLC proposes to build a wind energy generation project approximately 22 miles southeast of Flagstaff and 18 miles south of the I-40 Twin Arrows interchange. The proposed project would be located on private ranch lands and Arizona State Trust Lands. A new transmission tie-line across the Coconino National Forest and upgrades to portions of F.S. Road 126 are proposed. Western is an agency of the U.S. Department of Energy and has the responsibility to prepare an environmental impact statement. The U.S. Forest Service will be a cooperating agency.
















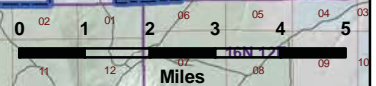
Email: [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)  
Website: [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)



# Grapevine Canyon Wind Project



- |   |                                       |   |
|---|---------------------------------------|---|
|  | Proposed Wind Project Area            | <b>Land Ownership</b>   |
|  | Potential tie-line route              |  Private               |
|  | Potential alternate tie-line route    |  State Trust Land      |
|  | Potential interconnection switch yard |  USDA Forest Service   |
|  | Potential site access road            |  Arizona Game and Fish |
|  | Western 345kV Transmission Line       |  BLM                   |
|  | Existing Roads                        |  Navajo                |







# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

Your comments will help Western Area Power Administration define issues and alternatives for evaluation of the environmental impacts of the proposed project

Please provide your comments by August 28, 2009 to:

Mary Barger  
Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. *Circle below*

- |     |    |  |
|-----|----|--|
| Yes | No | I wish to remain on the mailing list for this project ( <i>provide Name, below</i> ) |
| Yes | No | Please send me information by regular mail only ( <i>provide Address, below</i> )    |
| Yes | No | Please send me information by email ( <i>provide Email, below</i> )                  |

### **YOUR COMMENTS:** Please print clearly


Your Name: \_\_\_\_\_ E-Mail: \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

*Please provide your name and contact information if you wish to receive future information on this project*

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**Mary Barger**  
**Western Area Power Administration**  
**National Environmental Policy Act (NEPA) Document Manager**  
**P.O. Box 6457**  
**Phoenix, AZ 85005**

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## **NEWSPAPER AND RADIO ANNOUNCEMENTS**

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Western Area Power Administration

## Grapevine Canyon Wind Project

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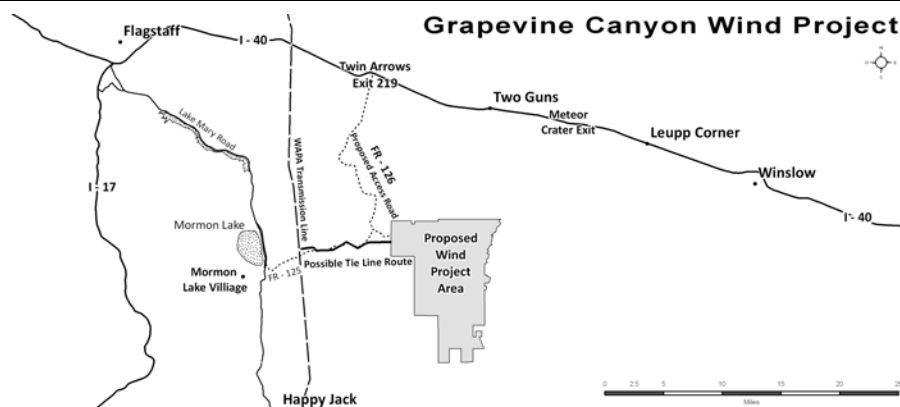
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### PROJECT VICINITY MAP



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updated prescriptions and a coupon from Kush LA, a marijuana magazine.

Wiegman says hundreds of people called asking if the offer was for real.

## Palin implicated in ethics probe

ANCHORAGE, Alaska (AP) — An independent investigator has found evidence that Gov. Sarah Palin may have violated ethics laws by trading on her position as she sought money for lawyer fees, in the latest legal distraction for the former vice presidential candidate as she prepares to leave office this week.

The report obtained by The Associated Press says Palin is securing unwarranted benefits and receiving improper gifts through the Alaska Fund Trust, set up by supporters.

An investigator for the state Personnel Board says in his July 14 report that there is probable cause to believe Palin used or attempted to use her official position for personal gain because she authorized the creation of the trust as her legal defense fund.

## Greenpeace charged in Mount Rushmore demo

SIoux FALLS, S.D. (AP) — A federal grand jury has indicted the environmental group Greenpeace and 11 people involved in hanging a banner on Mount Rushmore.

# Evangelist Alamo may not testify on own behalf

TEXARKANA, Ark. (AP) — The woman considered to be the common-law wife of evangelist Tony Alamo told jurors at his sex-crimes trial Tuesday that she thought the wedding rings in his bedroom were donations to the ministry, and that she didn't notice that younger and younger girls were living with them.

Sharon Alamo, who was testifying for the defense, appeared at times to be reading from a notebook she took to the stand with her. The judge told her to rely on her memory. When lawyers took a break to confer, Tony Alamo gave her a thumbs-up.

Tony Alamo, 74, is accused of taking five young girls across state lines for sex between 1994 and 1995 after "marrying" them. Defense lawyers say prosecutors targeted him because the government is anti-Christian. Alamo, who has pleaded not guilty, has also said the Vatican is behind his troubles.

Each of the 10 counts against Alamo is punishable by 10 years in prison and a \$250,000 fine.

Alamo told reporters on the way to court Tuesday that he planned to take the stand to defend himself, despite his lawyers' advice against it. But when leaving that afternoon, Alamo said his defense team had

lawyers had counseled him not to take the witness stand, though no final decision would be made until Wednesday. Kuhn said defense lawyers plan to call two more witnesses, meaning jurors could have the case as soon as Wednesday afternoon.

During her testimony, Sharon Alamo, 50, acknowledged to jurors that she had seen young women wearing wedding rings around the house.

"Didn't you notice the girls moving into the defendant's residence ... were getting younger and younger?" Assistant U.S. Attorney Clay Fowlkes asked.

"No, I didn't," she replied.

She said she believed the collection of wedding rings found in Alamo's bedroom were donations. Prosecution witnesses have testified that rings were given to underage girls when Alamo "married" them.

Sharon Alamo said she never formally married Alamo but lives with him, took his name and conducted business as his wife.

"We were together for a while but decided to separate but still live and work together," Sharon Alamo said. As she spoke, Alamo muttered to his lawyers, "They don't understand it's a spiritual marriage."



## Western Area Power Administration

### Grapevine Canyon Wind Project

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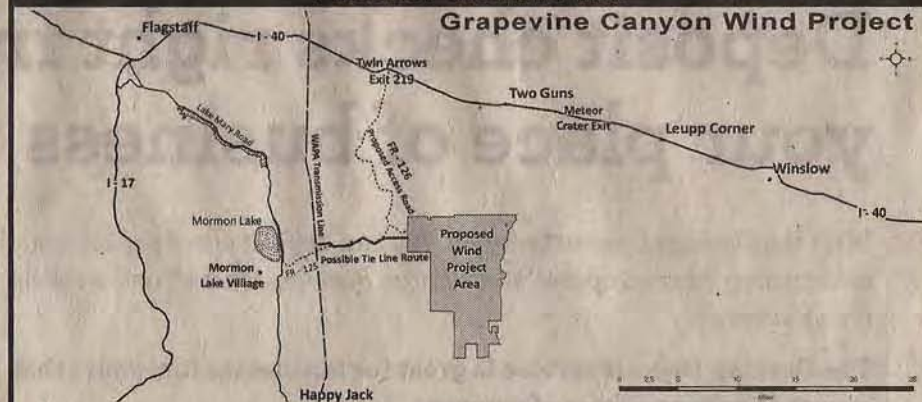
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7/25/09

**THE INSIDER'S GUIDE TO  
THE GRAND CANYON**

A NEW WEBSITE BROUGHT TO YOU BY THE ARIZONA DAILY SUN

[www.gcscout.com](http://www.gcscout.com)  
[www.grandcanyonscout.com](http://www.grandcanyonscout.com)

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area drivers honked their horns.

"I didn't expect so many people to be here," said German visitor Tschale Haas, 50, who was dressed in a Sgt. Pepper jacket.

Abbey Road, which cuts through London's well-to-do neighborhood of St. John's Wood, is home

across the street.

The enduring popularity of the site has caused headaches for local authorities, who have had to move the Abbey Road street sign up out of reach to prevent theft and repaint the wall every three months to hide fans' graffiti.



*We Miss You Nick*

Nichollas Newell • 4/11/85 -8/4/08

*Thank you Flagstaff and all those from New Horizons and Lamb of God Church who made him feel so loved - Especially Pastor Daniel Williamson*

NickNewell.com

lier this month after being captured 400 miles off the southern Somali port of Kismayu on April 4.

"All crew are safe and their health is good," Capt. Krzysztof Kotiuk told journalists. "We are exhausted but eager to be reunited with our families."

**Medvedev: Georgia war showed might**

VLADIKAVKAZ, Russia (AP) — Russian President Dmitry Medvedev on Saturday hailed the Russian victory in a war with Georgia a year ago, saying it showed the nation's strength and boosted its role in the world.

Medvedev vowed that Russia would not renege on its recognition of the independence of two breakaway Georgian regions after the brief and bitter war.

Medvedev awarded medals to servicemen who fought in the war, in which thousands of Russian troops crushed the Georgian military in five days of fighting.

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**HOMES**  
from Page A1

a few years ago. It has also dropped by 14 percent when compared to figures from last July.

The July median price falls in between what homes have been selling for the last few months — \$274,000 in April to \$335,000 in June.

The local inventory, however, is not following the national trends. The city has had an inventory

914 E. Route 66 • Flagstaff • (928) 774-2211  
1505 W. 3rd St. • Winslow • (928) 289-3838



## Sunday, Aug. 9

**BEHIND THE SCENES WITH RAPTOR:** 10 a.m. Meet a raptor handler for a program behind the scenes at The Arboretum. Learn about the habits and care of owls, hawks, and falcons used in free-flight presentations. Program is limited to six participants. Fee includes admission to the gardens. \$15 members/\$20 non-members. The Arboretum at Flagstaff, 4001 S. Woody Mountain Road. 774-1442.

**SNOWBOWL RANGER TALKS:** 10 a.m. - 4 p.m. Discover the beauty of the San Francisco Peaks with ranger talks atop the Scenic Skyride every Friday, Saturday, Sunday and holiday through October. Adults \$12; Juniors (8-12) and seniors (65-69) \$8; 70 and older/7 and younger and birthdays free. Arizona Snowbowl, Scenic Skyride. 779-1951.

**FLAGSTAFF HISTORIC WALK:** Friday at 3 p.m.; Saturday and Sunday at 10:30 a.m. An enjoyable and informative tour of downtown Flagstaff. Free. Flagstaff Visitors Center, 774-9541.

**FLAGSTAFF COMMUNITY MARKET:** 8 a.m. - noon. A local and regional farmer's market, runs every Sunday, featuring fresh local produce, fruits, honey, flowers, jams, tamales, baked goods, and much more. City Hall west parking lot (corner of Route 66 and N. Sitgreaves Street). 607-4088.

**HART PRAIRIE NATURE WALKS:** 10 a.m. The Nature Conservancy's 245-acre Hart Prairie Preserve is a unique landscape at the base of the San Francisco Peaks. The following items are essential to the walks: sturdy shoes, sun protection, rain gear or jacket and water. No pets. Free; reservations are not required. Meet at the Fort Valley Plaza, 1000 N. Humphreys St. 774-8892 Ext. 5.

**YOGA FESTIVAL:** 9 a.m. - 10 p.m. Admission is free to the Wellness Marketplace, where there will be giveaways, a yoga swap, kirtan, acroyoga demos, bellydance, chi yoga demos, massage, music, reiki and more. More than 100 yoga and wellness workshops at the festival. Free marketplace admission. Pine Forest School, 1120 W. Kaibab Lane. 380-4538.

**HOPI PUEBLO REVOLT TOURS:** Today and Monday morning or afternoon presentation and tour of the events leading to the Hopi Pueblo Revolt of 1680 A.D. and how the Hopi people were able to maintain their sovereignty and culture from Spanish Crown and Franciscan Catholic oppression. \$30 per person / \$20 Pueblo Tribal Member. Hopi Cultural Center Conference Room, Highway 264 MM 379.5. Second Mesa - Hopi Cultural Center. Call for time. 206-7433.

**BLOOD DRIVE:** 10 a.m. All August United Blood Services donors will be thanked with a free one-day admission pass to the 60th Annual Coconino County Fair, Sept. 4 - 7, courtesy of Coconino County Parks & Recreation. Call (877)448-GIVE (4483) to make an appointment. Free. Mount Calvary Lutheran Church, 2605 N. Fort Valley Road, Bloodmobile in parking lot. 1-877-448-4483.

**HAPPY 65TH BIRTHDAY SMOKEY BEAR:** 10:30 a.m. Festivities include talks by NPS/USFS Interpreter Judi Irons and the USFS Fire Prevention team; birthday cake for the kids, and a free Smokey Bear doll raffle. Bring your picnic-lunches and chairs; and enjoy the view! Discounted Skyride tickets available. Free. Arizona Snowbowl-Agassiz Lodge, North Snowbowl Road, turn right on Snowbowl Road off Highway 180. Go about 7 miles to Agassiz lodge. 226-0332.

**POI SPINNING WORKSHOP:** 1 - 2:30 p.m. Poi Spinning is a ball swung rhythmically around the body. Poi balls come in many different forms: comet or tail, cane, flag, glow sticks and fire poi. Traditionally they told stories, songs, or war chants. Materials provided for practice and take home. \$10. Coconino Center for the Arts, 2300 N. Fort Valley Road. 774-2253.

**BALLET FOLKLORICO:** 2 p.m. Heritage Square Trust's Summer Concert Series Presents A delightful afternoon with traditional Mexican dance, Mariachi and more. Free. Heritage Square. 853-4292.

**BLOOD DRIVE:** 2:30 - 5 p.m. All August United Blood Services donors will be thanked with a free one-day admission pass to the 60th annual Coconino County Fair, Sept. 4 - 7, courtesy of Coconino County Parks & Recreation. Call (877) 448-GIVE (4483) to make an appointment. Free. Sam's Club, 1851 E. Butler, Bloodmobile in parking lot.

**COUNTRY DANCE WORKSHOP:** 3:15 - 4 p.m. Like country music but tired of doing the same old two-step, country swing, country cha-cha...etc? Join us for a country Shoddish workshop. Traditionally, the shoddish is a German dance, but come see how fun it is putting a country spin on it! \$5 donation. Coconino Center for the Arts, 2300 N. Fort Valley Road. 380-1593.

**WALK THE WALK:** 5 p.m. About 4 total miles of walking as we see where the FUTS uses the old sheep herders tunnel under the railroad tracks and the section of FUTS that climbs Observatory Mesa. Free. Arizona Daily Sun parking lot. 714-0504.

## Monday, Aug. 10

**COFFEE KLATCH:** 7:30 a.m. Join City Hall Reporter Joe Ferguson for coffee (yours) and doughnuts (his) to discuss the week's news while Daily Sun Editor Randy Wilson is on vacation. Each Monday this summer through Aug. 31. Free. Arizona Daily Sun board room, 1751 S. Thompson St. 556-2254.

**HOPI PUEBLO REVOLT TOURS:** Today morning or afternoon presentation and tour of the events leading to the Hopi Pueblo Revolt of 1680 A.D. and how the Hopi people were able to maintain their sovereignty and culture from Spanish Crown and Franciscan Catholic oppression. \$30 per person / \$20 Pueblo Tribal Member. Hopi Cultural Center Conference Room, Highway 264 MM 379.5. Second Mesa - Hopi Cultural Center. Call for time. 206-7433.

**BREASTFEEDING MONTH:** Registration for walk 8 a.m., walk begins 8:30 a.m.; fair and carnival at 9 a.m. The Fort Defiance WIC Clinic is sponsoring a Breastfeeding Walk, health fair and mini-carnival in celebration of World Breastfeeding Month. Navajo Nation Museum, amphitheater. Window Rock. 729-4011.

**TIPPY TOES:** 11 a.m. Kids Squared presents Tippy Toes. Children's dance class with Miss Amanda. Free. Heritage Square. 853-4292.

**BOOK DISCUSSION:** 12 - 1:30 p.m. Pastor Rigo Rios from Tegucigalpa, Honduras discusses NAU's book selection, "Enrique's Journey," as well as recent political events. Join us for a lunchtime discussion. Bring your lunch or order a healthy light lunch (vegetarian) from Just Peace. RSVP. Free. Campus Ministry Center, 500 W. Riordan Road. 607-7726.

**HONDURAS! POT LUCK DINNER:** 6 - 7:30 p.m. Pastor Rigo Rios from Tegucigalpa will speak about building community and hope in Honduras; the recent political events--a first-hand account of the complexities, issues and events; being global partners - sharing the riches of Honduran culture and values. Donation. Campus Ministry Center, 500 W. Riordan Road. 774-1572.

**PUBLIC MEETING FOR WIND PROJECT:** 6 - 8 p.m. Public scoping meeting for Grapevine Canyon Wind Project. Hosted by Western Area Power Administration for environmental impact statement process. Mormon Lake, Mormon Lake Fire Station. www.wapa.gov/transmission/grapevine.htm. Free. Mormon Lake Fire Station, Village of Mormon Lake. Mormon Lake. 602-605-2524.

## Tuesday, Aug. 11

**ARIZONA PREMIERE OF "FOOD, INC.":** 4 and 7 p.m. www.sedonafilmfestival.com. Harkins Sedona Six Theaters, 2081 W. Highway 89A. Sedona.

**MOVIE NIGHT: "Into the Wild":** Doors at 7 p.m./Show at 8 p.m. \$5. Orpheum Theater, 15 W. Aspen Ave. 556-1580.

**WALK INTO SUMMER:** 8 a.m. About 3 total miles of walking in and around the surrounding neighborhood. Fast and slow pace. Free. Adult Center, 245 Thorpe Road. 714-0504.

**BLOOD DRIVE:** 11 a.m. - 3 p.m. All August United Blood Services donors will be thanked with a free one-day admission pass to the 60th Annual Coconino County Fair, Sept. 4 - 7, courtesy of Coconino County Parks & Recreation. Call (877) 448-GIVE (4483) to make an appointment. Free. Arizona Dept of Transportation, 1801 S. Milton Road, Bloodmobile in parking lot.

**"ADVENTURES OF SALT AND SOAP":** 12:15 p.m. Lori Rome will talk about her new book for children, "The Adventures of Salt and Soap at Grand Canyon." It is the true story of two puppies that wandered into the Grand Canyon and experienced great adventures in the grandest of all canyons. Free. Riordan Mansion State Park, 409 W. Riordan Road. 779-4395.

**FILE PAST TAXES:** Haven't filed taxes for a while? Come get up to 3 years worth of refunds by filing your back taxes if your household income was less than \$42,000. Sponsored by Vita and United Way. Free. Family Resource Center, 1806 E. Route 66. 774-1103.

**YKIDZ PRESCHOOL OPEN HOUSE:** 3 - 6 p.m. Flagstaff Family YMCA Ykidz Preschool is having an open house. Come see the preschool that is family and community based with a focus on character development and hands-on learning. Free. Flagstaff Family YMCA, 2800 S. Lone Tree Road. 556-9622.

**PUBLIC MEETING FOR WIND PROJECT:** 6 - 8 p.m. Public scoping meeting for Grapevine Canyon Wind Project. Hosted by Western Area Power Administration for environmental impact statement process. www.wapa.gov/transmission/grapevine.htm. No fee. NACET Conference Room, 2225 N. Gemini Drive. (602) 605-2524.

## Wednesday, Aug. 12

**DANCING ON THE SQUARE:** 7 - 10 p.m. Salsa, swing, tango, ballroom, country dance, free lessons and open dance. Hosted by USA Dance, NAU Swing and Latin Dance Club. Free. Heritage Square. 600-2450.

**FLAGSTAFF COMMUNITY MARKET:** 4 - 7 p.m. Featuring fresh local produce, fruits, honey, flowers, jams, tamales, baked goods, and much more. San Francisco de Asis Church. 607-4088.

**MOUNTAIN BUS CLASS:** 9:15 - 11:45 a.m. If you haven't tried the Mountain Line Bus, yet, here's a great opportunity! This course is designed to inform new and existing Mountain Line patrons how to navigate the Mountain Line system. Free. Family Resource Center, 1806 E. Route 66. 774-1103.

**PRESCHOOL EXPLORERS:** 9:45 - 11 a.m. Explore the Colorado Plateau through monthly interactive programs on biology, geology, Native cultures, and fine arts. This month's program is Therizinosaur--Mystery of the Sickle-Claw Dinosaur. Pre-register at ext. 275 or lidoskocil@mna.mus.az.us. \$3 for members, \$5 for nonmembers. Museum of Northern Arizona, 3101 N. Fort Valley Road. 774-5211.

**DAVID GRANDON KID'S ART:** 11 a.m. Kids Squared presents David Grandon. Local painter David Grandon presents a painting workshop for children. Free. Heritage Square. 853-4292.

**BLOOD DRIVE:** 11:30 a.m. - 4 p.m. All August United Blood Services donors will be thanked with a free one-day admission pass to the 60th Annual Coconino County Fair, Sept. 4 - 7, courtesy of Coconino County Parks & Recreation. Call (877) 448-GIVE (4483) to make an appointment. Free. Mountain Heart, 2000 S. Thompson. Bloodmobile in parking lot.

**EXPLORERS II (AGES 6-8):** 1:45 - 3 p.m. Explore the Colorado Plateau through monthly interactive programs on biology, geology, Native cultures, and fine arts. This month's program is Therizinosaur--Mystery of the Sickle-Claw Dinosaur. Pre-register at ext. 275 or lidoskocil@mna.mus.az.us. \$3 for members, \$5 for non-members. Museum of Northern Arizona, 3101 N. Fort Valley Road. 774-5211.

**PARTICIPATION IN SPECIAL ED.:** 5 - 7 p.m. Presented by Allison Meritt from the Arizona Department of Education, This PowerPoint training discusses how children with disabilities and their parents are guaranteed certain educational rights, known as procedural safeguards, from birth through 21 year. Free. Family Resource Center, 1806 E. Route 66. 774-1103.

**CELEBRATE YOUR INDEPENDENTS:** 5:30 - 7:45 p.m. Join the Flagstaff Independent Business Alliance (FIBA) in welcoming Kimber Lanning, founder and director of Local First Arizona, for a free business networking meeting at the historic Orpheum. Learn what other local businesses do to support each other! Free. The Historic Orpheum Theatre, 15 W. Aspen Ave. 527-9989.

**"SIMPLY RAW: REVERSING DIABETES":** 6 p.m. This film chronicles six Americans with 'incurable' diabetes switching their diet and getting off insulin. The film follows each participant's medical, physical, and emotional transformations brought on by this radical diet and lifestyle change. Free. New Frontiers Natural Marketplace, 320 S. Cambridge Lane. 774-5747.



# Thunderbird Supply introduces expanded silver-plated bead line

GALLUP, N.M. — Thunderbird Supply Company, an international supplier to jewelers, artists and hobbyists, introduces an expanded line of silver plated beads.

Silver plated beads have the great look of sterling silver without the cost. Thunderbird Supply Company has expanded their silver plated beads product line of by over 55 brand new styles and shapes. These silver plated beads are now available in Thunderbird Supply's four stores in Albuquerque, Flagstaff, Gallup and at [www.thunderbirdsupply.com](http://www.thunderbirdsupply.com).

For additional information on

Thunderbird Supply Company's seed bead product line please visit [www.thunderbirdsupply.com](http://www.thunderbirdsupply.com).

## About Thunderbird Supply

Since 1971, Thunderbird Supply Company has supported Native American cultural heritage with product and service, allowing individual artists and craftspeople to express themselves and offer an independent lifestyle that preserves ancestral tradition.

Thunderbird Supply has four stores including Gallup, Albuquerque, Flagstaff and online at [www.thunderbirdsupply.com](http://www.thunderbirdsupply.com).

## • From Forest kids, Page 9

- **Camp Colley:** Supported by the Camp Colley Foundation with the Phoenix Parks and Recreation Department, this program offers outdoor experiences near the Mogollon Rim for urban youth and their families.

- **Museum of Northern Arizona's Discovery Program:** Offers summer sessions for kids to learn about the region's fine arts, natural sciences, native cultures and ecology.

- **Northern Arizona University's Junior Forester Academy:** Provides summer day camps where future foresters grow career skills, then apply those skills to community forest health projects.

- **North Kaibab Kids Camp:** Hosted by the North Kaibab Ranger District, this program offers a cultural and natural science learning camp to students from Fredonia and the Kaibab Piute Tribe.

- **Wildfire in Native Schools:** Managed by the Forest Service's Rocky Mountain Research Station-Flagstaff Lab, the program includes field trips to historic Fort Valley Experimental Forest Station, in

during a particularly challenging year for them. Best of all is to know these programs and others use our national forests as places to learn."

The common goals for all seven programs include: increase the time children spend in nature, as well as increase the number of children participating in the programs; provide opportunities that increase children's awareness, appreciation and understanding of the natural world; and to strengthen local conservation/outdoor educational partnerships.

"Kids must understand why forests are so valuable so they will grow into citizens who support conservation," said Gail Kimbell, former chief of the Forest Service. "Building on the Forest Service traditions of conservation education, we will work with partners to ensure that American children have the opportunity to experience the great outdoors."

These seven programs represent participation of approximately 2,290 youth and over \$336,000 in partners' matching contributions. Funds provided by the Forest

## Western Area Power Administration

### Grapevine Canyon Wind Project

Western will host open house public scoping meetings August 10 and 11, 2009, to share information about the proposed Grapevine Canyon Wind Project. Learn about the National Environmental Policy Act (NEPA) process, meet with project team members, ask questions and make comments at the informal meetings.

#### PUBLIC SCOPING MEETINGS

**Monday, August 10, 6-8 pm**

**Mormon Lake, AZ — Mormon Lake Fire Station, 43 Mormon Lake Rd**

**Tuesday, August 11, 6-8 pm**

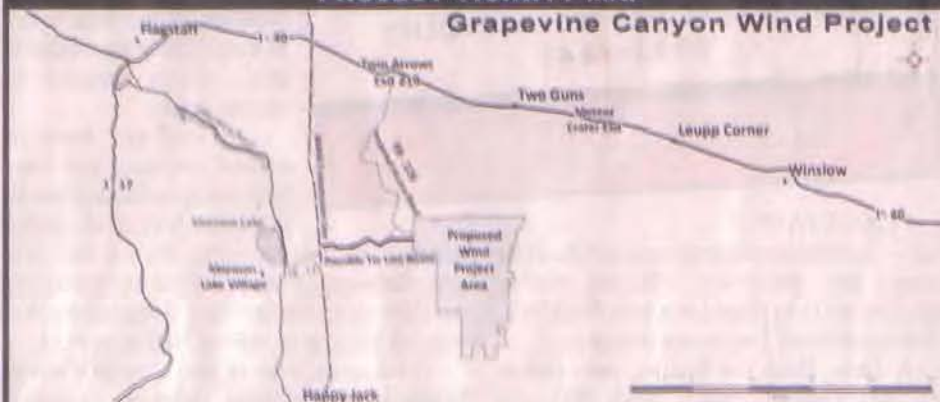
**Flagstaff, AZ — NACET Conference Room, 2225 N. Gemini Drive**

**Project Presentations at 6:15 and 7:30 pm, Open House Format 6-8 pm**

Foresight Flying M LLC proposes to build a wind energy generation project approximately 22 miles southeast of Flagstaff and 18 miles south of the I-40 Twin Arrows interchange. The proposed project would be located on private ranch lands and Arizona State Trust Lands. A new transmission tie-line across the Coconino National Forest and upgrades to portions of F.S. Road 126 are proposed. Western is an agency of the U.S. Department of Energy and has the responsibility to prepare an environmental impact statement. The U.S. Forest Service will be a cooperating agency.

#### PROJECT VICINITY MAP

#### Grapevine Canyon Wind Project



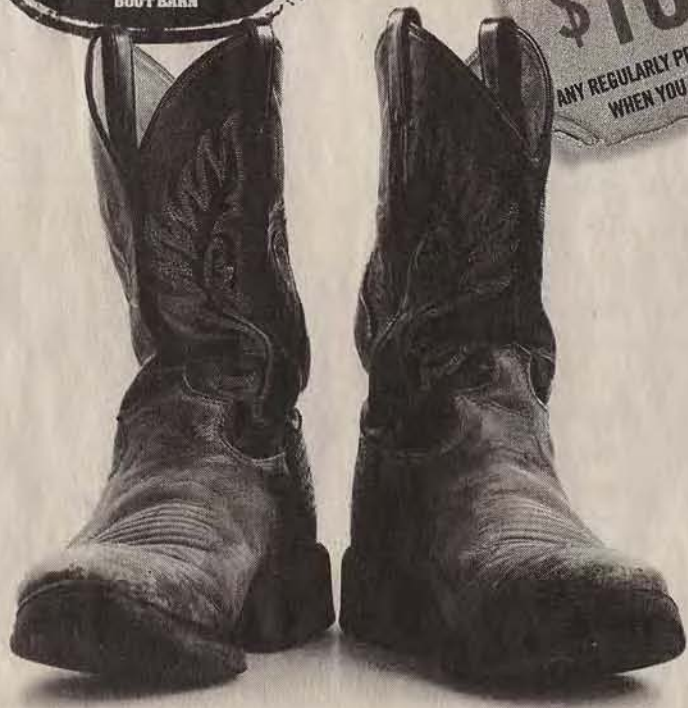
#### We Welcome Your Comments

Your comments will help define issues and alternatives for evaluation in the environmental impact statement. The public scoping comment period closes August 28, 2009. For more information visit the project website at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm), or contact Mary Barger, Western Area Power Administration, PO Box 6457, Phoenix, AZ, 85005, telephone 602-605-2524, fax 602-605-2630, email [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)



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## Western Area Power Administration

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## Across the USA

News from every state

**Alabama: Huntsville** — The state's fourth annual sales tax holiday begins Friday and continues until midnight Sunday. The state is waiving its 4% sales tax on many clothing and school purchases. An additional 253 cities and counties are lifting local sales taxes.

**Alaska: Anchorage** — A local government is helping to pay the legal bill for hunters accused of wasting caribou meat. North Slope Borough is putting up \$56,000 in the case between the state and the hunters. The state said subsistence users must follow the same laws as everyone else. The defendants counter that traditional subsistence hunts should not be included.

**Arizona: Flagstaff** — Foresight Wind Energy wants to install 130 to 330 wind-driven turbines on the Flying M Ranch east of Mormon Lake to provide the equivalent of 500 megawatts of electricity. Once power is generated, the company would tie into federally owned power lines. Developers need approval from the federal government.

**Arkansas: Searcy** — Kitchen and bath product manufacturer Kohler plans to lay off 41 workers at its plant here. The company said the layoffs will include production and administrative positions. It said the layoffs are a "cost containment strategy" to bring the business in line with decreasing sales.

**California: San Jose** — A former high school physical education teacher has been sentenced to six months in jail for having a sexual relationship with a 17-year-old female student. Rita Brum, 24, was arrested in February and pleaded no contest in June. She was fired from Mount Pleasant High in March.

**Florida: Pensacola Beach** — Amateur anglers are upset over a new requirement that Floridians buy a \$9 license to fish off the shoreline. The estimated \$900,000 a year the license will generate is needed for the Fish and Wildlife Commission to cover research and law enforcement costs. The law exempts those younger than 16 and older than 65 and those who fish with cane poles.

**Georgia: Tybee Island** — The Tybee Island Museum is scheduled to reopen Sept. 6 after being closed since February for renovations. Located near the lighthouse, the museum features exhibits focused on the island's culture and its military history, which dates to the American Revolution. The museum is in an artillery battery built in 1899.

**Hawaii: Honolulu** — A proposal to build an affordable-housing development in Honolulu's Chinatown is on hold after facing opposition from neighbors. The Downtown Neighborhood Board voted to oppose the \$10.6 million project. The proposal came out of a 2006 pledge by Mayor Mufi Hannemann to address the area's growing homeless problem.

**Idaho: Coeur D'Alene** — A man was cited for heroism after pulling a man from a burning car. Coeur d'Alene Police Chief Wayne Longo and Coeur d'Alene Fire Chief Kenny Gabriel made a presentation of appreciation to Jody Burns, who helped save Michael Brandt's life on July 24.

**Illinois: Springfield** — Sex offenders are no longer allowed to get behind the wheel of ice cream trucks in Illinois. A new law bars sex offenders from operating trucks that sell food or beverages. Officials worry that offenders might sell ice cream and other snacks as a front for harming children. The law also prohibits offenders from operating emergency

**Louisiana: Monroe** — A teenage inmate at a north Louisiana youth prison has been charged in an alleged attack on guards. Monroe police charged the 17-year-old on Tuesday with three counts of battery on a corrections officer. He is accused of punching, kicking and biting officers who were taking him to his cell at the Swanson Center for Youth.

**Maine: Camden** — A 500-pound moose entered the downtown Knox Mill Center, and police and building staff corralled it before game wardens arrived with a tranquilizer. It was set free in the Ruffingham Meadow State Game Management Area in Searsmont. A Discovery Channel filmmaker working on a documentary about how moose interact with people filmed the entire event.

**Maryland: Annapolis** — The value of the state's public pension fund has fallen by more than 20% over the past year. The stocks and other investments held by the Maryland State Retirement and Pension System hit a peak of \$40.9 billion in 2007. But officials said it shrank to \$28.5 billion as of June 30.

**Massachusetts: Boston** — A report said the long-promised commuter rail project linking New Bedford and Fall River to Boston would create up to 3,800 permanent jobs by 2030 and generate nearly \$500 million in economic activity. The report was released by Gov. Patrick's administration, which is forging ahead with plans for the proposed \$1.4 billion project.

**Michigan: Lansing** — The Michigan Catholic Conference, the Michigan League for Human Services and more than 20 other advocacy groups are asking lawmakers and Gov. Granholm to abandon planned cuts to social service programs as they negotiate a budget compromise. The groups oppose cuts to grants for low-income families, day care

**Nebraska: Omaha** — Omaha fire officials said a hospital venting system was taking care of dangerous fumes from a toxic leak early Wednesday at Clarkson Tower at Nebraska Medical Center. The danger from the ethylene oxide, used to help sterilize medical equipment, was contained to one room. No injuries were reported. A similar spill occurred at the hospital two months ago.

**Nevada: Las Vegas** — Casino operator Boyd Gaming Corp. said that its second-quarter profit dropped 41% as the recession prompted gamblers to curtail their spending. The Las Vegas-based company earned \$12.8 million for the three months ending June 30, compared with \$21.7 million a year earlier. "The uncertainty which exists in the economy today continues to negatively impact consumer spending," President and CEO Keith Smith said in a statement.

**New Hampshire: Pinkham Notch** — The Mount Washington Auto Road will celebrate its 148th birthday on Saturday. Any vehicle that arrives with the "This Car Climbed Mt. Washington" bumper sticker already affixed will receive free passage up the auto road. The road is open 7:30 a.m. to 6 p.m. The eight-mile road to the top of the Northeast's highest peak opened in 1861.

**New Jersey: Camden** — The number of homicides in the first half of 2009 is down by 24% in the state compared with the first six months of last year. There were 158 homicides reported through June, down from 209 in that period last year. In Camden, consistently ranked as one of the USA's most violent cities, slayings declined from 30 in the first half of last year to 17 this year.

**New Mexico: Albuquerque** — Gov. Richardson said he wants to see 10,000 dropouts back in high school by the end of his term. The Democratic governor

**Ohio: Huber Heights** — Chief Master Sgt. Tamara Phillips has been chosen as the Ohio Air National Guard's first African-American and first female state command chief. Phillips, 41, will serve as mentor and guide to 5,000 airmen, including her daughter and son. Phillips was the first female chief for the Springfield-based 178th Fighter Wing in 2005.

**Oklahoma: Wetumka** — A man has been arrested for allegedly locking a 16-year-old girl in a large toolbox and holding a heated screwdriver against her. Christopher Lewis was booked into the Hughes County jail on charges of kidnapping and assault and battery with a dangerous weapon. The girl alleged that he locked her in the toolbox so he could drink inside his home.

**Oregon: Klamath Falls** — Katie Prewitt took her Geo Tracker to her husband's body shop because of a hissing noise. Dave Prewitt wasn't sure what the problem was until he spotted a 3-foot diamondback rattlesnake in the car's undercarriage. His friend Martin Schenck used a shovel to kill the snake.

**Pennsylvania: Pottsville** — Kyle Bluge, 23, of Frackville, who pleaded guilty in the death of a 6-month-old infant last year, was sentenced to five to 11 years in state prison by President Judge William Baldwin. The prosecutors said the infant suffered brain hemorrhaging and two retinal tears when he was shaken in April 2008.

**Rhode Island: Providence** — Rhode Island is receiving \$1.2 million to help the state prepare for a potential resurgence of swine flu in the fall. Sen. Jack Reed announced Wednesday that the state is eligible for the federal funding, which would go toward vaccination campaigns and making sure local hospitals are ready for any future outbreaks.

**Utah: Salt Lake City** — Lt. Gov. Gary Herbert tapped Senate Assistant Majority Whip Greg Bell to succeed him once Herbert is sworn in as the state's top executive. Bell, a fellow Republican, is considered a moderate — best known for pursuing ethics reforms in the Legislature and sponsoring a failed bill that would have extended some legal rights to gay couples.

**Vermont: Burlington** — In spite of the recession, more people are visiting Vermont this summer. A recent survey found that visits are up by 1 million, for a total of 14 million people. Steve Cook the deputy commissioner of the state Travel and Tourism Department, said the state is in a good position geographically, with 80 million potential visitors in a drive market in a five-hour radius.

**Virginia: Roanoke** — Coca-Cola Bottling Co. Consolidated has opened a warehouse and logistics center in Roanoke. President and CEO Bill Elmore said the more than \$9 million expansion also includes a new bottling line at the company's plant in Roanoke. The expansion will create 10 jobs.

**Washington: Vancouver** — Firefighters suspect carbon monoxide sickened more than a dozen children at a hockey camp at the Mountain View Ice Arena. The *Vancouver Columbian* reports six children sought medical care Tuesday. Fire department spokesman Jim Flaherty said a propane-powered ice resurfacer was the likely source of the carbon monoxide.

**West Virginia: Nitro** — Nitro City Council plans to vote Aug. 18 on whether to put a smoking area at the Tri-State Racing and Gaming Center. If adopted, the ordinance would conflict with the Kanawha-Charleston Health Department's ban on smoking in public places. The Alcohol Beverage Control Admini-



## KNAU RADIO SPOT

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Funding for KNAU comes from Foresight Wind Energy. Announcing 2 public scoping meetings for the Grapevine Canyon Wind Project. Offering information on the proposed wind energy project and the environmental impact statement process. August 10<sup>th</sup> and 11th. Information on times and locations at [grapevine wind dot com](http://grapevinewind.com).

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**PRESS RELEASE**

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**NEWS FROM WESTERN AREA POWER ADMINISTRATION****FOR IMMEDIATE RELEASE:** July 24, 2009**CONTACT:** Randy Wilkerson, 720-962-7056, [wilkerson@wapa.gov](mailto:wilkerson@wapa.gov)**PUBLIC COMMENT SOUGHT FOR PROPOSED WIND PROJECT NEAR FLAGSTAFF**

LAKEWOOD, Colo. —Western Area Power Administration will host open-house public scoping meetings August 10 and 11 to share information about the proposed Grapevine Canyon Wind Project. The informal meetings will provide the public and interested parties with the opportunity to learn about the environmental impact statement process, meet one-on-one with project team members, ask questions, and make comments.

Foresight Flying M, LLC, the project proponent, proposes to construct a wind energy generation project up to 500 megawatts. The project would be located on privately owned ranch lands and trust lands administered by the Arizona State Land Department. The project location is approximately 22 miles southeast of Flagstaff and about 18 miles south of the I-40 Twin Arrows interchange. To support delivery of the power generated by the project, the proponent proposes to build a new transmission tie-line to interconnect with Western's existing Glen Canyon-Pinnacle Peak Transmission Line. The transmission tie-line would cross lands administered by Coconino National Forest. The project area would be accessed by the existing F.S. 126 road, south of the Twin Arrows I-40 exit.

**Meeting information**

**Monday, August 10, 2009**, 6-8 p.m., Mormon Lake, AZ. - Mormon Lake Fire Station, 43 Mormon Lake Road

**Tuesday, August 11, 2009**, 6-8 p.m., Flagstaff, AZ. - NACET Conference Room, 2225 N. Gemini Drive

The proposed project would interconnect with Western's power transmission system. As an agency of the U.S. Department of Energy, Western has the responsibility under the National Environmental Policy Act to prepare an environmental impact statement. Western will be the lead Federal agency for preparing the environmental impact statement, and the U.S. Forest Service has agreed to be a cooperating agency.

Public comments will help Western define issues and alternatives for evaluation of the environmental impacts of the proposed project. Comments can be provided in person at the public meetings, or by mail, e-mail or phone via the contact information below. To ensure consideration as we develop the EIS, Western should receive your comments by August 28, 2009. Additional project information and directions to the public meetings are available at the project website.

**Contact information**

Mary Barger

Western Area Power Administration

Project website: [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)

E-mail: [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)

Project phone: 602-605-2524

Project fax: 602-605-2630

Mail: P.O. Box 6457, Phoenix, AZ 85005

-30-

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Western Area Power Administration annually markets and transmits more than 10,000 megawatts of clean, renewable power from hydroelectric powerplants owned and operated by the Bureau of Reclamation and the U.S. Army Corps of Engineers in 15 western and central states. It is part of the Department of Energy.

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***Serving the West with Federal hydropower***



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# Serving the West with Federal hydropower

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An agency of the U.S. Department of Energy

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#### [Interconnection](#)

#### [Infrastructure projects](#)

### Grapevine Canyon Wind Project

Foresight Flying M, LLC, proposes to construct a wind energy generation project up to 500 megawatts. The project would be located on privately owned ranch lands and trust lands administered by the Arizona State Land Department. The project location is approximately 22 miles southeast of Flagstaff and about 18 miles south of the I-40 Twin Arrows interchange. To support delivery of the power generated by the project, Foresight proposes to build a new transmission tie-line to interconnect with Western's existing Glen Canyon-Pinnacle Peak transmission line. The transmission tie-line would cross lands administered by Coconino National Forest. The project area would be accessed by the existing F.S. 126 road, south of the Twin Arrows I-40 exit.

Foresight has applied to interconnect the proposed project to Western's power transmission system. Western will prepare an environmental impact statement to address the proposed interconnection and any necessary modifications to Western facilities to accommodate the interconnection. The EIS will also review the potential environmental impacts of constructing, operating and maintaining Foresight's wind generation facility and associated facilities. The U. S. Forest Service will be a cooperating agency in the preparation of the EIS.

#### Scoping meetings scheduled

Western will host open-house public scoping meetings August 10 and 11, 2009 to share information about the proposed Grapevine Canyon Wind Project. The informal meetings will provide the public and interested parties with the opportunity to learn about the environmental impact statement process, meet one-on-one with project team members, ask questions and make comments. Meetings will be held from 6 to 8 p.m.

Monday, August 10 - **Mormon Lake, AZ**. Mormon Lake Fire Station, 43 Mormon Lake Road ([Meeting location map](#)) (75 kb pdf)

Tuesday, August 11 - **Flagstaff, AZ**. NACET Conference Room, 2225 N. Gemini Drive ([Meeting location map](#)) (193 kb pdf)

#### We need your ideas by August 28

Your comments will help Western define issues and alternatives for evaluation of the environmental impacts of the proposed project. Comments can be provided in person at the public meetings; by mail, e-mail or phone via the contact information below; or [online](#). To ensure consideration as we develop the EIS, Western should receive your comments by August 28, 2009.

#### Project Updates

[Notice of Intent to Prepare an Environmental Impact Statement \(55 kb pdf\)](#)

[Project area map \(173 kb pdf\)](#)

[Project area land ownership map \(311 kb pdf\)](#)

[Scoping comment form \(90 kb pdf\)](#)

[Scoping meeting announcement \(75 kb pdf\)](#)

[Scoping meeting news release](#)

[Online comment form](#)

#### Contact information

Mary Barger  
 Western Area Power Administration  
 Mail: P.O. Box 6457, Phoenix, AZ. 85005  
 Telephone: 602-605-2524  
 Fax: 602-605-2630  
 E-mail: [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)

#### Links

[Foresight's Grapevine Canyon Wind Project Web site](#)



- Home
- Project Information
- Project Developer
- Wind Energy Benefits
- NEPA

## Grapevine Canyon Wind Project

**Clean, Renewable Energy for the  
Desert Southwest**

The Grapevine Canyon Wind Project is a commercial wind energy generation facility being developed approximately 22 miles southeast of Flagstaff in Coconino County, Arizona.

The project is sited on private ranch lands and trust lands administered by the Arizona State Land Department.

The project is designed for up to 500 megawatts of clean, renewable energy. Each 100 megawatts would provide the average annual energy usage of approximately 25,000 to 30,000 homes in the Southwest. The project anticipates construction will begin in 2011.



[Home](#) | [Project Information](#) | [Project Developer](#) | [Wind Energy Benefits](#) | [NEPA](#)

Grapevine Canyon Wind  
657 Mission Street, Suite 504, San Francisco, CA 94105  
415-495-0700 | [info@grapevinewind.com](mailto:info@grapevinewind.com)

**APPENDIX B**

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**MAILING LISTS**

## **AGENCY AND INTERESTED PARTIES**

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Organization	NAME	Address	City	State	Zip
	Aaron Alvidrez				
NAU - Institute for Native Americans	Al Henderson	PO Box 4085	Flagstaff	AZ	86011
Arizona State Land Department	Al Hendricks	1616 West Adams Street	Phoenix	AZ	85007
City of Flagstaff	Al White	211 W Aspen Ave	Flagstaff	AZ	86001
Interwest Energy Alliance	Amanda Ormand	1956 E. Vaughn Street	Phoenix	AZ	85283
Foresight Wind Energy	Amy LeGere	2225 N Gemini Dr, Suite 7	Flagstaff	AZ	86001
Arizona Game & Fish Department	Andi Rogers	3500 S Lake Mary Rd	Flagstaff	AZ	86001
Sierra Club	Andy Bessler	PO Box 38	Flagstaff	AZ	86002
Arizona Game & Fish Department	Angie McIntire	5000 West Carefree Highway	Phoenix	AZ	85086
Navajo Nation, Department of Natural Resources	Arvin Trujillo	PO Box 9000	Window Rock	AZ	86515
	Barbara Hirt				
Arizona Public Service	Barbara Lockwood	400 N Fifth Street	Phoenix	AZ	85004
Arcadis	Barbara Neary	1687 Cole Blvd, 2nd Floor	Lakewood	CO	80401
Arizona Cattlegrowers Association	Bas Aja	1401 N 24th St, Suite A	Phoenix	AZ	85008
N AZ Audubon Society	Bea Cooley				
Arizona, Office of the Governor	Benjamin Grumbles	1700 West Washington	Phoenix	AZ	85007
Coconino Cattlegrowers Association	Benny Ajo	P.O. Box 1911	Litchfield Park	AZ	85340
	Bernardo Aquilar	220 Grove Avenue	Prescott	AZ	86303
	Betsy Feinberg				
U.S. Fish & Wildlife Service	Bill Austin	325 N Leroux Street, Suite 101	Flagstaff	AZ	86001
Flagstaff 40	Bill Calloway	4700 E Nestle Purina Ave	Flagstaff	AZ	86004
Grand Canyon Trust	Bill Hedden	2601 N. Fort Valley Road	Flagstaff	AZ	86001
Coconino County	Bill Towler	2500 N Fort Valley Road, Building 1	Flagstaff	AZ	86001
Northern Arizona University	Blasé Scarnati	PO Box 4092	Flagstaff	AZ	86011
Winslow Chamber of Commerce	Bob Hall	523 W 2nd Street	Winslow	AZ	86047
Arizona Corporation Commission	Bob Stump, Commissioner	1200 W Washington, 2nd Floor	Phoenix	AZ	85007
Meteor Crater Enterprises	Brad Andes	PO Box 30940	Flagstaff	AZ	86003
U.S. Fish & Wildlife Service	Brenda Smith	323 N Leroux Street, Suite 101	Flagstaff	AZ	86001
Arizona Cattlegrowers Association	Brooks Cameron	P.O. Box 36	Williams	AZ	86046
Flagstaff 40	Bruce Nordstrom	150 W Dale Ave, Ste 2	Flagstaff	AZ	86001
	Bryan Cooperrider				
Coconino County	Carl Taylor	219 E Cherry Ave	Flagstaff	AZ	86001
U.S. Forest Service, Coconino National Forest	Carol Boyd	1824 S Thompson Street	Flagstaff	AZ	86001
NAU - School of Forestry	Carol Chambers	PO Box 15018, NAU	Flagstaff	AZ	86011
Sierra Club	Carol Tepper	PO Box 38	Flagstaff	AZ	86002
Western Area Power Administration	Cathy Cunningham	12155 W. Alameda Pkwy	Lakewood	CO	80228

Organization	NAME	Address	City	State	Zip
U.S. Forest Service, Coconino National Forest	Cathy Taylor	PO Box 388	Springerville	AZ	85938
U.S. Geologic Service, Colorado Plateau Research S	Charles Drost	PO Box 5614	Flagstaff	AZ	86011
Arizona Game & Fish Department	Chris Bagnoli	2878 E White Mountain Blvd	Pinetop	AZ	85935
Arizona State Land Department	Chuck Vencill	1616 West Adams Street	Phoenix	AZ	85007
City of Flagstaff	City Council	211 W Aspen Ave	Flagstaff	AZ	86001
City of Flagstaff	Coral Evans	211 W Aspen Ave	Flagstaff	AZ	86001
Interwest Energy Alliance	Craig Cox	PO Box 272	Conifer	CO	80433
Edison Mission Energy	Craig Pospisil	18101 Von Karman Ave, Suite 1700	Irvine	CA	92612
NACET	Craig Snyder	Wells Fargo Bank, 1200 S Milton Road	Flagstaff	AZ	86001
Arizona Public Service	Dan Froetscher	400 N Fifth Street	Phoenix	AZ	85004
N AZ Audubon Society	Dave & Marcia Lamkin	999 W Coy Drive	Flagstaff	AZ	86001
Arizona Game & Fish Department	David Dorum	2878 E White Mountain Blvd	Pinetop	AZ	85935
WEST, Inc	David Young	2003 Central Ave	Cheyenne	WY	82001
	Dean Greenwood				
Flagstaff 40	Dean Pickett	100 North Elden Street P.O. Box 10	Flagstaff	AZ	86001
Arizona Department of Commerce	Deborah Tewa	1700 West Washington Street, Suite 600	Phoenix	AZ	85007
Arizona State Land Department	Denis Humphrey	3048 White Mountain Blvd	Pinetop	AZ	85935
Diablo Trust	Derrick Widmark	Box 3058	Flagstaff	AZ	86003
Arizona Public Interest Research Group	Diane Brown	130 N. Central Ave., Suite 202	Phoenix	AZ	85004
Arizona Cattlegrowers Association	Doc Lane	1401 N. 24th St. Suite A	Phoenix	AZ	85008
Arizona Department of Commerce	Don Cardon	1700 West Washington Street, Suite 600	Phoenix	AZ	85007
Arizona Daily Sun	Don Rowley	1751 S. Thompson	Flagstaff	AZ	86001
Barringer Crater Company	Drew Barringer	PO Box 30940	Flagstaff	AZ	86003
Hopi 3 Canyon Ranches	Dwayne Coleman	114 East Third Street	Winslow	AZ	86047
N AZ Audubon Society	Elaine Morral	4924 E Pebble Beach Drive	Flagstaff	AZ	86004
	Ellen Parish				
The Hopi Tribe	Energy Committee	PO Box 123	Kykotsmovi	AZ	86039
	Erik Ryberg	312 S Convent Avenue	Tucson	AZ	85701
Arizona Corporation Commission	Ernest Johnson	1200 W Washington, 2nd Floor	Phoenix	AZ	85007
N AZ Audubon Society	Frank Brandt	1270 E Appalachian	Flagstaff	AZ	86004
U.S. Forest Service, Coconino National Forest	Gary Hase, Jr.	6661 E. Anasazi	Flagstaff	AZ	86004
NRCS	Gary Parrott	1585 S PLAZA WAY STE 120	Flagstaff	AZ	86001
Arizona Corporation Commission	Gary Pierce, Commissioner	1200 W Washington, 2nd Floor	Phoenix	AZ	85007
Unisource Energy Services	Gary Smith	2901 W. Shamrell Blvd., Ste. 110	Flagstaff	AZ	86001
Transcon	George Miller	3740 E Southern Ave, Suite 218	Mesa	AZ	85206
Arizona Game & Fish Department	Ginger Ritter	5000 West Carefree Highway	Phoenix	AZ	85086

Organization	NAME	Address	City	State	Zip
Mormon Lake Fire Department	Glen Reagan	43 Mormon Lake Road	Mormon Lake	AZ	86038
Foresight Wind Energy	Grant Brummels	2225 N Gemini Dr, Suite 7	Flagstaff	AZ	86001
Arizona Department of Environmental Quality	Henry Darwin	1110 West Washington Street	Phoenix	AZ	85007
U.S. Forest Service, Coconino National Forest	Henry Provencio	1824 S Thompson Street	Flagstaff	AZ	86001
U.S. Department of Defense	Jack Bush	1235 South Clark Street, Suite 1000	Arlington	VA	22202
	James Babbitt	211 E Elm Ave	Flagstaff	AZ	86001
Arizona Game & Fish Department	James Driscoll	5000 West Carefree Highway	Phoenix	AZ	85086
Arizona State Historic Preservation Office	James Garrison	1300 West Washington Street	Phoenix	AZ	85007
Arizona State Land Department	Jamie Hogue	1616 West Adams Street	Phoenix	AZ	85007
NAU - EMA	Janet Lynn	PO Box 5845	Flagstaff	AZ	86011
NACET	Jason Baer	5120 W Kiltie Lane	Flagstaff	AZ	86001
Center for Biological Diversity	Jay Lininger	PO Box 1178	Flagstaff	AZ	86002
Foresight Wind Energy	Jeff Organ	2225 N Gemini Dr, Suite 7	Flagstaff	AZ	86001
Northern Arizona Center for Emerging Technologies	Jeff Saville	2225 N Gemini Drive, Suite 1	Flagstaff	AZ	86001
U.S. Forest Service, Coconino National Forest	Jeremy Haines	5075 N. Highway 89	Flagstaff	AZ	86004
Arizona Department of Commerce	Jerry Ewing	1700 West Washington Street, Suite 600	Phoenix	AZ	86007
Western Area Power Administration	Jessica Herndon	615 S. 43rd Ave	Phoenix	AZ	85005
Arizona State Land Department	Jim Adams	1616 West Adams Street	Phoenix	AZ	85007
Arizona Department of Commerce	Jim Arwood	1700 West Washington Street, Suite 600	Phoenix	AZ	85007
U.S. Forest Service, Coconino National Forest	Jim Beard	1824 S Thompson Street	Flagstaff	AZ	86001
Arizona Farm Bureau	Jim Klinker	325 S. Higley Road, Suite 210	Gilbert	AZ	85296
	Jim McCarthy	1755 W Sequoia Dr	Flagstaff	AZ	86001
Arizona Antelope Foundation	Jim Mehen	10 West Dale Ave	Flagstaff	AZ	86001
Arizona, Office of the Governor	Joanne Keene	1801 W Route 66	Flagstaff	AZ	86001
Museum of Northern Arizona	Jodi Griffith	3101 N. Fort Valley Road	Flagstaff	AZ	86001
Coconino Community College	Joe Costion	2800 S Lone Tree Rd	Flagstaff	AZ	86001
City of Flagstaff	Joe Haughey	211 W Aspen Ave	Flagstaff	AZ	86001
U.S. Forest Service, Coconino National Forest	Joe Stringer	1824 S Thompson Street	Flagstaff	AZ	86001
Northern Arizona University	John D. Haeger	PO Box 4092	Flagstaff	AZ	86011
Coconino Sustainable Economic Development Initiative	John Grahame	PO Box 22100	Flagstaff	AZ	86002
N AZ Audubon Society	John Grahame	375 Choctaw St	Flagstaff	AZ	86001
Arcadis	John Hanisch	1687 Cole Blvd, 2nd Floor	Lakewood	CO	80401
NACET	John Kalinich	123 N Leroux Street	Flagstaff	AZ	86001
Coconino Trail Riders	John Neff	6185 Black Bill Rd	Flagstaff	AZ	86004
U.S. Fish & Wildlife Service	John Nystedt	324 N Leroux Street, Suite 101	Flagstaff	AZ	86001
U.S. Forest Service, Coconino National Forest	John O'Brien	1824 S Thompson Street	Flagstaff	AZ	86004

Organization	NAME	Address	City	State	Zip
Sierra Club	Jon Findley	1030 E Baseline Rd, Suite 105-987	Tempe	AZ	85281
Edison Mission Energy	JT Boone	18101 Von Karman Ave, Suite 1700	Irvine	CA	92612
N AZ Audubon Society	Judi Radd				
Bar T Bar Ranch Inc	Judy & Bob Prosser	PO Box 190	Winslow	AZ	86047
Crater Ranch LLC	Judy & Bob Prosser	PO Box 190	Winslow	AZ	86003
Flagstaff Chamber of Commerce	Julie Pastrick	101 W Route 66	Flagstaff	AZ	86001
NAU - Vice President for Research	Karan English	P:O Box 5845	Flagstaff	AZ	86011
City of Flagstaff	Karla Brewster	211 W Aspen Ave	Flagstaff	AZ	86001
	Kathleen Satterfield				
Edison Mission Energy	Kellie Doherty	One International Place, 9th Floor	Boston	MA	02110
	Ken Jacobs	PO Box 1401	Flagstaff	AZ	86002
Arizona State Land Department	Kevin Boness	3650 Lake Mary Road	Flagstaff	AZ	86001
City of Flagstaff	Kevin Burke	211 W Aspen Ave	Flagstaff	AZ	86001
Arizona Corporation Commission	Kristin Mayes, Chair	1200 W Washington, 2nd Floor	Phoenix	AZ	85007
The Hopi Tribe	Land Committee	PO Box 123	Kykotsmovi	AZ	86039
Diablo Trust	Larry Bright	805 Sunshine Ln	Sedona	AZ	86336
Diablo Trust	Larry Holland	PO Box 492	Taylor	AZ	85939
Museum of Northern Arizona	Larry Stevens	3101 N. Fort Valley Road	Flagstaff	AZ	86001
NACET	LaVelle McCoy	361 N Switzer Canyon Dr	Flagstaff	AZ	86004
Coconino Community College	Leah Bornstein	2800 S. Lone Tree Rd.	Flagstaff	AZ	86001
Coconino County	Lena Fowler	219 E Cherry Ave	Flagstaff	AZ	86001
Navajo Nation, Leupp Chapter	Leonard Chee	CPO Box 5428	Leupp	AZ	86035
N AZ Audubon Society	Linda Hall	2305 Whispering Pines Way	Flagstaff	AZ	86001
The Nature Conservancy	Lisa McNeilly	114 N San Francisco St	Flagstaff	AZ	86001
Coconino County	Liz Archuleta	219 E Cherry Ave	Flagstaff	AZ	86001
Navajo Nation, Leupp Chapter	Lorraine Jones-Noline, Vice Preside	CPO Box 5428	Leupp	AZ	86035
Coconino County	Lucinda Andriani	219 E Cherry Ave	Flagstaff	AZ	86001
Arizona House of Representatives	Lucy Mason	1700 W Washington St	Phoenix	AZ	85007
Coconino County	Mandy Metzger	219 E Cherry Ave	Flagstaff	AZ	86001
NACET / NAU	Marc Chopin	2225 N Gemini Drive, Suite 1	Flagstaff	AZ	86001
Arizona State Land Department	Maria Baier	1616 West Adams Street	Phoenix	AZ	85007
U.S. Geologic Service, Colorado Plateau Research S	Mark Sogge	PO Box 5614	Flagstaff	AZ	86011
Northern Arizona Center for Emerging Technolog	Mark Yelton	2225 N Gemini Drive, Suite 1	Flagstaff	AZ	86001
Coconino Sustainable Economic Development Initia	Marshall Whitmire	PO Box 22100	Flagstaff	AZ	86002
Western Area Power Administration	Mary Barger	615 S. 43rd Ave	Phoenix	AZ	85005
U.S. Geologic Service, Colorado Plateau Research S	Matt Johnson	PO Box 5614	Flagstaff	AZ	86011



Organization	NAME	Address	City	State	Zip
Coconino County	Matt Ryan	219 E Cherry Ave	Flagstaff	AZ	86001
Arizona Department of Environmental Quality	Matthey Capalby	1801 W Route 66, Suite 117	Flagstaff	AZ	86001
Northern Arizona University	Merriam Powell Center for Environ	NAU Box 6077, Peterson Hall #330	Flagstaff	AZ	86011
Flying M Ranch	Metzger Family	PO Box 700	Flagstaff	AZ	86002
U.S. Forest Service, Coconino National Forest	Michael Chaveas	1824 S Thompson Street	Flagstaff	AZ	86001
Western Area Power Administration	Michael Garcia	615 S 43rd Ave, PO Box 6457	Phoenix	AZ	85005
Transcon	Michael Warner	3740 E Southern Ave, Suite 218	Mesa	AZ	85206
Arizona, Office of the Governor	Michael Anable	1700 West Washington	Phoenix	AZ	85007
NAU - EMA	Michele James	PO Box 5845	Flagstaff	AZ	86011
Navajo Land Department	Mike Halona	PO Box 2249	Window Rock	AZ	86515
U.S. Forest Service, Coconino National Forest	Mike Hannemann	5075 N Hwy 89	Flagstaff	AZ	86004
Arizona Game & Fish Department	Mike Ingraldi	5000 West Carefree Highway	Phoenix	AZ	85086
Arizona Public Service	Mike McElmury	2200 E Huntington Drive	Flagstaff	AZ	86004
	Mitch Buckingham	1016 W University, #108	Flagstaff	AZ	86001
Northern Arizona University	MJ McMahan	PO Box 4092	Flagstaff	AZ	86011
U.S. Forest Service, Coconino National Forest	Nora Rasure, Supervisor	1825 S Thompson Street	Flagstaff	AZ	86001
Diablo Trust	Norm Lowe	2660 E Hemberg	Flagstaff	AZ	86004
Diablo Trust	Norm Wallen	3716 N Grandview Drive	Flagstaff	AZ	86004
The Hopi Tribe, 3 Canyon Ranches	Norman Honanie	114 East Third Street	Winslow	AZ	86047
The Hopi Tribe	Norman Honie	PO Box 123	Kykotsmovi	AZ	86039
	Patty Denison				
Foresight Wind Energy	Paul Andrae	2608 Courtside Lane	Plano	TX	75093
Arizona Corporation Commission	Paul Newman, Commissioner	1200 W Washington, 2nd Floor	Phoenix	AZ	85007
N AZ Audubon Society	Peter Friederici	713 West Grand Canyon Ave	Flagstaff	AZ	86001
N AZ Audubon Society	Phyllis Kegley	1911 N Marion Drive	Flagstaff	AZ	86001
Western Area Power Administration	Randy Wilkerson	12155 W. Alameda Pkwy	Lakewood	CO	80228
Arizona Corporation Commission	Ray Williamson	1200 W Washington, 2nd Floor	Phoenix	AZ	85007
Arizona Game & Fish Department	RE Schweinsburg	5000 West Carefree Highway	Phoenix	AZ	85086
Northern Arizona University	Rich Bowen	NAU Box 4074	Flagstaff	AZ	86011
NACET	Rick Gibron	5930 N Moccasin Trail	Flagstaff	AZ	86001
Arizona Game & Fish Department	Rick Miller	5000 West Carefree Highway	Phoenix	AZ	85086
City of Flagstaff	Rick Swanson	211 W Aspen Ave	Flagstaff	AZ	86001
Sierra Club	Rob Smith	202 E McDowell Rd, Ste 277	Phoenix	AZ	85004
Museum of Northern Arizona	Robert Breunig	3101 N Fort Valley Road	Flagstaff	AZ	86001
City of Winslow	Robin Boyd	21 Williamson Avenue	Winslow	AZ	86047
Meteor Crater Enterprises	Robyn Messerschmidt	PO Box 30940	Flagstaff	AZ	86003

Organization	NAME	Address	City	State	Zip
Grand Canyon Trust	Roger Clark	2601 N Fort Valley Rd	Flagstaff	AZ	86001
Rocky Mountain Elk Foundation	Ron Pittman	3895 Yo He Wah Drive	Chino Valley	AZ	86323
Arizona Game & Fish Department	Ron Sieg	3500 S Lake Mary Rd	Flagstaff	AZ	86001
Arizona State Land Department	Ruben Ojeda	1616 West Adams Street	Phoenix	AZ	85007
Arizona Wildlife Federation	Ryna Rock	PO Box 51510	Mesa	AZ	85208
Arizona Corporation Commission	Sandra Kennedy, Commissioner	1200 W Washington, 2nd Floor	Phoenix	AZ	85007
U.S. Forest Service, Coconino National Forest	Sandra Nagiller	4373 S Lake Mary Rd	Flagstaff	AZ	86001
City of Flagstaff	Sara Presler	211 W Aspen Ave	Flagstaff	AZ	86001
Arizona Game & Fish Department	Sarah Reif	3500 S Lake Mary Rd	Flagstaff	AZ	86001
The Hopi Tribe	Scott Canty	5200 East Cortland Blvd, #E-200	Flagstaff	AZ	86001
National Wild Turkey Federation	Scott Lerich	PO Box 4126	Amarillo	TX	79116
City of Flagstaff	Scott Overton	211 W Aspen Ave	Flagstaff	AZ	86001
NRCS	Shai Schendel	1585 S PLAZA WAY STE 120	Flagstaff	AZ	86001
Arizona, Office of the Governor	Shannon Scutari	1700 West Washington	Phoenix	AZ	85007
U.S. Fish & Wildlife Service	Shaula Hedwall	323 N Leroux Street, Suite 101	Flagstaff	AZ	86001
NAU - University Development	Shelley Silbert	3209 W Brenda Loop	Flagstaff	AZ	86001
Flagstaff 40	Stephanie McKinney	211 N Leroux Street	Flagstaff	AZ	86001
Dine Power Authority	Stephen Begay	P.O. Box 3239	Window Rock	AZ	86515
Western Area Power Administration	Stephen Tromly	12155 W Alameda Pkwy, PO Box 281213	Lakewood	CO	80228-8213
Arizona State Land Department	Stephen Williams	1616 West Adams Street	Phoenix	AZ	85007
NAU - Mechanical Engineering	Steve Atkins	PO Box 15600	Flagstaff	AZ	86011-15600
Arizona Game & Fish Department	Steve Goodman	5325 North Stockton Hill Road	Kingman	AZ	86401
Arizona Game & Fish Department	Steve Partridge	5000 West Carefree Highway	Phoenix	AZ	85086
Coconino County	Steve Peru	219 E Cherry Ave	Flagstaff	AZ	86001
Arizona State Senate	Steve Pierce	1700 W Washington	Phoenix	AZ	85007-2890
U.S. Fish & Wildlife Service	Steve Spangle	2321 W. Royal Palm Road, Suite 103	Phoenix	AZ	85021
NRCS	Stu Tuttle	1585 S PLAZA WAY STE 120	Flagstaff	AZ	86001
Arizona Game & Fish Department	Susan MacVean	3500 S Lake Mary Rd	Flagstaff	AZ	86001
NAU - College of Business	Susan Williams	PO Box 15066	Flagstaff	AZ	86011-15066
Museum of Northern Arizona	Susie Garretson	3101 N Fort Valley Road	Flagstaff	AZ	86001
U.S. House of Representatives	The Honorable Ann Kirkpatrick	240 South Montezuma Street #101	Prescott	AZ	86303
Arizona, Office of the Governor	The Honorable Jan Brewer	1700 West Washington	Phoenix	AZ	85007
U.S. Senate	The Honorable John McCain	5353 North 16th Street, Suite 105	Phoenix	AZ	85016
U.S. Senate	The Honorable Jon Kyl	2200 East Camelback, Suite 120	Phoenix	AZ	85016-3455
Navajo Nation, Leupp Chapter	Thomas Cody, President	CPO Box 5428	Leupp	AZ	86035
Navajo Nation, Leupp Chapter	Thomas Walker, Jr	CPO Box 5428	Leupp	AZ	86035

Organization	NAME	Address	City	State	Zip
The Hopi Tribe	Three Canyon Ranches	PO Box 1138	Winslow	AZ	86047
	Tischa Munoz-Erickson	509 E Charles	Flagstaff	AZ	86001
Foresight Wind Energy	Todd Thorner	657 Mission St, Suite 504	San Francisco	CA	94105
NAU - Mechanical Engineering	Tom Acker	PO Box 15600	Flagstaff	AZ	86011-15600
Arizona House of Representatives	Tom Chabin	1700 W Washington St, Suite H	Phoenix	AZ	85007-2844
NAU - Environmental Sciences	Tom Sisk	3865 Hidden Hollow Rd	Flagstaff	AZ	86004
Grand Canyon Trust	Tony Skrelunas	2601 N Fort Valley Rd	Flagstaff	AZ	86001
Village of Mormon Lake	Town Council	Mormon Lake Town Hall	Mormon Lake	AZ	86038
Arizona Game & Fish Department	Troy Corman	5000 West Carefree Highway	Phoenix	AZ	85086
U.S. House of Representatives	Virginia Turner	240 South Montezuma Street #101	Prescott	AZ	86303
Navajo Tribal Utility Authority	Walter Haase	PO Box 170	Ft Defiance	AZ	86504
Foresight Wind Energy	Warren Byrne	657 Mission St, Suite 504	San Francisco	CA	94105
Northern Arizona University	William Auberle	PO Box 15600	Flagstaff	AZ	86011-5600
Babbitt Ranches	William Cordasco	12 E Aspen Ave	Flagstaff	AZ	86001
U.S. Department of the Interior	Willie R. Taylor	1849 C Street, NW, Mail Stop 2342	Washington	DC	20240
Arizona Wind Working Group		P.O. Box 15600	Flagstaff	AZ	86011-15600
Diablo Trust		P.O. Box 31239	Flagstaff	AZ	86002
Forest Guardians		312 Montezuma	Santa Fe	NM	87501
Friends of Flagstaff's Future		PO Box 23462	Flagstaff	AZ	86002
Historic Two-Guns Properties LLC		302 N Verde	Flagstaff	AZ	86001
Meteor Crater Enterprises		P:O Box 30940	Flagstaff	AZ	86003-0940
Mormon Lake Lodge		1 Main Street	Mormon Lake	AZ	86038
N AZ Audubon Society		PO Box 1496	Sedona	AZ	86339
The Hopi Tribe		PO Box 123	Kykotsmovi	AZ	86039
Diablo Trust	Rebecca Daggett	PO Box 3058	Flagstaff	AZ	86003
Diablo Trust	Maury Herman	PO Box 3058	Flagstaff	AZ	86003
Diablo Trust	Jim Highsmith	PO Box 3058	Flagstaff	AZ	86003
Diablo Trust	Richard Knight	PO Box 3058	Flagstaff	AZ	86003
Diablo Trust	Joan Murphy	PO Box 3058	Flagstaff	AZ	86003
Diablo Trust	Helen & Tom Sisk				

Department of Defense

[www.defenselink.mil](http://www.defenselink.mil)

U.S. Air Force

Mr. Jack Bush

Air Force Civil Engineer, Planning Division

U.S. Department of Defense

1235 South Clark Street, Suite 1000

Arlington, VA 22202-4367

Phone: 703-604-5264

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Department of the Interior

[www.doi.gov](http://www.doi.gov)

Mr. Willie R. Taylor

Director

Office of Environmental Policy and Compliance

U.S. Department of the Interior

1849 C Street, NW, Mail Stop 2342

Washington, DC 20240

Phone: 202-208-3891

FAX: 202-208-6970

E-Mail: [willie\\_taylor@ios.doi.gov](mailto:willie_taylor@ios.doi.gov)

State NEPA Point of Contact:

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Mr. Henry Darwin

Counsel

Arizona Department of Environmental Quality

1110 West Washington Street

Phoenix, AZ 85007

Phone: 602-771-2328

FAX: 602-771-2251

E-Mail: [hrd@azdeq.gov](mailto:hrd@azdeq.gov)

**TRIBAL**

---

<b>Name</b>	<b>Title</b>	<b>Tribe</b>	<b>Address</b>	<b>City,</b>	<b>State</b>	<b>Zip Code</b>
Ronnie Lupe	Chairman	White Mountain Apache Tribe	P.O. Box 700	White River	AZ	85941
Thomas Beauty	Chairman	Yavapai-Apache Nation	2400 Datsi Street	Camp Verde	AZ	86322
Wendsler Noise	Chairman	San Carlos Apache Tribe	P.O. Box 0	San Carlos	AZ	85550
Ivan Smith	Chairman	Tonto Apache Tribe	Tonto Apache No. 30	Payson	AZ	85541
Wilfred Whatoname, Sr.	Chairman	Hualapai Nation	P.O. Box 179	Peach Springs	AZ	86434
Ernest Jones, Sr.	President	Yavapai-Prescott Tribe	530 E. Merritt	Prescott	AZ	86301
Raphael Bear	President	Ft. McDowell Yavapai Nation	P.O. Box 17779	Fountain Hills	AZ	85269
Don Watahomigie	Chairman	Havasupai Tribe	P.O. Box 10	Supai	AZ	86435
Mary Lou Boone	President	San Juan Southern Paiute Tribe	P.O. Box 2710	Tuba City	AZ	86045
Joe Shirley	President	Navajo Nation	P.O. Box 9000	Window Rock	AZ	86515
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Chandler Sanchez	Governor	Pueblo Acoma	P.O. Box 309	Acoma	NM	87034
Norman Coeeyate	Governor	Pueblo of Zuni	P.O. Box 339	Zuni	NM	87327
Navajo Medicine Men Association		Navajo Nation		Window Rock	AZ	86515

## **PROPERTY OWNERS**

---

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ANTELOPE HILLS LLC	7670 E BROADWAY BLVD STE 207	TUCSON	AZ	85710
ANTELOPE MESA RANCH LLC	7670 E BROADWAY BLVD STE 207	TUCSON	AZ	85710
ATCHISON TOPEKA & SANTA FE RY CO NKA	PO BOX 961089	FORT WORTH	TX	76161
BAR T BAR RANCH CO LTD PTNRSHP	PO BOX 30940	FLAGSTAFF	AZ	86003
BAR T BAR RANCH INC	PO BOX 190	WINSLOW	AZ	86047
BARRINGER CRATER CO	PO BOX 30940	FLAGSTAFF	AZ	86003
CARTTER ROBIN D & SHONA JT	38 TWIN ARROWS	FLAGSTAFF	AZ	86004
CLIFTON MICHAEL GREGORY	PO BOX 357	FLAGSTAFF	AZ	86002
CRATER RANCH LLC	PO BOX 190	WINSLOW	AZ	86047
DRYE AARON DANIEL OR DEBRA JEAN	1210 LIBERTY RD	NORMAN	AR	71960
DRYE AARON M	45 TWIN ARROWS	FLAGSTAFF	AZ	86004
DRYE AARON M II	15 N TWIN ARROWS	FLAGSTAFF	AZ	86004
DRYE MAUDIE J	45 TWIN ARROWS	FLAGSTAFF	AZ	86004
DRYE RONALD L & BONNI JO CPWROS	2913 N WEST ST	FLAGSTAFF	AZ	86004
DRYE RUTH TRUSTEE	6095 E LEISURE LN	FLAGSTAFF	AZ	86004
DRYE STEVEN C & PATSY G CPWROS	34 TWIN ARROWS	FLAGSTAFF	AZ	86004
DRYE WENDY LYNN JT	132 TWIN ARROWS	FLAGSTAFF	AZ	86004
FLYING M LAND & CATTLE CO	PO BOX 700	FLAGSTAFF	AZ	86002
FLYING M RANCH LIMITED PARTNERSHIP	DRAWER 700	FLAGSTAFF	AZ	86002
GUETTER HARRY H & JOAN A JT	526 W HAVASUPAI RD	FLAGSTAFF	AZ	86001
HENDRICKS JOHN D & MARY C JT	43 TWIN ARROWS	FLAGSTAFF	AZ	86004
HISTORIC TWO-GUNS PROPERTIES LLC	302 N VERDE	FLAGSTAFF	AZ	86001
HOPI TRIBE	PO BOX 123	KYKOTSMOVI	AZ	86039
HOPI TRIBE	PO BOX 1138	WINSLOW	AZ	86047
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Name	Address	City	State	Zip
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TURRELL TRADING COMPANY	9000 HUTTON RANCH RD	FLAGSTAFF	AZ	86004
TWIN ARROWS ESTATES LLC	7670 E BROADWAY BLVD STE 207	TUCSON	AZ	85710
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**APPENDIX C**

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**PUBLIC SCOPING MEETINGS**

**SLIDE PRESENTATION**

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## Grapevine Canyon Wind Project

# Public Scoping Meetings for Environmental Impact Statement

August 2009



# *Public Scoping Meeting Agenda*

- **Introductions**
  - Agencies / Roles
  - Proponent / Foresight Flying M
- **Project Overview**
  - Location
  - Project Timeline
  - Components
    - Transmission Tie-Line and Interconnection Switchyard
    - Wind Park
    - Site Access
- **Environmental Impact Statement Process**
- **Comment, Q&A**



## *Introductions – Federal Agencies*

- **Western Area Power Administration (*Western*)**
  - One of four power marketing administrations within the U.S. Department of Energy
  - 15-State Service Territory
  - Owns & operates 17,000 miles of high-voltage transmission lines
  - Role is to market and transmit electricity from multi-use water projects
- **U.S. Forest Service**
  - Agency of U.S. Department of Agriculture
  - US Forest Service is charged with the care of the nation's forests and rangelands
  - **Coconino National Forest**
    - One of 6 national forests in Arizona





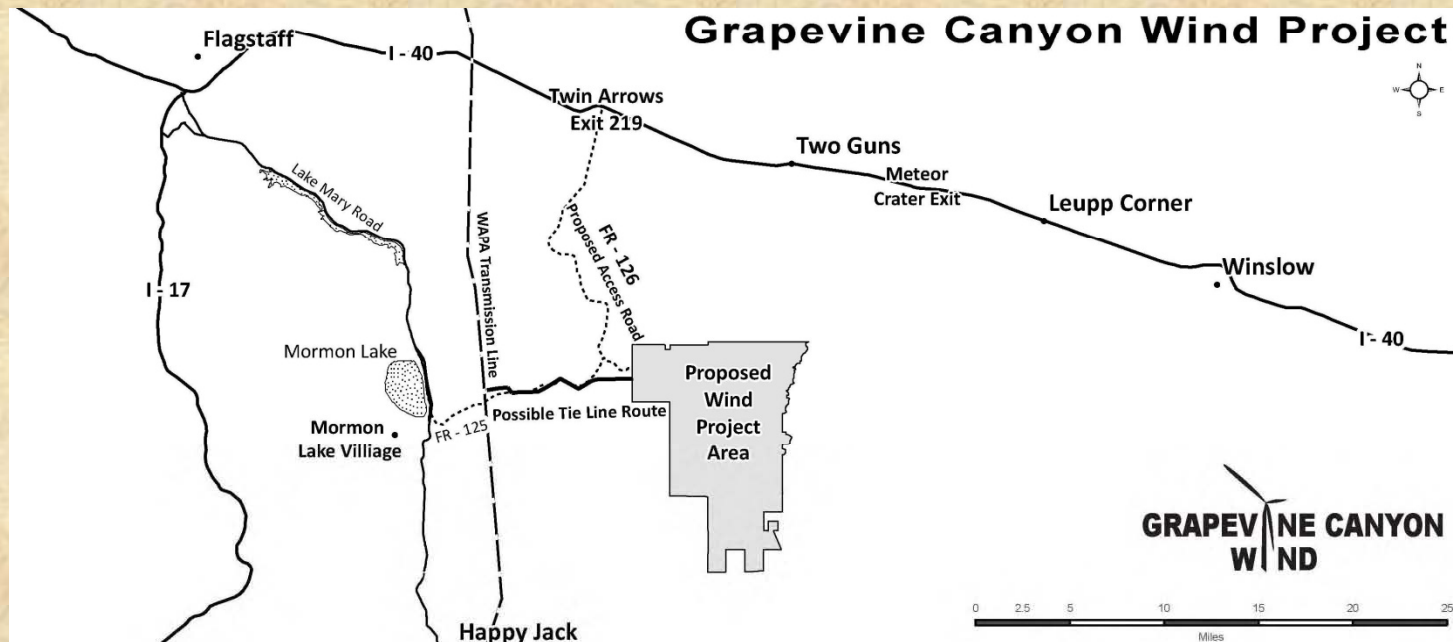
## *Introductions – Project Proponent*

- **Foresight Flying M, LLC**
  - **Project Company: Foresight Flying M, LLC**
  - **Developer/Owner of Grapevine Canyon Wind Project**
  - **Manager: Foresight Wind Energy, LLC**
  - **Project Development Activities**
    - **Wind assessment, environmental and cultural/historical studies, permitting, transmission, project management, stakeholder relations**
    - **Project Financing**
    - **Construction, Operations & Maintenance**
    - **Power marketing**

## *Project Proponent, cont'd*

- **About Foresight Wind Energy, LLC**
  - Leading wind developer in the Southwest
  - Working in Arizona since 2002
  - Over 2.5 GW of projects in various stages of development
  - Expertise: Project Development, Wind & Renewable Energy Technologies, Transmission, Power Marketing
  - Desert Southwest focus
  - Office Locations: San Francisco, Flagstaff
- **Flagstaff Development Team**
  - Lead Personnel for Permitting, GIS, Wind Analysis, Project Management, Government Relations
- **[www.foresightwind.com](http://www.foresightwind.com)**

## Project Overview - Location



- **Location**

- 22 miles SE of Flagstaff
- 18 miles S of I-40 Exit 219

- **Project Lands**

- Wind Park
  - Private Flying M Ranch lands
  - Arizona State Trust Lands
- Transmission Tie-Line & Switchyard
  - Coconino National Forest lands



## *Project Overview cont'd*

- **Project Size**
  - Potentially up to 500 megawatts
  - Project would be phased
  - Project would generate over 500,000 megawatt hours per year if fully built out
  - Each 100 megawatts would serve approximately 25,000 homes
- **Power Market**
  - Energy delivered to regional electric grid via Western's transmission system
  - Power to be marketed to Arizona and regional utilities, and Federal power preference customers



## *Project Timeline*

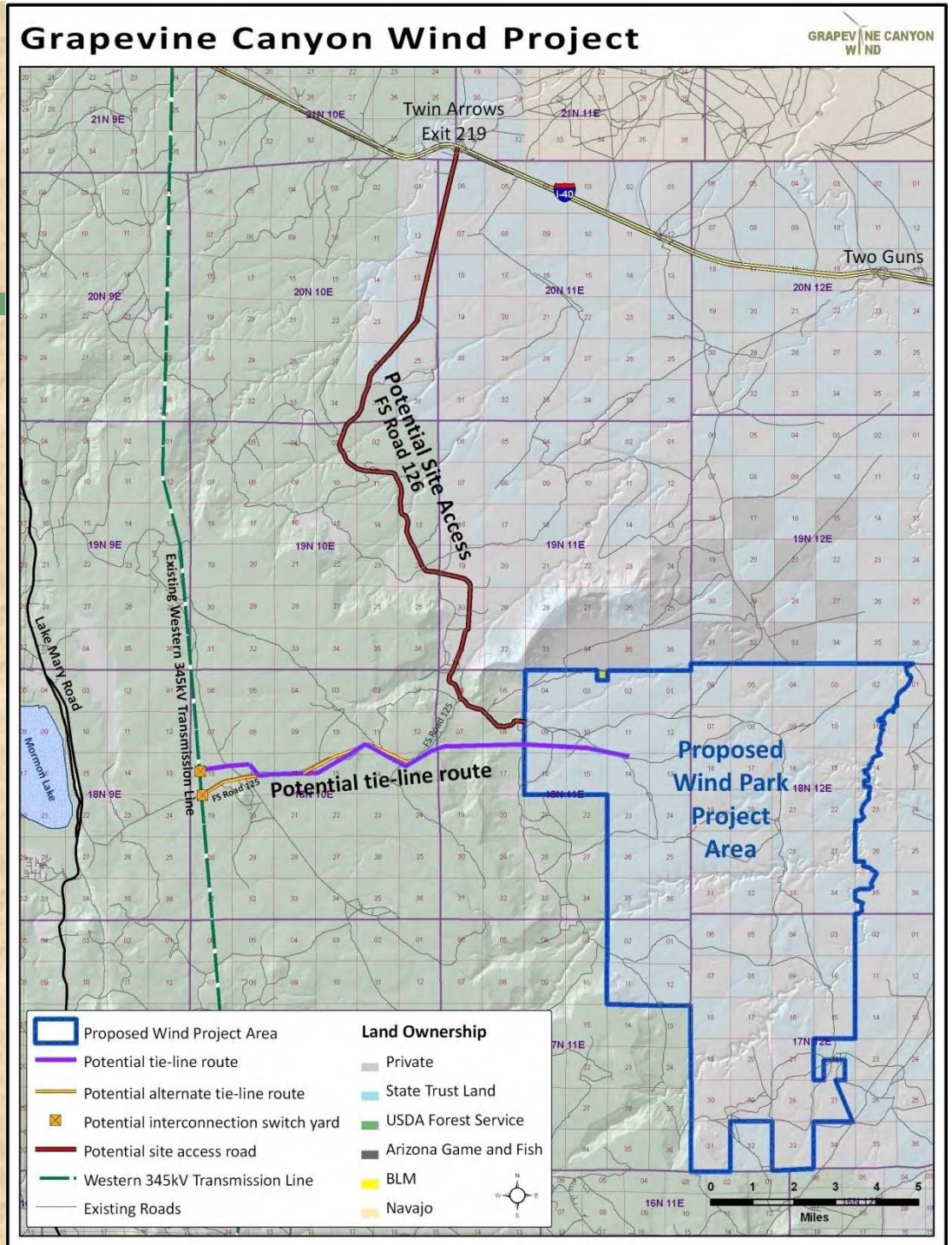
<b>Timeframe</b>	<b>Activities</b>
<b>2007-2010</b>	<b>Wind Assessment</b> <b>Feasibility &amp; Environmental Studies</b> <b>Development Activities</b> <b>Interconnection &amp; Transmission Studies</b> <b>Power Marketing</b>
<b>2009-2010</b>	<b>NEPA: Environmental Impact Statement</b>
<b>Fall 2010</b>	<b>NEPA: Record of Decision (Western, US Forest)</b>
<b>Fall 2010</b>	<b>Tie Line: Arizona Certificate of Environmental Compatibility</b>
<b>Fall 2010</b>	<b>Coconino County Conditional Use Permit</b>
<b>2011</b>	<b>Anticipated Construction</b>
<b>2011-2012</b>	<b>Anticipated Commercial Operation</b>





# Project Components

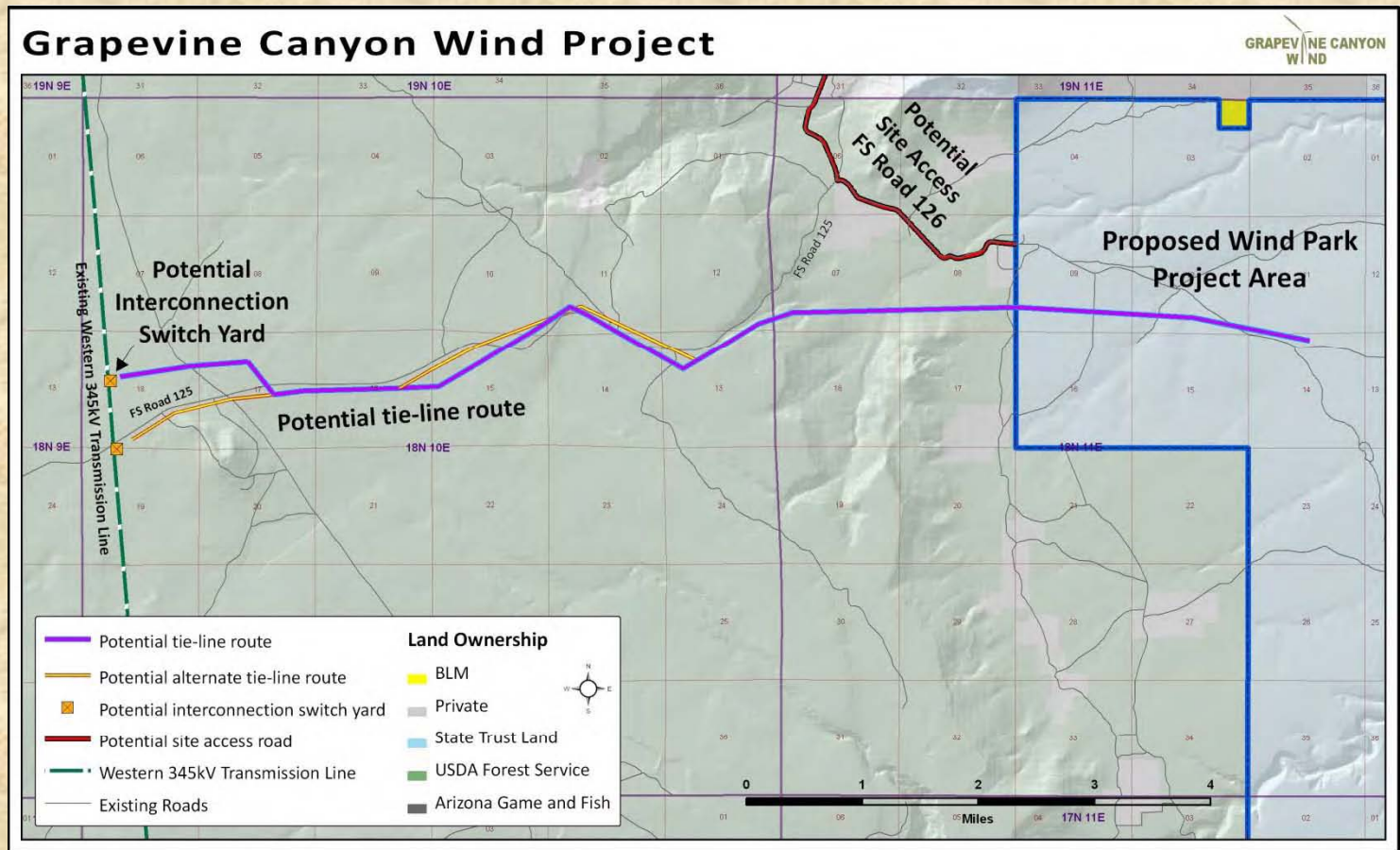
- Transmission Tie-Line
- Interconnection Switchyard
- Wind Park
- Site Access Road





# Proposed Transmission Tie-Line

- Proposed Transmission Tie-Line
  - 9 miles
  - 345 kV



*Right: Potential Tie Line Route Alternatives*

## *Proposed Interconnection Switchyard*

- **Interconnection Switchyard**
  - **Switchyard to interconnect to Western's Glen Canyon to Pinnacle Peak 345kV Transmission Line**



*Above: Existing Western Transmission Line, Potential Interconnection Area.  
Left, an existing 345kV switchyard*



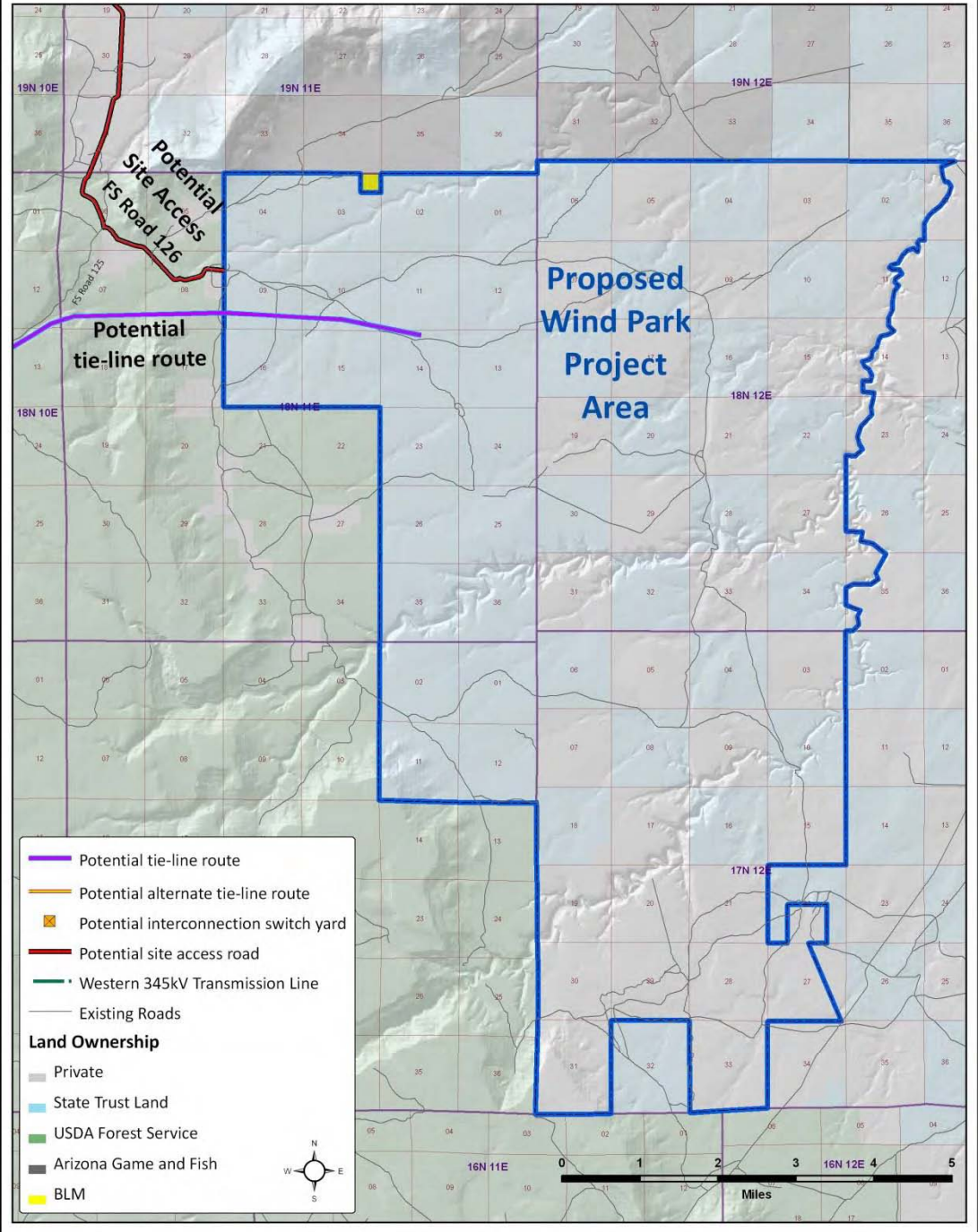


# Proposed Wind Park

- Up to 500 megawatts
- 166 to 333 turbines if fully built out
- Step-up Substation
- O&M Building
- Collection system between turbines
- Service Roads

## Grapevine Canyon Wind Project

GRAPEVINE CANYON WIND



## *Wind Park, cont'd*



*Above: Typical Step-up  
Substation*

*Right: Typical Wind  
Farm. 1.5 MW Turbines*





## *Wind Park / Wind Assessment*



*Typical Meteorological  
“MET” Tower*





# Site Access

- F.S. Road 126
- Approximately 18 miles

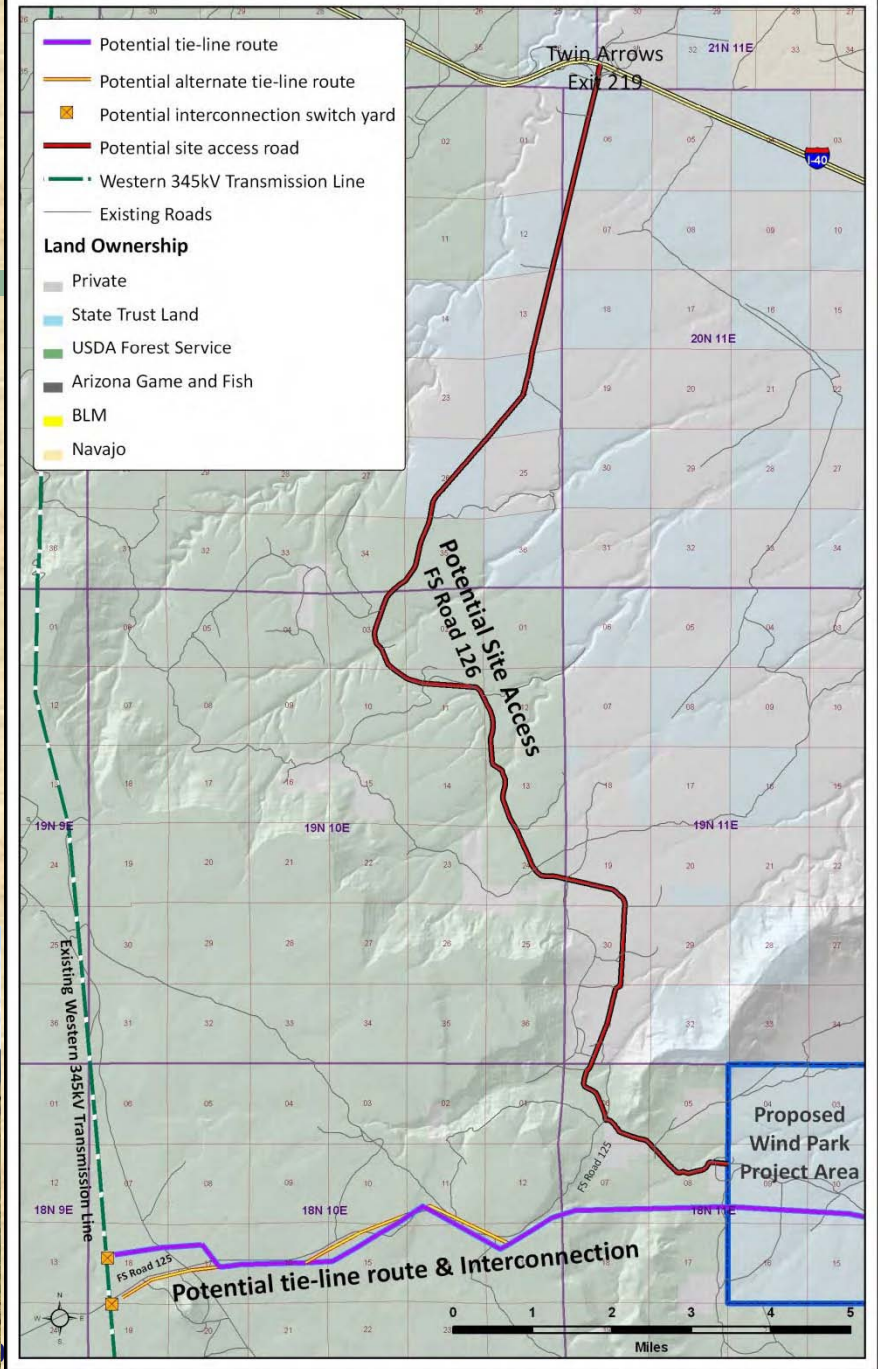


*Above & Right:  
F.S. Road 126*



*Far Right:  
Access Road  
Location*

## Grapevine Canyon Wind Project



# *National Environmental Protection Act*

*Under the National Environmental Protection Act, Federal agencies must consider the potential environmental consequences of their proposals, document the analysis and make this information available to the public for comment before taking action.*

	<b>Western</b>	<b>Forest</b>
NEPA Policy	Environmental review for interconnection projects	Environmental review for ROW for utility & infrastructure projects
Proposed Action	Interconnect wind project to Western transmission system	Identify suitable interconnection site and tie-line route across Forest
NEPA Role	Lead Agency	Cooperating Agency



## *EIS Process Timeline*

- **Public Scoping**
  - July/August 2009
  - Public Comment requested by August 28, 2009
- **Draft EIS**
  - January 2010
  - Public Comment period February/March 2010
- **Final EIS**
  - Summer 2010
- **Record of Decision**
  - Fall 2010

## *Your Comments are Welcome*

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**Please provide public comment by August 28, 2009**

- **Public Meeting Comment Form**
- **Mail / Comment Form**
  - **Ms. Mary Barger**  
**Western Area Power Administration**  
**PO Box 6457**  
**Phoenix, AZ 85005**
- **Email: [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)**
- **Website: E-comment form at [ww.wapa.gov/transmission/grapevine.htm](http://ww.wapa.gov/transmission/grapevine.htm)**
- **Phone: (602) 605-2524**
- **Fax: (602) 605-2630**

## *More Information*

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- Visit the **Western Project Website**
  - [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)
- Visit the **Proponent's Project Website**
  - [www.GrapevineWind.com](http://www.GrapevineWind.com)
- Visit the **Department of Energy NEPA Website**
  - <http://www.gc.energy.gov/NEPA/>
- Visit the **Department of Energy Wind Powering America Website**
  - [www.WindPoweringAmerica.com](http://www.WindPoweringAmerica.com)
- Visit the **American Wind Energy Association Website**
  - [www.awea.org](http://www.awea.org)



## *Public Comment, Q&A*

---

Your comments will help Western define issues and alternatives for evaluation of the environmental impacts of the proposed project.

Thank You  
for your  
Participation & Comments

## **DISPLAY BOARDS**

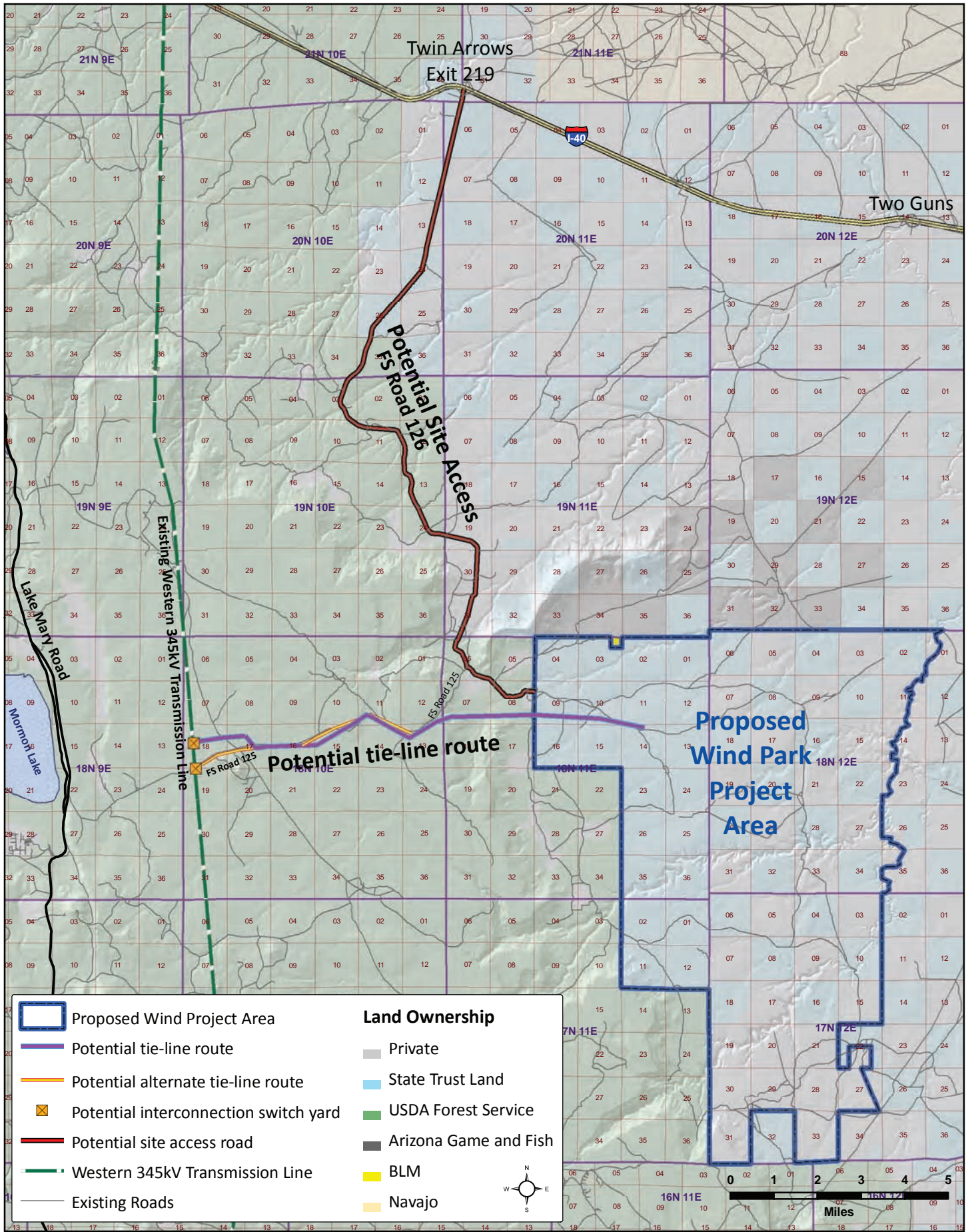
---














**WELCOME**

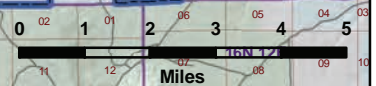




# Grapevine Canyon Wind Project

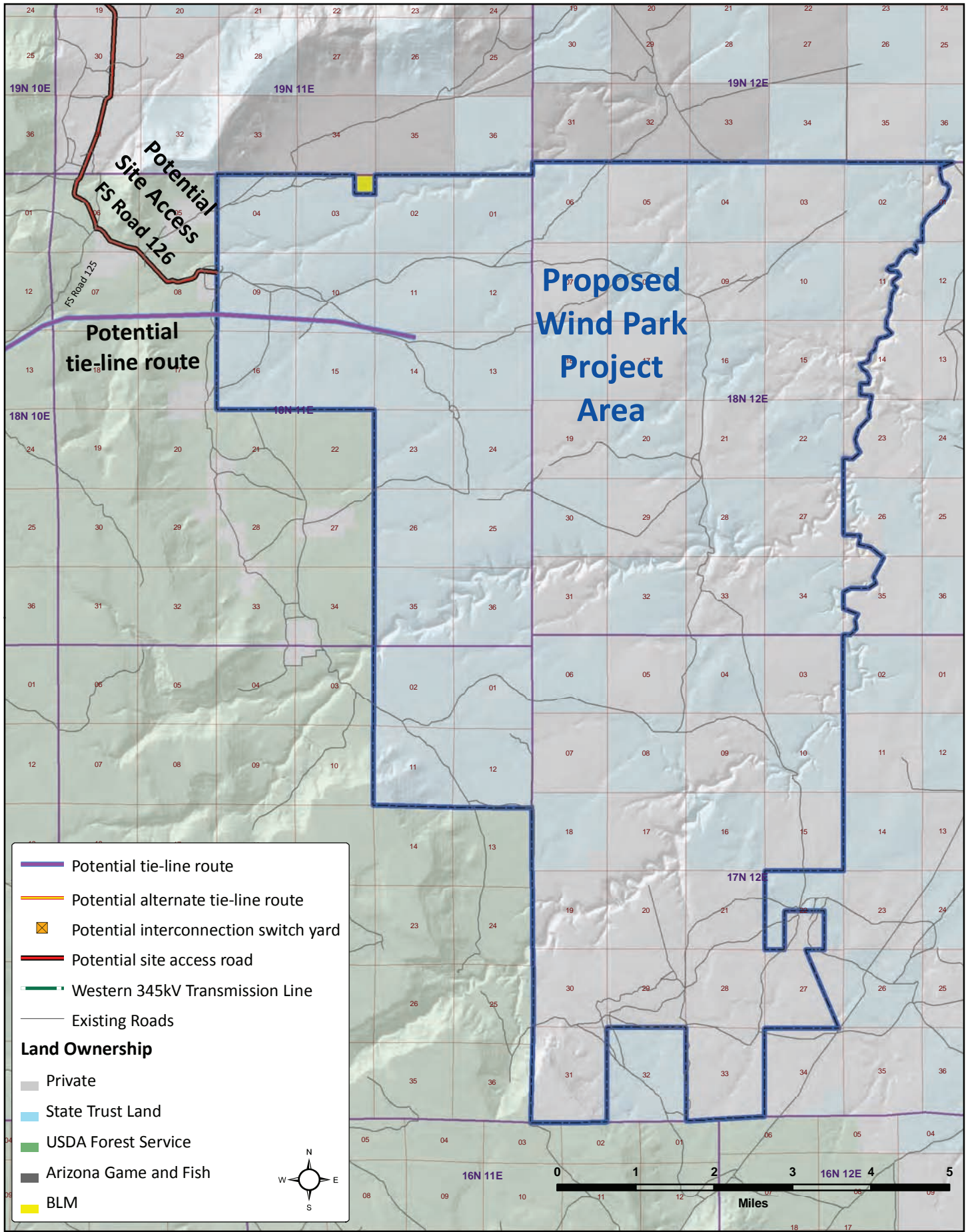


- |   |                                       |   |
|---|---------------------------------------|---|
|  | Proposed Wind Project Area            | <b>Land Ownership</b>   |
|  | Potential tie-line route              |  Private               |
|  | Potential alternate tie-line route    |  State Trust Land      |
|  | Potential interconnection switch yard |  USDA Forest Service   |
|  | Potential site access road            |  Arizona Game and Fish |
|  | Western 345kV Transmission Line       |  BLM                   |
|  | Existing Roads                        |  Navajo                |






# Grapevine Canyon Wind Project

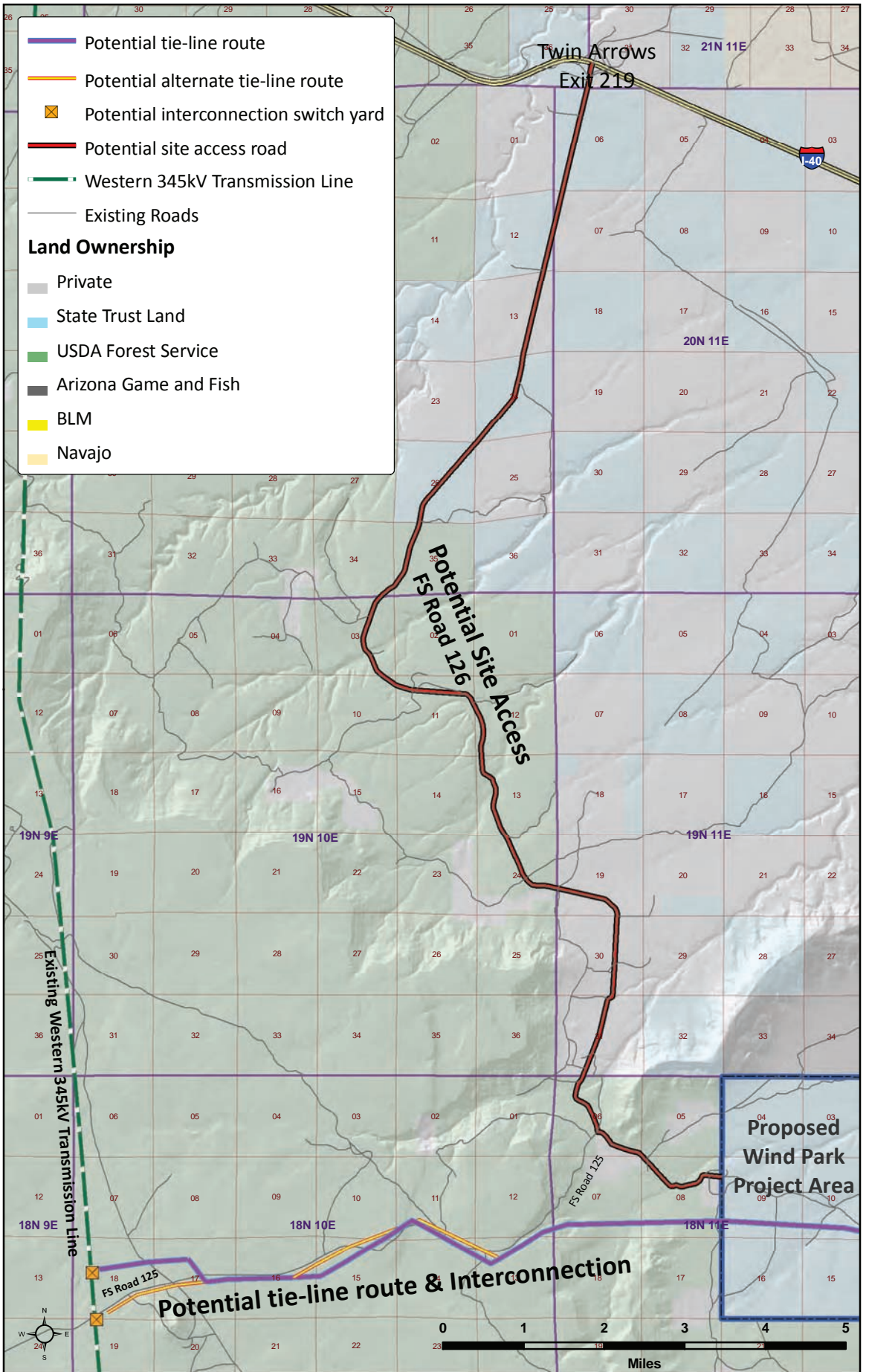


-  Potential tie-line route
-  Potential alternate tie-line route
-  Potential interconnection switch yard
-  Potential site access road
-  Western 345kV Transmission Line
-  Existing Roads

**Land Ownership**

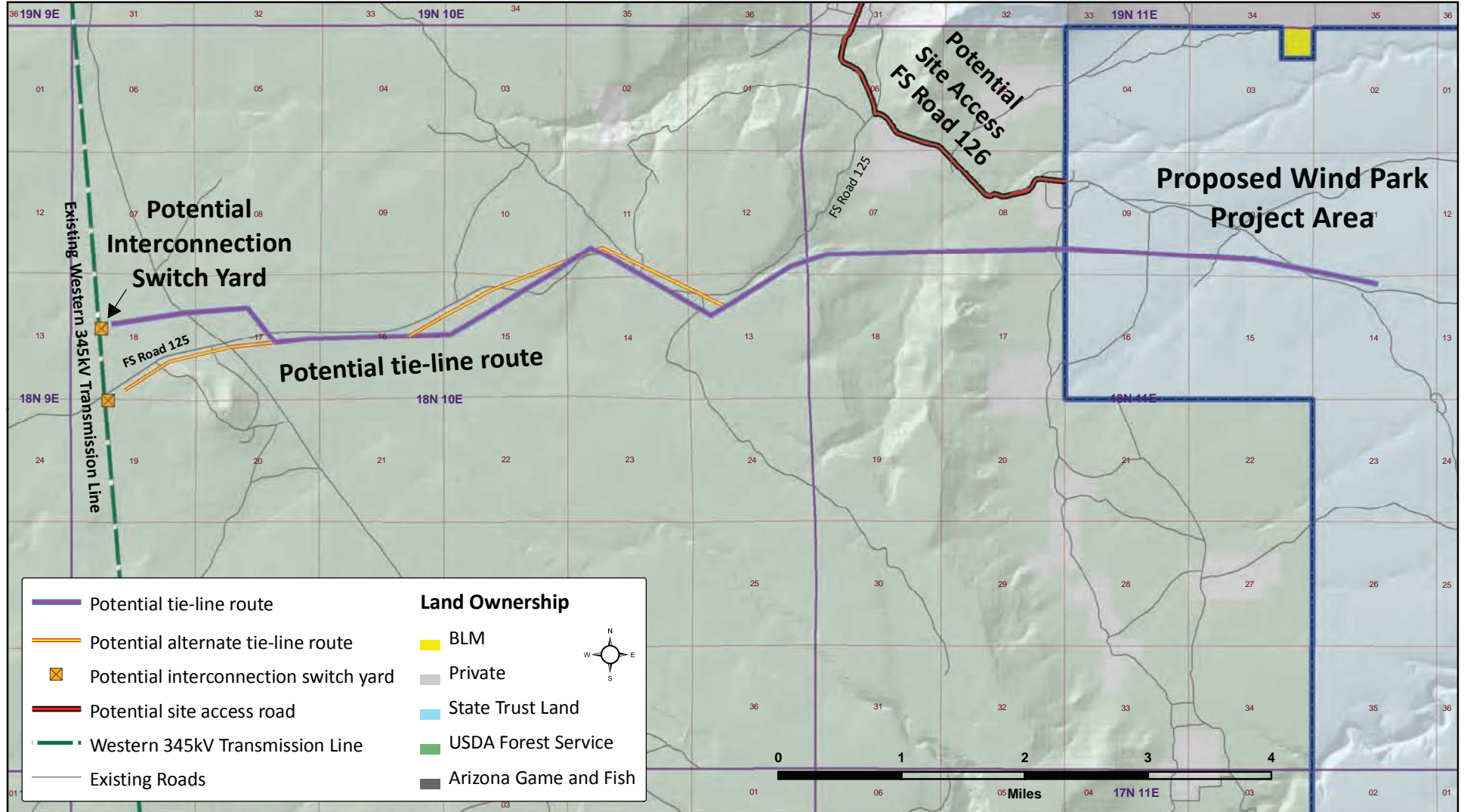
-  Private
-  State Trust Land
-  USDA Forest Service
-  Arizona Game and Fish
-  BLM

# Grapevine Canyon Wind Project





# Grapevine Canyon Wind Project



# Grapevine Canyon Wind Project NEPA Process

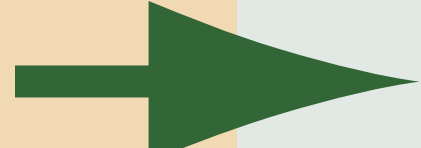
Identify Project Purpose and Need



Publish Notice of Intent to Prepare EIS



WE ARE  
HERE



Scoping Meeting / Comment Period



Prepare Draft EIS:  
Project Need, Alternatives Screening,  
Environmental Analysis



Draft EIS Available for Review



Draft EIS Comment Period



Prepare Final EIS / Respond to Comments



Final EIS Available for Review



Record(s) of Decision by  
Western Area Power Administration  
and USDA Forest Service



# ENVIRONMENTAL RESOURCES ISSUES

Resources to be addressed in the Environmental Impact Statement



**Please provide your comments by August 28, 2009 to:**

**Mary Barger  
Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005**



**BLANK COMMENT FORM AND SIGN-IN SHEET**

---



# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

Your comments will help Western Area Power Administration define issues and alternatives for evaluation of the environmental impacts of the proposed project

Please provide your comments by August 28, 2009 to:

Mary Barger  
 Western Area Power Administration  
 National Environmental Policy Act (NEPA) Document Manager  
 P.O. Box 6457  
 Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. *Circle below*

Yes   No   I wish to remain on the mailing list for this project (*provide Name, below*)  
 Yes   No   Please send me information by regular mail only (*provide Address, below*)  
 Yes   No   Please send me information by email (*provide Email, below*)

### YOUR COMMENTS: Please print clearly


Your Name: \_\_\_\_\_ E-Mail: \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

*Please provide your name and contact information if you wish to receive future information on this project*



*Fold Here, Tape Edges to Seal for Mailing*

---

**Mary Barger  
Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005**

---

*Fold Here, Tape Edges to Seal for Mailing*





**SIGN-IN SHEETS (UTILIZED)**

---





# Grapevine Canyon Wind Project

Public Scoping Meeting, August 10, 2009, Mormon Lake, Arizona

GRAPEVINE CANYON  
WIND

Name	Organization	Email	Address	City	State	Zip	Receive future info about project*
STEVE ATKINS	NAU	steve.atkins@nav.edu	Box 38530	MORMON LK	AZ	86038	<input checked="" type="radio"/> Yes <input type="radio"/> No
Josh McFarley	Flying M						<input type="radio"/> Yes <input type="radio"/> No
Kit Metzger	Flying M						<input checked="" type="radio"/> Yes <input type="radio"/> No
ANDI ROGERS	Arizona F&B	arogers@azgfd.gov	3500 S Lake Mary Flagstaff	Flag, AZ		86001	<input checked="" type="radio"/> Yes <input type="radio"/> No
TEX WALKER			Box 176	Cameron AZ		86020	<input checked="" type="radio"/> Yes <input type="radio"/> No
Alysa Walker			Box 176	Cameroon	AZ	86020	<input checked="" type="radio"/> Yes <input type="radio"/> No
Ellen Parish		sunsetclay@hughes.net					<input checked="" type="radio"/> Yes <input type="radio"/> No
JAMES BAKER		JAMEZ13@AOL.COM		FLAGSTAFF			<input checked="" type="radio"/> Yes <input type="radio"/> No
Mike Chaveus	USFS	mchaveus@fs.fed.us	5575 N. Hwy 89	"	AZ	86004	<input checked="" type="radio"/> Yes <input type="radio"/> No
TERRY ALEXANDER	CONCERNED CITIZEN	TOWNLAKETERRY@gmail.com	P.O. BOX 84463 MORMAN LAKE AZ 86038	MORMAN LAKE	AZ	86038	<input checked="" type="radio"/> Yes <input type="radio"/> No
Trever H Walker		trevwalk@ymail.com	P.O. Box #107 Cameron AZ 86020	Cameron	AZ	86020	<input checked="" type="radio"/> Yes <input type="radio"/> No
Jim	Flag			Flag	A	86003	<input type="radio"/> Yes <input checked="" type="radio"/> No
Mike Morgenthal	resident		PO Box 38457 Mormon Lake AZ 86038				<input type="radio"/> Yes <input checked="" type="radio"/> No
Chad Cardiff	RSC Equipment	chad.Cardiff@rscrental.com	Flagstaff			86001	<input checked="" type="radio"/> Yes <input type="radio"/> No

\*Contact information must be provided to receive future information about the project



# Grapevine Canyon Wind Project

Public Scoping Meeting, August 10, 2009, Mormon Lake, Arizona

GRAPEVINE CANYON  
WIND

Name	Organization	Email	Address	City	State	Zip	Receive future info about project*
William Palmer	RSC EQUIPMENT	William.Palmer@rscrental.com	5998 N. Christmastree <del>FAGSTAFF</del>	FAGSTAFF	AZ	86004	
Paul Seppanen	Fagen, Inc	pseppanen@fageninc.com	6159 Victoria Chandler, AZ 85226	Chandler	AZ	85226	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
JASON HALE	CORE STRUCTURE GROUP	JASONHALE@CORESTRUCTUREGROUP.COM	624 E. GURLEY ST. PRESCOTT, AZ 86301	PRESCOTT	AZ	86301	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Stanford Lake	Core Structure Group	StanfordLake@corestructuregroup.com	621 E Gurley St Prescott AZ 86301	Prescott	AZ	86301	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Ed Van Brock	VASTCO, INC.	VASTCO@VASTCO.COM	425 INDUSTRIAL DR. CHANDLER, AZ 85226	CHANDLER	AZ	86227	<input type="checkbox"/> Yes <input type="checkbox"/> No
John B. Mullen	individual	jbmullen@att.net	HC 31 Box 12 MORMON LAKE		AZ	86038	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No

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# Grapevine Canyon Wind Project

Public Scoping Meeting, August 10, 2009, Mormon Lake, Arizona

GRAPEVINE CANYON  
WIND

Name	Organization	Email	Address	City	State	Zip	Receive future info about project*
Vincent Fray		vfray1@yahoo.com	2 Sunset Drive #10	Mormon Lake	AZ		Yes No
Glen Reagan			PO Box 38455	Mormon Lake	AZ	86038	Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No

\*Contact information must be provided to receive future information about the project



# Grapevine Canyon Wind Project

Public Scoping Meeting, August 11, 2009, Flagstaff, Arizona

## GRAPEVINE CANYON WIND

Name	Organization	Email	Address	City	State	Zip	Receive future info about project*
TED MULLIKIN	TERRACON	TMULLIKIN@TERRACON.COM	4695 S. ASH AVE., #4-A	TEMPE	AZ	85282	YES
Ty Rock	AWF	vedrock@verdeonline.com	30 Creech Rock Circle	Sedona	AZ	86351	<input checked="" type="radio"/> Yes <input type="radio"/> No
Phyllis Kegley	Northern Arizona	Audubon Society	1911 N. Marston Dr.	Flagstaff	AZ	86001	<input checked="" type="radio"/> Yes <input type="radio"/> No
DON WALTERS	AZFRP	DON.WALTERS@SAB.COM	1500 E. CEDAR AVE, #86B	FLAG	AZ	86004	<input checked="" type="radio"/> Yes <input type="radio"/> No
DAVE SLICK	SRP	DPSLICK@SRPNET.COM	P.O. BOX 52025	PHX	AZ	85072-2025	<input checked="" type="radio"/> Yes <input type="radio"/> No
RANDY JAMES		randy.james@nmfn.com	8350-N Renter Road, FLAG	FLAGSTAFF	AZ	86004	<input checked="" type="radio"/> Yes <input type="radio"/> No
Ken Berkhoff	1st Brokers	KenBerkhoff@gmail.com	6895 N Greene LN	Flagstaff	AZ	86001	<input checked="" type="radio"/> Yes <input type="radio"/> No
Jeff Saville	NACET	JSaville@NACET.ORG	2225 N. GEMINI	FLAGSTAFF	AZ	86001	<input checked="" type="radio"/> Yes <input type="radio"/> No
Wanda Scholz		ARIZONAMOUNTAINSGIRL@peoplepc.com	8355 E Little Prairie	Flag	AZ	86004	<input checked="" type="radio"/> Yes <input type="radio"/> No
CARL TAYLOR	COCONINO COUNTY	CTAYLOR@COCONINO.AZ.GOV		FLAG		86004	<input checked="" type="radio"/> Yes <input type="radio"/> No
Craig Higbee	Coconino County	chigbeeX4x4@yahoo.com		Flag	A	86001	<input checked="" type="radio"/> Yes <input type="radio"/> No
DERRICK WIDMAREN	DIABLOTRUST	INFO@DIABLOTRUST.ORG	PO Box 3058 FLAG	FLG	AZ	86003	<input checked="" type="radio"/> Yes <input type="radio"/> No
Roger Tungosia	Hopi Tribe	rtungosia@hopi.asn.u.	Bdx 123, Kykekwasi, AZ	Kykekwasi	AZ	86039	<input checked="" type="radio"/> Yes <input type="radio"/> No
Art BABBOTT		ababbott@gmail.com	1414 N. Rim	Flag	AZ	86001	<input checked="" type="radio"/> Yes <input type="radio"/> No
Carolyn Cooper		c.elisecooper@gmail.com	50 E Mohawk	Flagstaff	AZ	86001	<input checked="" type="radio"/> Yes <input type="radio"/> No

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# Grapevine Canyon Wind Project

Public Scoping Meeting, August 11, 2009, Flagstaff, Arizona

## GRAPEVINE CANYON WIND

Name	Organization	Email	Address	City	State	Zip	Receive future info about project*
ELAINE MORRALL	NOAZ Audubon	elaimorr@mpgcallo.com	4924 Pebble Beach DR	Flag	AZ	86004	<input type="checkbox"/> Yes <input type="checkbox"/> No
Warr P. Sekagumpeta S.	Apai Tribe		P.O. Box 123	Kykotsavau	"	86039	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Bill Auberle	EN3 Professionals	wauberle@en3pro.com	125 E. Elm Flagstaff AZ 86001	Flagstaff	AZ	86001	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
MICHAEL VENE	NETGENUITY	MLEGERE@NETGENUITY.COM	4850 REATA	Flag	AZ	86001	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
ROBERT INFANTINO	ARCHER WESTERN	rintantino@wellshgroup.com	1951 W. CAMELBACK RD, PHX AZ	PHX	AZ	85015	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Jay Yeager	Southwest Windpower	jay@windenergy.com	602 E Cherry Ave, 1801 W Rt 66	Flagstaff	AZ	86001	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
BRAD HILL	CITY OF FLAGSTAFF	bhill@flagstaffaz.gov	212 W. ASPEN AVE	Flagstaff	AZ	86001	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Brent Halls		bchalls@gmail.com	8080 W. Colt Dr	Flag	AZ	86001	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
T. BRITT	RMEK	rtguail@infomagil.net	2126 N. Kington Dr.	Flag	AZ	86001	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
David Blanchard	-	-	3892 S. Marble Gyn L	FLG	AZ	86001	<input type="checkbox"/> Yes <input type="checkbox"/> No
Lena Fowler	Cocouino County	lfowler@cocouinoaz.gov	Box 1990, TC, AZ 86001	Tuba City	AZ	86045	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Lucinda Anderson	Cocouino Co.	LANDAN@COCOUNINO.AZ.GOV	2195 Cherry Flg 86001	Flag	AZ	86001	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <i>on list already</i>
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No
							<input type="checkbox"/> Yes <input type="checkbox"/> No

\*Contact information must be provided to receive future information about the project





# Grapevine Canyon Wind Project

Public Scoping Meeting, August 11, 2009, Flagstaff, Arizona

GRAPEVINE CANYON  
WIND

Name	Organization	Email	Address	City	State	Zip	Receive future info about project*
Cindy Parke	Private	cparke@inhamogic.net	Flagstaff				Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No
							Yes No

\*\*Contact information must be provided to receive future information about the project\*\*

**APPENDIX D**

---

**COMMENTS**



# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

Your comments will help Western Area Power Administration define issues and alternatives for evaluation of the environmental impacts of the proposed project

Please provide your comments by August 28, 2009 to:

Mary Barger  
Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. Circle below

- Yes    No    I wish to remain on the mailing list for this project (provide Name, below)
- Yes    No    Please send me information by regular mail only (provide Address, below)
- Yes    No    Please send me information by email (provide Email, below)

*either way is fine*

### YOUR COMMENTS: Please print clearly

*We have been working with Amy Legere of Foresight on the Conditional Use Permit required for zoning approval of this project.*

Your Name: Bill Towler E-Mail: btowler@coconino.az.gov  
 Dept. of Community Development  
 Address 2500 Fort Valley Road City Flagstaff State AZ Zip 86001

Please provide your name and contact information if you wish to receive future information on this project



# Grapevine Canyon Wind Project

**WESTERN**  
AREA POWER  
ADMINISTRATION

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- Yes  No Please send me information by regular mail only (*provide Address, below*)
- Yes  No Please send me information by email (*provide Email, below*)

### YOUR COMMENTS: Please print clearly

<i>Brad Aules</i>

Your Name: *Brad Aules* E-Mail: \_\_\_\_\_

Address: *P.O. Box 30940* City: *Flagstaff* State: *AZ* Zip: *86003*

Please provide your name and contact information if you wish to receive future information on this project



**WESTERN**  
**AREA POWER**  
**ADMINISTRATION**

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- Yes  No Please send me information by email (provide Email, below)

### YOUR COMMENTS: Please print clearly

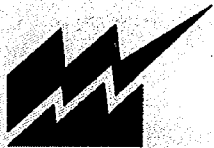
<del>SUNIL ARORA</del>
<del>HAYWARD</del>
WE ARE DESIGN BUILD CONTRACTORS FOR
GEOTECHNICAL CONSTRUCTION.

Your Name: SUNIL ARORA E-Mail: SARORA@HAYWARDBAKER.COM

Address 301 ENTERPRISE ST., STE 3 City ESCONDIDO State CA Zip 92029

Please provide your name and contact information if you wish to receive future information on this project





# Grapevine Canyon Wind Project

**WESTERN**  
AREA POWER  
ADMINISTRATION

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Phoenix, AZ 85005

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- Yes No I wish to remain on the mailing list for this project (*provide Name, below*)
- Yes No Please send me information by regular mail only (*provide Address, below*)
- Yes No Please send me information by email (*provide Email, below*)

### YOUR COMMENTS: Please print clearly

Ken Berkhoff
ken.berkhoff@gmail.com
1500 E Cedar Ave 8-6 B
Flooyton AZ 86004

Your Name: \_\_\_\_\_ E-Mail: \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Please provide your name and contact information if you wish to receive future information on this project

From: David Shelton [SHELTON@wapa.gov]  
Sent: Wednesday, August 05, 2009 3:45 PM  
To: GrapevineWindEIS  
Cc: rslynch@rslynchaty.com  
Subject: Fwd: Scoping meetings for the Grapevine Canyon Wind Project

Please send any available documentation associated with this project to Mr. Lynch.

Thanks

Dave

>>> On 8/5/2009 at 4:21 PM, in message <AF16F203D6334501802D42837C695F66@MANAGER>, "RSLynch" <rslynch@rslynchaty.com> wrote:

Dave:

Like Leslie, I cannot make either the meeting at Mormon Lake or the meeting in Flagstaff next week. If there are documents associated with this proposal in addition to what might be on your website, I would appreciate having copies of them.

Thanks.

Bob

Robert S. Lynch, Esq.  
Robert S. Lynch & Associates  
340 E. Palm Lane, Suite 140  
Phoenix, AZ 85004-4603  
Phone: 602-254-5908  
Fax: 602-257-9542  
Cell: 602-228-6355  
E-mail: rslynch@rslynchaty.com



# Grapevine Canyon Wind Project

**WESTERN**  
AREA POWER  
ADMINISTRATION

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P.O. Box 6457  
Phoenix, AZ 85005

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- Yes No Please send me information by regular mail only (provide Address, below)
- Yes No Please send me information by email (provide Email, below)

### YOUR COMMENTS: Please print clearly

"TOPOGRAPHIC SIMULATIONS" ARE CRITICAL TO UNDERSTANDING AND VISUALIZING THIS PROJECT. (3D VISUAL MODELS)

IMPACTS TO WILD LIFE, PRIMARILY ANTELOPE, DEER, AND ELK HABITS NEED TO BE STUDIED + REPORTED.

WILL FIREARM HUNTING BE RESTRICTED IN THIS AREA OF 70 SQUARE MILES?

WILL THE ROADS BE UPGRADED TO AN "ALL WEATHER" ROAD?

Your Name: DON WALTERS E-Mail: DBWALTERS@AZCONTRACTING.COM  
 Address 1500 E. CEDAR AVE. # 86B City FLAGSTAFF State AZ Zip 86004

Please provide your name and contact information if you wish to receive future information on this project



# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

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Please provide your comments by August 28, 2009 to:

Mary Barger  
 Western Area Power Administration  
 National Environmental Policy Act (NEPA) Document Manager  
 P.O. Box 6457  
 Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. Circle below

- Yes    No    I wish to remain on the mailing list for this project (provide Name, below)
- Yes    No    Please send me information by regular mail only (provide Address, below)
- Yes    No    Please send me information by email (provide Email, below)

### YOUR COMMENTS: Please print clearly

• All weather roads to 330 turbines is huge amount of "Spider web" roads. Will entire area be open to Public in perpetuity or fenced off.
• Area is home to one of the largest populations of ELK in AZ. Huge impact on view shed, land, wildlife, recreation.
• Remediation of disturbed areas.
• collection system will be plowed in amount of disturbed land.

Your Name: Ty Rock      E-Mail: redrock@verdeonline.com  
 Address: 30 Creek Rock Circle      City Sedona      State AZ      Zip 86351

Please provide your name and contact information if you wish to receive future information on this project



# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

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AREA POWER  
ADMINISTRATION

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Phoenix, AZ 85005

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- Yes    No    I wish to remain on the mailing list for this project (*provide Name, below*)
- Yes     No    Please send me information by regular mail only (*provide Address, below*)
- Yes    No    Please send me information by email (*provide Email, below*)

### YOUR COMMENTS: Please print clearly

How is the Hopi Tribe being informed in regards to this project since it is close to their lands?

How is the Navajo Wind Project going to effect the power distribution on the WAPA Transmission line.

Your Name: Roger Tungoria E-Mail: rtungoria@hopi.nsn.us  
 Address: P.O. Box 123 City: Kykotsmavi State: Az Zip: 86059

Please provide your name and contact information if you wish to receive future information on this project





# Grapevine Canyon Wind Project

WE WELCOME YOUR COMMENTS

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AREA POWER  
ADMINISTRATION

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Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. *Circle below*

- No I wish to remain on the mailing list for this project (*provide Name, below*)
- Yes No Please send me information by regular mail only (*provide Address, below*)
- Yes No Please send me information by email (*provide Email, below*)

**YOUR COMMENTS:** Please print clearly

1.	How close is the project to the Hopi Tribes Fee Lands & trust lands?
2.	W.A.P.A. gives a certain percentage to the Hopi Tribe from the hydro power. Will this percentage change dollar wise?
3.	If impacts on cultural or historic resources are found affecting tribal values are found will the tribes in this case the Hopi Tribe be informed and get involved?
4.	What happened to the Hopi Project with Forest? + ?
5.	Are there any eagle nesting areas within the proposed wind park project area?

Your Name: Werry R. Sekoyungtau Sr. E-Mail: \_\_\_\_\_

Address P.O. Box 123, City Kykotsavoo, State AZ Zip 86039

Please provide your name and contact information if you wish to receive future information on this project



# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

**WESTERN**  
AREA POWER  
ADMINISTRATION

Your comments will help Western Area Power Administration define issues and alternatives for evaluation of the environmental impacts of the proposed project

Please provide your comments by August 28, 2009 to:

Mary Barger  
Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. *Circle below*

- Yes    No    I wish to remain on the mailing list for this project (*provide Name, below*)
- Yes    No    Please send me information by regular mail only (*provide Address, below*)
- Yes    No    Please send me information by email (*provide Email, below*)

### YOUR COMMENTS: Please print clearly

*I am in favor of this project.*

*Would like an agreement to maintain the improved FS Road #126 between investors and Forest Service. Project workers will utilize the road, therefore they should share in maintenance expense.*

Your Name: RANDY JAMES E-Mail: randy.james@nmpfn.com

Address 8350 N. REATA ROAD City FLAGSTAFF State AZ Zip 86001

Please provide your name and contact information if you wish to receive future information on this project



**WESTERN**  
AREA POWER  
ADMINISTRATION

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Yes

No

I wish to remain on the mailing list for this project (*provide Name, below*)

No

No

Please send me information by regular mail only (*provide Address, below*)

Yes

No

Please send me information by email (*provide Email, below*)

### YOUR COMMENTS: Please print clearly

Consider installing tie line underground.
Pronghorn impacts?

Your Name: Bill Auberle E-Mail: wauberle@en3pro.com

Address 125 E. Elm Ave., Suite 101 City Flagstaff State AZ Zip 86001

Please provide your name and contact information if you wish to receive future information on this project



# Grapevine Canyon Wind Project

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- Yes No I wish to remain on the mailing list for this project (*provide Name, below*)
- Yes No Please send me information by regular mail only (*provide Address, below*)
- Yes No Please send me information by email (*provide Email, below*)

### YOUR COMMENTS: Please print clearly

study migration/routes of travel for birds, especially in relation to Mormon Lake & Upper/Lower Lake Mary, also for wildlife/large animals
Ensure that turbines are built in the U.S.

Your Name: Carolyn Cooper E-Mail: c.elise.cooper@gmail.com  
 Address 50 E. Mohawk Dr. City Flagstaff State AZ Zip 86001

Please provide your name and contact information if you wish to receive future information on this project

**Clark Bryner**

---

**From:** Slick David P (Dave) [Dave.Slick@srpnet.com]  
**Sent:** Monday, August 17, 2009 3:48 PM  
**To:** GrapevineWindEIS@wapa.gov  
**Subject:** Grapevine Canyon Wind Project EIS Process Comments

August 17, 2009

Ms. Mary Barger

NEPA Document Manager

Western Area Power Administration

Desert Southwest Region

Mary,

SRP offers the following comments about the Grapevine Canyon Wind Project for Western's consideration.

1. Within the socio-economic portion of the NEPA process as portrayed at the 8/11/09 public meeting, SRP believes that Western should evaluate the potential impacts of the proposed project on existing Western customers. SRP is hopeful that Western will specifically address:

a) How Western will ensure that there are no negative impacts resulting from the proposed project on:

- i. Colorado River Storage Project firm electric and/or transmission service deliveries to customers, and
- ii. The long-standing SRP - Western 2468 agreement;

b) Given the proponent's stated intent to sell energy from the facility to prospective non-preference customers, how Western will ensure that the utilization of Western's facilities for this purpose will not impact preference customers holding long term CRSP contracts that extend through the year 2024.

2. With respect to one of the sister agencies that you referred to during the 8/11/09 public scoping meeting, given the challenges that Bonneville Power Administration has encountered with respect to integrating wind resources in its northwest system, within the EIS, SRP suggests that Western address its plan for managing the control area and associated operational challenges that are inherent to dealing with intermittent resource integration.

It was a pleasure meeting you at the 8/11/09 open house. Thank you for the opportunity to comment on this activity. Please include SRP as a recipient of all future communications regarding this project.

Dave Slick

Manager of Strategic Projects

Energy Management & Information

9/1/2009



SRP

(602) 236-2082

From: grapevine\_scoping\_comment@wapa.gov  
Sent: Wednesday, August 12, 2009 4:17 PM  
To: GrapevineWindEIS@wapa.gov  
Subject: Grapevine Canyon Scoping Comment Form

Issues, concerns or questions : The project area is rich in archaeological sites in general, and rock art (petroglyph) sites in particular. These cultural resources must be located, documented, and protected.

Mail list yes - E-mail : Yes, add me to the mailing list - e-mail

Name : Robert Mark, Ph.D.

Representing : Rupestrian CyberServices

Address : 3644 Stone Crest Street

City : Flagstaff

State : AZ

Zip Code : 86004

Fax : 928-526-3625

E-mail address : rmark@infomagic.net



# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

**WESTERN**  
AREA POWER  
ADMINISTRATION

Your comments will help Western Area Power Administration define issues and alternatives for evaluation of the environmental impacts of the proposed project

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Mary Barger  
Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. *Circle below*

- |     |    |  |
|-----|----|--|
| Yes | No | I wish to remain on the mailing list for this project ( <i>provide Name, below</i> ) |
| Yes | No | Please send me information by regular mail only ( <i>provide Address, below</i> )    |
| Yes | No | Please send me information by email ( <i>provide Email, below</i> )                  |

### YOUR COMMENTS: Please print clearly

RE: MAP GRID 18 N 10 E, 05-06,  
 VERY FRAGILE AND SENSATIVE NATIVE SITE.  
 I AM CONCERNED ABOUT TRUCK VIBRATION!  
 I CAN SHOW YOU THIS SITE

Your Name: JAMES BAKER E-Mail: JAMEZ13@AOL.COM  
 Address: 928-556-0326 City: FLAG STAFF State: \_\_\_\_\_ Zip: \_\_\_\_\_

Please provide your name and contact information if you wish to receive future information on this project



# Grapevine Canyon Wind Project

## WE WELCOME YOUR COMMENTS

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AREA POWER  
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Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. Circle below

- |                                  |                       |   |
|----------------------------------|-----------------------|---|
| Yes                              | No                    | I wish to remain on the mailing list for this project (provide Name, below) |
| <input checked="" type="radio"/> | <input type="radio"/> | Please send me information by regular mail only (provide Address, below)    |
| <input type="radio"/>            | <input type="radio"/> | Please send me information by email (provide Email, below)                  |

### YOUR COMMENTS: Please print clearly

*jbm.mullen@tntmail.com*

*Your project seems to have low impact on the desert scrub juniper environment. The late wind turbine development minimize impact on bird life. Additionally being in a partnership with the Metzger Flying M is good for the local economy.*

Your Name: John B. Mullen E-Mail: \_\_\_\_\_

Address: HC 31 Box 12 City: Mormon Lake State: Ariz Zip: 86038

Please provide your name and contact information if you wish to receive future information on this project



# Grapevine Canyon Wind Project

WE WELCOME YOUR COMMENTS

**WESTERN**  
AREA POWER  
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Your comments will help Western Area Power Administration define issues and alternatives for evaluation of the environmental impacts of the proposed project

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Mary Barger  
Western Area Power Administration  
National Environmental Policy Act (NEPA) Document Manager  
P.O. Box 6457  
Phoenix, AZ 85005

Please indicate how you would like to keep informed on this project. Circle below

- Yes  No  I wish to remain on the mailing list for this project (provide Name, below)
- Yes  No  Please send me information by regular mail only (provide Address, below)
- Yes  No  Please send me information by email (provide Email, below)

**YOUR COMMENTS:** Please print clearly

I would like to not see the proposed area to some the same based on the wildlife impacted mainly the Elk and big game. I like the idea of being able to drive 45 min. to the proposed area and seeing the Elk and big game not being affected in any means. This area is where I hunt on daily basis. The new paved road will affect the game traveling habits, the increase of traffic and equipment will also make the game more to a less traveled area. I understand the need for the added power to Coconino area is need. If you proposed an already ~~area~~ developed area, where the game is not effective I would be all for it.

Your Name: Craig Higbee E-Mail: chigbee.x4x4@yahoo.com  
 Address \_\_\_\_\_ City Flagstaff State AZ Zip 86001

Please provide your name and contact information if you wish to receive future information on this project





**SIERRA  
CLUB**  
FOUNDED 1892

Grand Canyon Chapter • 202 E. McDowell Rd, Ste 277 • Phoenix, AZ 85004  
Phone: (602) 253-8633 Fax: (602) 258-6533 Email: grand.canyon.chapter@sierraclub.org

August 28, 2009

Mary Barger  
Western Area Power Administration  
PO Box 6457  
Phoenix, AZ 85005  
Submitted via email to GrapevineWindEIS@wapa.gov

Dear Ms. Barger:

Please accept these comments on the Grapevine Canyon Wind Project on behalf of the Sierra Club's Grand Canyon Chapter and our 12,000 members in Arizona.

The Sierra Club is America's oldest, largest and most influential grassroots environmental organization. Inspired by nature, the Sierra Club's more than 750,000 members – including 12,000 plus in Arizona as part of the Grand Canyon Chapter – work together to protect our communities and the planet. The Sierra Club has been involved for many years in working to protect Arizona's public lands, wildlife, air and water. The Sierra Club is also very interested and involved in promoting renewable energy and energy efficiency as a means to reduce greenhouse gas emissions and help limit global climate change. We strongly believe that properly sited renewable energy resources are part of the solution to this most challenging issue.

The National Environmental Policy Act (NEPA) mandates that the environmental impacts, including any cumulative impacts as well as direct and indirect impacts of the project be considered. To ensure that facilities are being properly sited, a number of issues need to be considered, including transmission and its impacts on the lands. Key considerations for this project should include minimizing disturbance to the land for both the turbines and the transmission line. For example, can the tie-line be sited along an existing road rather than creating new roads and new disturbance? What are the impacts to wildlife? Generally with wind projects, bat and bird species are of concern. How will this project affect them, and what will be done to minimize those impacts?

Arizona has 28 species of bats and at least some of those species inhabit the area of the proposed Grapevine Wind Project including pallid bats (*Antrozous pallidus*), big brown bats (*Eptesicus fuscus*), Allen's lappet-browed bats (*Idionycteris phyllotis*), and others. Allen's lappet-browed bat forms maternity colonies in ponderosa pine snags and the big brown bats can be found in ponderosa pine forests and piñon-juniper woodland. The NEPA analysis associated with this project should include consideration of the species of bats in the area and the potential impacts on those bats. Can impacts be mitigated and how? Studies of bat fatalities indicate that weather patterns affect them – most bats are killed on nights with lower wind speeds. More bats were killed before and after storm fronts passed through as well.<sup>1</sup>

---

<sup>1</sup>Arnett, Edward B., et al, January 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America, *Journal of Wildlife Management* 72(1):61-78. 2008

Regarding any transmission lines associated with the project, we ask that the line length be kept as short as possible to avoid disturbing larger areas and that the lines be designed in a manner to minimize impact on wildlife. In the NEPA process, burying the tie-in lines and restoring the disturbed area with native vegetation should be considered.

The installation should be designed to discourage birds from landing on the towers and all other structures. Birds and bats have had major conflicts with some earlier wind projects. To what degree can these problems be solved or mitigated with new designs? Please evaluate this in the National Environmental Policy Act process for this project.

Visual impacts are also a consideration. How will this project affect the viewshed? The impact could be reduced by burying the tie-in line. Can the structures and visible mechanisms be painted to minimize impact on the viewshed? Any aircraft warning lights should be no more intrusive to the surrounding night time viewshed than is actually necessary – no strobe lights should be allowed.

What are the noise impacts of the wind turbines and how will those impacts be mitigated? Outdoor recreation, particularly quiet recreation, is the major attraction for many National Forest visitors. People visit our national forests to relax, view wildlife, hike, walk, and camp. These wind turbines generate noise in frequencies from 20 – 3,600 Hz. The frequencies vary with the speed of wind, the pitch and speed of the blades. How noticeable or annoying the wind turbine noise will be depends on the level of ambient noise.<sup>2</sup> The noise of the turbines relative to the ambient noise levels should be addressed in NEPA process.

What will be the impacts of construction? This site does not appear to be easily accessible to the heavy equipment necessary for construction and maintenance. There is also the issue of hauling the towers and the turbines to the site. Wind requires many gravel roads for construction and placement of the towers – these roads should be fully decommissioned and restored to natural conditions, at least on any state or public lands involved in the project. The road system should be capable of reclamation and rehabilitation, and all roads not essential for routine maintenance should be recontoured and revegetated with native seeds/plants of species that are endemic to the area. Care should be taken not to promote the spread of invasive non-native plant species by ensuring that disturbed areas are revegetated and that any equipment used is cleaned thoroughly before and after entering the area.

Again, we want to reiterate our support for clean renewable energy sources such as wind. We do think it is critical that these facilities be properly sited and conflicts with wildlife and overall environmental impacts minimized and mitigated, where possible.

Thank you for considering our comments.

Sincerely,



Sandy Bahr  
Chapter Director  
Sierra Club – Grand Canyon Chapter

<sup>2</sup> Alberts, Daniel J., *Addressing Wind Turbine Noise*, Revised October 2006.  
Printed on Recycled Paper

**IRRIGATION & ELECTRICAL DISTRICTS  
ASSOCIATION OF ARIZONA**

R. GALE PEARCE  
PRESIDENT

R.D. JUSTICE  
VICE-PRESIDENT

SUITE 140  
340 E. PALM LANE  
PHOENIX, ARIZONA 85004-4603  
(602) 254-5908  
Fax (602) 257-9542  
E-mail: [rslynch@rslynchaty.com](mailto:rslynch@rslynchaty.com)

ELSTON GRUBAUGH  
SECRETARY-TREASURER

ROBERT S. LYNCH  
ASSISTANT SECRETARY-TREASURER

E-MAILED ONLY  
([GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov))

August 25, 2009

Mary Barger  
Western Area Power Administration  
P.O. Box 6457  
Phoenix, Arizona 85005

Re: Scoping comments on the Grapevine Canyon Wind Project

Dear Ms. Barger:

Your colleague, David Shelton, has opined to Leslie James of the Colorado River Energy Distributors Association that the current scoping phase is for an interconnection process only and separate from a transmission service process. His e-mail acknowledges that it is the intent of the Wind Project to market to third parties and not to Western. Thus, transmission service will be absolutely necessary for the success of the project. Under these circumstances, bifurcating the interconnection process and the transmission service process is not warranted and is in fact illegal. At the very least, the Environmental Impact Statement must account for the cumulative impacts of the proposal and that would obviously include transmission service. Moreover, the applicant is required to pay for a study of available transfer capability. It is our information that the Glen Canyon to Pinnacle Peak line is already a constrained path. Thus, it is vital that this study be done at this stage in order to properly assess the impacts on Western and its facilities as well as the impacts on its customers whose CRSP deliveries depend on transfer capability on this line. In short, the transmission service process cannot be bifurcated and any attempt to do so is in violation of NEPA and contrary to FERC Orders 888 and 889 which Western has agreed to abide by.

Thank you for the opportunity to comment on this important proposal.

Sincerely,

/s/

Robert S. Lynch  
Counsel and Assistant Secretary/Treasurer

RSL:psr  
cc: Leslie James, Executive Director, CREDA  
IEDA Presidents/Chairmen and Managers



**CREDA**  
**Colorado River Energy Distributors Association**

**ARIZONA**

Arizona Municipal Power Users Association

Arizona Power Authority

Arizona Power Pooling Association

Irrigation and Electrical Districts  
Association

Navajo Tribal Utility Authority  
(also New Mexico, Utah)

Salt River Project

**COLORADO**

Colorado Springs Utilities

Intermountain Rural Electric Association

Platte River Power Authority

Tri-State Generation & Transmission  
Association, Inc.  
(also Nebraska, Wyoming, New Mexico)

Yampa Valley Electric  
Association, Inc.

**NEVADA**

Colorado River Commission  
of Nevada

Silver State Energy Association

**NEW MEXICO**

Farmington Electric Utility System

Los Alamos County

City of Truth or Consequences

**UTAH**

City of Provo

City of St. George

South Utah Valley Electric Service District

Utah Associated Municipal Power Systems

Utah Municipal Power Agency

**WYOMING**

Wyoming Municipal Power Agency

**Leslie James**

Executive Director

CREDA

4625 S. Wendler Drive, Suite 111  
Tempe, Arizona 85282

Phone: 602-748-1344

Fax: 602-748-1345

Cellular: 602-469-4046

Email: [creda@qwest.net](mailto:creda@qwest.net)

Website: [www.creda.org](http://www.creda.org)

August 27, 2009

Mary Barger

Western Area Power Administration

Mail: P.O. Box 6457, Phoenix, AZ. 85005

Telephone: 602-605-2524

Fax: 602-605-2630

E-mail: [GrapevineWindEIS@wapa.gov](mailto:GrapevineWindEIS@wapa.gov)

RE: Scoping Comments – Grapevine Canyon Wind Project

Dear Ms. Barger:

In response to Western Area Power Administration's (Western) Notice of Intent to Conduct an Environmental Impact Statement, published in the Federal Register July 24, 2009 (Vol. 74, No. 141), the Colorado River Energy Distributors Association (CREDA), offers the following comments.

CREDA's members include the majority of firm electric service customers of the Colorado River Storage Project (CRSP), which have entered into long-term contracts (2024) for the delivery of resources from the CRSP. The proposed Grapevine Project is anticipated to interconnect a new 345 kV transmission line and new switchyard with the Glen Canyon-Pinnacle Peak transmission line, which is a key element of the CRSP power and transmission delivery system. As part of Western's socio-economic evaluation of this proposal, it should evaluate the potential impacts on Western's current firm electric and transmission service customers, from operational and rates perspectives. Analysis of specific cost allocation and cost responsibility methodologies should be employed.

The project proponent indicated at the scoping meeting that it anticipates selling the project's expected 500 MW of output to local and regional entities. Western's analysis should include how the addition of this resource will affect system reliability and operational impacts, including control area and other issues associated with the integration of an intermittent resource, on an already constrained transmission path.

Please include CREDA in any future distribution of materials and information on this proposed project.

Sincerely,

*/s/ Leslie James*

Leslie James

Executive Director

Cc: CREDA Board

**Clark Bryner**

---

**From:** grapevine\_scoping\_comment@wapa.gov  
**Sent:** Friday, August 28, 2009 3:43 PM  
**To:** GrapevineWindEIS@wapa.gov  
**Subject:** Grapevine Canyon Scoping Comment Form

Issues, concerns or questions : I am concerned about how this would affect the antelope, deer and elk populations and migration and birthing in this area. would there be any closed hunting areas? how will the improved road and powerline affect the wildlife. I feel the area on the other side of grapevine canyon should not be considered as it is to remote. I feel the wildlife and hunting will suffer because of the environment of this area

Mail list yes - Regular mail : Yes, add me to the mailing list - regular mail

Mail list yes - E-mail : Yes, add me to the mailing list - e-mail

Name : BRENT HULLS

Representing :

Address :

City :

State :

Zip Code :

Fax :

E-mail address :



## Clark Bryner

---

**From:** grapevine\_scoping\_comment@wapa.gov  
**Sent:** Friday, August 28, 2009 3:44 PM  
**To:** GrapevineWindEIS@wapa.gov  
**Subject:** Grapevine Canyon Scoping Comment Form

Issues, concerns or questions : I am concerned about how this would affect the antelope, deer and elk populations and migration and birthing in this area. would there be any closed hunting areas? how will the improved road and powerline affect the wildlife. I feel the area on the other side of grapevine canyon should not be considered as it is too remote. I feel the wildlife and hunting will suffer because of the environment of this area

Mail list yes - Regular mail : Yes, add me to the mailing list - regular mail

Mail list yes - E-mail : Yes, add me to the mailing list - e-mail

Name : BRENT HULLS

Representing :

Address : 8080 N. COLT DR

City : FLAGSTAFF

State : AZ

Zip Code : 86001

Fax : 928 774 1315

E-mail address : BCHULLS@gmail.com



# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Post Office Box 1306

Albuquerque, N.M. 87103

August 28, 2009

In Reply Refer To:  
R2/ MBO

Ms. Mary Barger  
NEPA Document Manager  
Western Area Power Administration  
Desert Southwest Region  
P.O. Box 6457  
615 S. 43<sup>rd</sup> Avenue  
Phoenix, Arizona 85005

Dear Ms. Barger:

This letter constitutes our response from the U.S. Fish and Wildlife Service's Migratory Bird Office, Region 2, on the "Notice of Intent to Prepare an Environmental Impact Statement / Environmental Impact Report and Conduct Scoping Meetings; Notice of Floodplain and Wetlands Involvement" which was published in the Federal Register on July 24, 2009. We offer the following preliminary comments and look forward to further reviewing the EIS once it becomes available.

Descriptions of the actual boundaries of the project are vague in the Notice of Intent (NOI) so it is not possible to know at this time the specific range of habitats that will be impacted by development of the 55-square-mile Grapevine Canyon Wind Project in this part of Arizona. A few issues, however, are immediately apparent from our perspective. Please consider the following concerns when preparing the Environmental Impact Statement.

First, be advised that nearly all native species of birds in the United States are Federally protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712). Under this Act it is unlawful to "pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess... any migratory bird, any part, nest, or egg of any such bird..." of the species protected under the Act, unless such take is authorized by permit. A list of protected species may be found at Title 50, Code of Federal Regulations, Part 10. There is no permit available under the MBTA that authorizes incidental take of migratory birds, so it will be in the interest of Foresight Flying M, LLC to take steps to avoid take of migratory birds as much as possible.

In order to avoid violations of the MBTA through destruction of active bird nests, habitat clearing for this project should occur outside the local avian nesting season. In this region the months September through March would constitute the non-breeding season for most species, although even in those months some nesting may occur. Once the specific region for the project is identified, this office (also Arizona Department of Game and Fish) will be able to identify potential nesting species during the "non-breeding" months.

An inventory of active raptor nests should be completed before construction begins to determine their locations and if there are any Golden Eagle territories in the vicinity. Golden Eagles nest throughout this region wherever there are suitable cliffs and an appropriate food supply, thus it is likely that there will be some nesting pairs either within or adjacent to the project area. Destruction of or causing abandonment of a Golden Eagle nest would constitute a violation of the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d).

In addition to eagles, other species of raptors that may nest in or near the project area include Red-tailed, Ferruginous, and Swainson's hawks, Great Horned, Barn, and Burrowing owls, and possibly Peregrine and Prairie falcons. Turbine placement should take into account nest locations and movement patterns of these species (particularly the eagles and falcons) and avoid those areas as much as possible. Further, eagle and other raptor movements through this region during spring and fall migrations are not well known; these should be monitored through each of those seasons during the pre-construction phase to identify concentration corridors that should potentially be avoided.

A thorough understanding of the status and distribution of all birds of conservation concern found in the project area will help to reduce impacts to declining species during the habitat-altering activities. This should include those species identified as conservation priorities in the USFWS 2008 list of Birds of Conservation Concern (<http://www.fws.gov/migratorybirds>), the Partners in Flight Species Assessments for that region (<http://www.rmbo.org/pif/pifdb.html>), and the Arizona State Wildlife Action Plan ([http://www.azgfd.gov/w\\_c/cwcs.shtml](http://www.azgfd.gov/w_c/cwcs.shtml)). One of these species of concern is the Gray Vireo, which is a specialist of the habitats described in the NOI for the project area (pinyon-juniper and associated brushlands). Impacts to this species in particular should be addressed prior to construction and Gray Vireo locations avoided if possible.

Because bats are also an issue with wind energy facilities, seasonal and annual occurrence of bats, locations of hibernacula, breeding colonies, and roosts should be thoroughly assessed as well as locations of predictable flight lines. These assessments should include migratory bats such as those in the Lasiurine group (e.g. hoary bat, silver-haired bat), which have been shown to be particularly vulnerable to blade strikes.

Finally, wind turbine placement and FAA-required lighting should follow the FWS guidelines available, respectively, at: [http://www.fws.gov/habitatconservation/windpower/wind\\_turbine\\_advisory\\_committee.html](http://www.fws.gov/habitatconservation/windpower/wind_turbine_advisory_committee.html) and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>. Although these guidelines are considered voluntary, it is important to keep these in mind to minimize impacts to birds at these facilities.

Thank you for the opportunity to comment. If you have any questions please contact me at 505-248-6875 or by e-mail at [Bill\\_Howe@fws.gov](mailto:Bill_Howe@fws.gov).

Sincerely,

William H. Howe

# Coordinator, Nongame Bird Program



THE STATE OF ARIZONA  
**GAME AND FISH DEPARTMENT**

5000 W. CAREFREE HIGHWAY  
PHOENIX, AZ 85086-5000  
(602) 942-3000 • WWW.AZGFD.GOV

REGION II, 3500 S. LAKE MARY ROAD, FLAGSTAFF, AZ 86001

**GOVERNOR**

JANICE K. BREWER

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**DIRECTOR**

LARRY D. VOYLES

**DEPUTY DIRECTORS**

GARY R. HOVATTER

ROBERT D. BROSCHEID



August 28, 2009

Mary Barger  
Western Area Power Administration  
P.O. Box 6457  
Phoenix, AZ 85005

RE: Grapevine Wind Interconnection

Dear Ms. Barger,

The Arizona Game and Fish Department (Department) appreciates the opportunity to comment on the proposed Grapevine Interconnection Project which includes proposed power lines, road improvements, and Grapevine Wind Park. The Department generally supports the development of wind energy as a viable source of clean and renewable energy. We believe with proper site placement and safeguards, the benefits of utilizing wind energy outweigh the potential for negative effects to wildlife populations. While we believe that wind can be a viable option for energy, we are concerned that specific sites may have an increased potential for negative impacts to certain breeding, migratory, and wintering species. To address these concerns and to facilitate working relationships with project partners, the Department has created Wind Energy Guidelines entitled *Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona*. These guidelines can be found on our website at <http://www.azgfd.gov/hgis/guidelines.aspx>. Below are the Department's comments as they relate to our history with the Grapevine project, and our thoughts on how the Department might engage with Western Area Power Administration on this project in the future. It is our hope that these comments will help you in the environmental analysis process, and provide the framework for field discussions with your planning team.

Our Department has been engaged on the Grapevine energy project, and associated personnel for several years. We have met with Foresight and West, Inc. many times to discuss potential wildlife issues and commented and reviewed their Final Report for Phase 1 of the project. West's report and data collection for Phase 1 was completed prior to the finalization of the Department's Wind Energy Guidelines; therefore we look forward to meeting with Western Energy Power and Foresight to discuss how best our *Guidelines* can help facilitate avoiding impacts to wildlife. The Department foresees a potential first meeting as a discussion of which Category (see page 18 of the Guidelines) the Grapevine Project may fit into, and how that Category may dictate pre- and post construction monitoring. Additionally, the Department would like to discuss further pre-construction data collection specifically as it relates to Phase 2, which currently has not been monitored for potential wildlife impacts.

As with any wind project, the Department has concerns initially about met tower construction. We are aware that the Grapevine Project has several met towers constructed within the footprint of the project already, however, we invite Western Area Power to review the section in our guidance related to met tower construction and safety to aircraft pilots. Bulleted recommendations within the guidelines (Pg. 15) are as follows:



- AGFD requests all *permanent* met towers be unguyed, free standing structures. If possible, AGFD also requests temporary met towers be unguyed, free standing structures.
- If guy wires are present, AGFD recommends the applicant attach Bird Flight Diverters (BFDs) **at 10-meter intervals along the length of each guy wire** (Note: There are several manufacturers of BFDs: TYCO, Preformed Line Products, Dulmison, etc.). Research shows the attachment of BFDs can reduce bird collisions by as much as 86-89% (Pope et al., 2006. [http://www.chelanpud.org/documents/Burch\\_Final\\_Report\\_V1.pdf](http://www.chelanpud.org/documents/Burch_Final_Report_V1.pdf)).
- AGFD recommends all temporary towers are only on site for the minimum amount of time needed to monitor the wind resource. If towers are on site for more than 1 year, AGFD recommends carcass searches be implemented, especially during the bird migration period (see Chapter 5, Post-construction Monitoring and Reporting).
- If a temporary tower is going to become a permanent structure for the life of the project, AGFD recommends the tower(s) be included as part of the longer term (pre-construction and post-construction) monitoring program.
- AGFD recommends the applicant place acoustic monitoring stations on met towers in the proposed project area (**Note:** This will help collect bat activity information needed for pre-construction analysis). An acoustic monitoring station is defined as two AnaBat detectors, one at “ground level” (approximately 1.5 meters above ground) and the other with an elevated microphone, ideally within the future rotor swept zone, but not less than 30 meters high. Reynolds (2006) and Lausen (2006) provide detailed guidelines for detector deployment and operation. Rainey et al. (2006) provides an in depth discussion of acoustic monitoring systems. Acoustic monitoring should be intensified during bat migration periods (August 16 – October 31). Acoustic data collection objectives should strive to collect as much acoustic information as is feasible across seasons with an emphasis on migration periods.
- Work with AGFD to determine the number of acoustic monitoring stations needed to adequately cover the project area. The number of acoustic stations will depend on project footprint and habitat complexity.
- When siting met towers, avoid habitat features that congregate wildlife such as water resources, habitat edges, etc.

### ***AGFD Personnel Safety***

- Low-level aerial flights can occur outside routine wildlife survey routes. GPS locations of all towers need to be provided to AGFD prior to construction to allow survey aircraft to avoid the towers. In addition, AGFD requests project proponents notify the Department when met towers are removed.
- For all monopole towers  $\geq 50$  feet tall, paint the top 30 feet of the tower in alternate orange and white paint. This does not apply to lattice towers or lit towers, both of which are more visible than monopoles.
- Low-level aerial flights can occur outside routine wildlife survey routes. Because it is known that dangerous incidents can occur between towers and aircraft, GPS locations of all towers need to be provided to the Department prior to construction.
- For all monopole towers  $\geq 50$  feet tall, paint the top 30 feet of the tower in alternate orange and white paint. This does not apply to lattice towers or lit towers, both of which are more visible than monopoles.

The Department has attached two wildlife lists to consider during the analysis of effects from this project. The special status species list was obtained during review of Phase 1 and 2 of the Grapevine project from the Heritage Data Management System (HDMS). Because this list may be outdated, the Department recommends contacting our Phoenix Program Evaluation Program ([pep@azgfd.gov](mailto:pep@azgfd.gov)) office to obtain any additional species information that may have been reported recently. Although only federally listed species and state species of concern are identified within HDMS system, species protected by other federal and state laws are applicable and need to be considered in project planning. Therefore, we are also providing a list from the Arizona Breeding Bird Atlas (ABBA) which identifies bird species in the area during their respective breeding seasons.

The Department thanks you for the opportunity provide comments on the Grapevine interconnection project. We would like to meet with you and your staff soon, as this project progresses through the NEPA process. Lastly, the Department also encourages Western Area Power to contact the USFWS Ecological Services in Flagstaff for wildlife issues that pertain to Threatened and Endangered Species. If you have any questions or would like to discuss any of our comments further please do not hesitate to contact Andi Rogers, Habitat Specialist, at 928-214-1251 or [arogers@azgfd.gov](mailto:arogers@azgfd.gov).

Sincerely,

Andi Rogers

cc: Laura Canaca, Project Evaluation Program Supervisor, Habitat Branch  
Ginger Ritter, Project Evaluation Program Specialist, Habitat Branch  
Sarah Reif, Habitat Program Manager, Region II  
Mike Chavez, Deputy District Ranger, Peaks and Mormon Lake Districts  
Shaula Hedwall, Ecological Services, USFWS

## Special Status Species within 5 Miles of Grapevine Wind Project

NAME	COMMON NAME	ESA	USFS	BLM	STATE
<i>Aquila chrysaetos</i>	Golden Eagle				
<i>Haliaeetus leucocephalus (wintering pop.)</i>	Bald Eagle	SC	S		WSC

AGFD #M09-01074654. Proposed Meteorological Towers and Wind Facility. ASLD #23-112027-17-002.

Arizona Game and Fish Department, Heritage Data Management System, January 27, 2009.  
Project Evaluation Program.

**Arizona Breeding Bird Atlas**  
**Species observed within 5 Miles of Grapevine Wind Project**

NAME	COMMON NAME	ESA	USFS	BLM	STATE
<i>Corvus brachyrhynchos</i>	American crow				
<i>Falco sparverius</i>	American kestrel				
<i>Turdus migratorius</i>	American robin				
<i>Falco peregrinus anatum</i>	American peregrine falcon	SC	S		WSC
<i>Myiarchus cinerascens</i>	Ash-throated flycatcher				
<i>Haliaeetus leucocephalus</i>	Bald eagle	SC	S		WSC
<i>Thyromanes bewickii</i>	Bewick's wren				
<i>Archilochus alexandri</i>	Black-chinned hummingbird				
<i>Nycticorax nycticorax</i>	Black-crowned night-heron				
<i>Pheucticus melanocephalus</i>	Black-headed grosbeak				
<i>Dendroica nigrescens</i>	Black-throated gray warbler				
<i>Amphispiza bilineata</i>	Black-throated sparrow				
<i>Polioptila caerulea</i>	Blue-gray gnatcatcher				
<i>Euphagus cyanocephalus</i>	Brewer's blackbird				
<i>Selasphorus platycercus</i>	Broad-tailed hummingbird				
<i>Certhia americana</i>	Brown creeper				
<i>Molothrus ater</i>	Brown-headed cowbird				
<i>Icterus bullockii</i>	Bullock's oriole				
<i>Psaltriparus minimus</i>	Bushtit				
<i>Catherpes mexicanus</i>	Canyon wren				
<i>Tyrannus vociferans</i>	Cassin's kingbird				
<i>Spizella passerina</i>	Chipping sparrow				
<i>Petrochelidon pyrrhonota</i>	Cliff swallow				
<i>Chordeiles minor</i>	Common nighthawk				
<i>Phalaenoptilus nuttallii</i>	Common poorwill				
<i>Corvus corax</i>	Common raven				
<i>Accipiter cooperii</i>	Cooper's hawk				
<i>Empidonax occidentalis</i>	Cordilleran flycatcher				
<i>Phalacrocorax auritus</i>	Double-crested comorant				
<i>Sturnus vulgaris</i>	European starling				
<i>Buteo regalis</i>	Ferruginous hawk	SC			WSC
<i>Anas strepera</i>	Gadwall				
<i>Empidonax wrightii</i>	Gray flycatcher				
<i>Vireo vicinior</i>	Gray vireo				
<i>Ardea herodias</i>	Great blue heron				
<i>Bubo virginianus</i>	Great horned owl				
<i>Pipilo chlorurus</i>	Green-tailed towhee				
<i>Picoides villosus</i>	Hairy woodpecker				
<i>Piranga flava</i>	Hepatic tanager				
<i>Eremophila alpestris</i>	Horned lark				
<i>Carpodacus mexicanus</i>	House finch				
<i>Troglodytes aedon</i>	House wren				
<i>Baeolophus ridgwayi</i>	Juniper titmouse				
<i>Charadrius vociferus</i>	Killdeer				
<i>Chondestes grammacus</i>	Lark sparrow				
<i>Lanius ludovicianus</i>	Loggerhead shrike	SC		S	
<i>Sialia currucoides</i>	Mountain bluebird				

NAME	COMMON NAME	ESA	USFS	BLM	STATE
<i>Anas platyrhynchos</i>	Mallard				
<i>Sialia currucoides</i>	Mountain bluebird				
<i>Poecile gambeli</i>	Mountain chickadee				
<i>Zenaida macroura</i>	Mourning dove				
<i>Colaptes auratus</i>	Northern flicker				
<i>Mimus polyglottos</i>	Northern mockingbird				
<i>Anas acuta</i>	Northern pintail				
<i>Stelgidopteryx serripennis</i>	Northern rough-winged swallow				
<i>Contopus cooperi</i>	Olive-sided flycatcher	SC			
<i>Phainopepla nitens</i>	Phainopepla				
<i>Gymnorhinus cyanocephalus</i>	Pinyon jay				
<i>Vireo plumbeus</i>	Plumbeous vireo				
<i>Buteo jamaicensis</i>	Red-tailed hawk				
<i>Salpinctes obsoletus</i>	Rock wren				
<i>Regulus calendula</i>	Ruby-crowned kinglet				
<i>Sayornis saya</i>	Say's phoebe				
<i>Icterus parisorum</i>	Scott's oriole				
<i>Actitis macularia</i>	Spotted sandpiper				
<i>Pipilo maculatus</i>	Spotted towhee				
<i>Cyanocitta stelleri</i>	Stellar's jay				
<i>Cathartes aura</i>	Turkey vulture				
<i>Tachycineta thalassina</i>	Violet-green swallow				
<i>Vermivora virginiae</i>	Virginia's warbler				
<i>Vireo gilvus</i>	Warbling vireo				
<i>Sturnella neglecta</i>	Western meadowlark				
<i>Otus kennicottii</i>	Western screech-owl				
<i>Aphelocoma californica</i>	Western scrub-jay				
<i>Piranga ludoviciana</i>	Western tanager				
<i>Contopus sordidulus</i>	Western wood-pewee				
<i>Sitta carolinensis</i>	White-breasted nuthatch				
<i>Aeronautes saxatalis</i>	White-throated swift				
<i>Wilsonia pusilla</i>	Wilson's warbler				
<i>Dendroica petechia</i>	Yellow warbler				
<i>Icteria virens</i>	Yellow-brested chat				

No Critical Habitats in project area. AGFD #M09-01074654. Proposed Construction, Maintenance, and Operation of a Wind Energy Generation Facility.

Arizona Game and Fish Department, Arizona Breeding Bird Atlas, January 30, 2009.  
Project Evaluation Program.



## APPENDIX C

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- Appendix C.1 Forest Service's Best Management Practices for Watershed Protection
- Appendix C.2 Design Features, Best Management Practices, Required Measures, and Mitigation Measures for Invasive Species Control

**APPENDIX C.1**

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FOREST SERVICE'S BEST MANAGEMENT PRACTICES FOR WATERSHED PROTECTION

Available online at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)

FOREST SERVICE HANDBOOK  
Albuquerque, New Mexico

FSH 2509.22 - SOIL AND WATER CONSERVATION PRACTICES HANDBOOK

Effective December 3, 1990

TRANSMITTAL SHEET

<u>Document Name</u>	<u>New Pages</u>
!2509.22 Transmittal	1
!2509.22 Contents	6
!2509.22 Zero Code	2
10	20
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Digest:

2509.22 - Establishes a new handbook, Soil and Water Conservation Practices Handbook.

This handbook is in the new format. One copy is being sent to each site. Amendments will be issued electronically unless paper copies are part of an amendment.

The electronic document names are shown for ease of accessing them from the REGION3 Information Center.

All subsequent amendments will be issued by document.

DAVID F. JOLLY  
Regional Forester

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**01 - AUTHORITY.**

See FSM 2501 for authorities related to water resource management and soil resource management.

**02 - OBJECTIVES.**

See FSM 2530.2 for objectives related to water resource management and FSM 2552.02 for objectives related to soil resource management. This handbook outlines the process for meeting the water quality goals contained in the Forest Land and Resource Management Plans (FLMP) and the objectives of The Clean Water Act, through the development and implementation of a Best Management Practice (BMP) for each project.

**03 - POLICY.**

See FSM 2530.3 for policy related to water resource management. This handbook outlines the process for addressing specific water quality issues in project planning, project implementation, and project monitoring through the Integrated Resource Management (IRM) process.

**04 - RESPONSIBILITY.**

See FSM 2530.4 and R-3 Supplement for responsibilities related to water quality management. See also FSM 2552.04 for responsibilities related to soil management.

## CHAPTER 10 - THE PROCESS FOR IDENTIFYING BEST MANAGEMENT PRACTICES

### Contents

The Southwestern Region's Integrated Resource Management (IRM) process is the basic process for developing a specific Best Management Practice (BMP) for each project or plan. An interdisciplinary approach using the 13 phase IRM process is used to design, implement, and monitor projects identified in the Forest Land and Resource Management Plans (FLMP). This interdisciplinary approach to project design will identify the resources involved, define the resource interrelationships and reasonably predict the effects or impacts of the project.

The 13 phases of the IRM process meet the criteria contained in the BMP definition. That is, a practice or combination of practices will be defined for each project using problem assessment, examination of alternatives, and appropriate public involvement.

Chapters 20, 30, and 40 of this Handbook contain soil and water conservation practices. These chapters are intended as a catalog of possible practices which can be recommended by an interdisciplinary team in developing a Best Management Practice through the Integrated Resource Management process. At least once a year this catalog will be reviewed. If there are new practices or updates to old practices they will be added.

### **10.5 - Definitions.**

Best Management Practice (BMP's). A practice or a combination of practices, that is determined by a State (or designated area-wide planning agency) after problem assessment, examination of alternative practices and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

Integrated Resource Management (IRM). A land management philosophy which recognizes that all the natural resources are connected through an intricate series of interrelationships.

Line Officer. Management personnel within the Forest Service organization

consisting of: Secretary of Agriculture, Chief of Forest Service, Regional Foresters, Forest Supervisors, and District Rangers. Refers to the line of authority and responsibility.

Log Landing. An area where logs are skidded or yarded prior to loading and transporting to a mill.

Mitigate. To offset or lessen real or potential impacts or effects through the application of additional controls or actions. Counter measures are employed to reduce or eliminate undesirable or unwanted results.



Monitoring. The periodic evaluation of resources or activities on a representative sample basis to establish long-term trends, assess the impacts of land management activities, determine how well objectives have been met, and check compliance with established standards.

NEPA Process. All measures necessary for compliance with the requirements of section 2 and Title I of the National Environmental Protection Act (NEPA).

Nonpoint Source Pollution. Water pollution that originate from many indefinable sources and normally include agricultural and urban runoff, runoff from construction activities, specific, single location (such as a single pipe). Nonpoint source pollutants are generally carried over, or through, the soil and ground cover via streamflow processes. Unlike point sources of pollution (such as industrial and municipal effluent discharge pipes), the following silvicultural activities are considered to be nonpoint sources of pollution: nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvest operations, surface drainage, and road construction and maintenance from which there is natural runoff (40 CFR 122.27).

Normal Operating Season. A portion of a year when normal timber harvesting operations are expected to take place uninterrupted by adverse weather conditions.

Outsloping. Shaping a road to cause drainage to flow toward the outside shoulder (generally the fill slope), as opposed to insloping which encourages drainage to flow to the inside shoulder (generally the cut slope). Emphasis is on avoiding concentrated water flow.

Permittee. Individual or entity that has received a grazing or special use permit from the Forest Service.

Pesticide. A general term applied to a variety of chemical materials including insecticides, herbicides, fungicides, and rodenticides.

Point Source. Originating from a discrete identifiable source or conveyance. Silvicultural point sources of pollution include the following: rock crushing, gravel washing, and log sorting and storage facilities where water is applied intentionally to the logs (40 CFR 122.27).

Purchaser. The entity which is awarded a USDA Forest Service contract after bidding, usually with competition. As used in timber, the entity which has purchased timber as identified in a timber sale contract.

Reclamation. Restabilization of land denuded by land management activities.

Reforestation. The renewal of forest cover by seeding, planting, or natural means.

Revegetation. The replacement of vegetative cover which as been harvested or lost due to natural occurrences. Accomplished either through planting of nursery stock or seeding, or through natural processes.

Riparian Areas. Geographically delineable areas with distinctive resource values and characteristics that are comprised of the aquatic and riparian ecosystems.

Riparian Ecosystem. A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem; identified by soil characteristics or distinctive vegetation communities that require free or unbound water.

Rip Rapping. The use of large rock, boulders, concrete chunks or similar non-erosive, heavy objects as an armoring device.

Road Maintenance Plan. A documented schedule and program for upkeep of roads to provide a level of service for the user and protection of resources. There are five levels of maintenance: Level I being the least intense and Level V being the most intensive.

Rocking. The application of aggregate to a roadbed to provide strength and a more stable erosion resistant surface.

Sale Area Map. A map of suitable scale and detail to be legible which is part of a timber sale contract. The map identifies sale area boundaries and contract requirements specific to the sale.

Significant Disturbance. Disturbance of surface resources, including soil, water and vegetation, which has the potential to degrade water quality to a level requiring corrective action.

Site Preparation. A general term for removing unwanted vegetation, slash, and even roots and stones from a site before reforestation. It is generally accomplished by either mechanical, chemical, or biological means, or controlled fire.

Site Specific. Pertains to a discernible, definable area or point on the ground where a project or activity will (or is proposed) to occur.

Soil and Water Conservation Practices (SWCP). The set of practices which, when applied during implementation of a project, protects soil and water quality to the level required by beneficial uses. They are used during the IRM process to create Best Management Practices for each project.

Soil Productivity. The capacity of a soil to produce a specific crop such as fiber and forage, under defined levels of management. It is generally dependent on available soil moisture, nutrients, texture, structure, organic matter, and length of growing season.

Special Use Permit. A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest System lands for some special purpose.

Specified Road. A forest development transportation system road that is identified in and to be constructed or reconstructed under a Forest Service timber sale contract.

Stream or Streamcourse. A natural channel with defined bed and banks. It may be perennial, intermittent, or ephemeral.

Streamside Management Zone (SMZ). A designated zone that consists of the stream and an adjacent area of varying width where management practices that might affect water quality, fish,

or other aquatic resources are modified. The SMZ is not a zone of exclusion, but a zone of closely managed activity. It is a zone which acts as an effective filter and absorptive zone for sediment; maintains shade; protects aquatic and terrestrial riparian habitats; protects channel and streambanks; and promotes floodplain stability. The SMZ may be wider than the riparian area.

Wetlands. Those areas that are inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances do or would support a prevalence of vegetation 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.

Windrowing. To pile slash or debris in a row along the contour of the slope.

## **11 - INTEGRATED RESOURCE MANAGEMENT.**

### **11.1 - Environmental Analysis.**

The IRM process incorporates 13 phases which meet the National Environmental Policy Act (NEPA) and National Forest Management Act (NFMA) requirements. The first phase is a review of the FLMP, followed by the the initial determination of the project parameters. Subsequent steps guide the design process so that NEPA compliance is assured. Citizen participation is sought and utilized, adequate environmental analysis is accomplished, and successful on-the-ground implementation is achieved.

### **11.2 - Integrated Resource Management (IRM) Phases. These are the IRM Phases.**

Phase 1 - Review Forest Plan.

Phase 2 - Develop Project Concept.

Phase 3 - Conduct Extensive Reconnaissance.

Phase 4 - Prepare Feasibility Report.

Phase 5 - Update Forest Plan 10-Year Implementation Schedule.

Phase 6 - Conduct Intensive Reconnaissance, Survey, or Design.

Phase 7 - Generate and Compare Alternatives.

Phase 8 - Select Alternative.

Phase 9 - Prepare NEPA Documentation.

Phase 10 - Create Project Record.

Phase 11 - Prepare Project Action Plan.

Phase 12 - Implement Project.

Phase 13 - Monitor and Evaluate Results.  
Following is a detailed discussion on each phase.

1. Phase 1 - Review Forest Plan

a. Phase Objective. Determine how proposed project may contribute to the accomplishment of Forest Plan goals and objectives. Determine how the project must be designed to conform with specific Forest Plan constraints, requirements, standards, guidelines, and so forth.

b. Narrative. Project Leader reviews the Forest Plan Forest-wide and management area specific standards and guidelines, manual, handbook, existing data bases, and other pertinent direction which is applicable to the proposed project area. This phase marks the beginning of project scoping (NEPA definition).

Line Officers and their staffs familiarize themselves with the project planning area in preparation for Phase 2, Develop Project Concept. Define the influence area of the project in such a manner that a meaningful estimate of direct, indirect, and cumulative environmental effects can be made.

Initial citizen participation needs should be established. Make initial contacts with public known to be interested or affected by this project. Note preliminary issues, concerns, and opportunities (ICO's)

c. Roles.

(1) Project Leader. Initiates project proposal and/or planning, develops background material on proposal to facilitate District Ranger and staff involvement.

(2) Support Staff. Review Forest Plan and other pertinent direction. Make initial contacts with key members of public.

Develop initial concepts of project ICO's, Forest Plan relationships, citizen participation needs, and influence area.

(3) Line Officer. Review Forest Plan and other pertinent direction to provide input in developing project concept (Phase 2).

d. Products of Phase

(1) Notes on emphasis items from Forest Plan.

(2) Notes on project's potential contribution in meeting Forest Plan goals and objectives.

(3) Notes on citizen participation needs and results of key contacts.

(4) Notes on preliminary ICO's.

## 2. Phase 2 - Develop Project Concept

a. Phase Objective. Determine precisely what this project will be designed to do and why.

b. Narrative. District Ranger and staff develop the project concept. They identify and list the site specific ICO's, the specific project activities (what this project will actually do; install tank, replace bridge, create forage), the skills needed on the interdisciplinary team or as constraints in subsequent phases and lists of affected or interested "publics." Use the public comments to the Forest Plan as a starting point for identifying interested and affected publics.

If a Line Officer does not have a needed skill represented on his staff, one will be invited to participate from another unit or from the public. This phase will serve to "set the tone" for this particular project.

To determine a project's specific objectives, first identify the ICO's. Following the identification of ICO's, determine project objectives to resolve the issues, to mitigate the concerns, and to accomplish the opportunities. Evaluation criteria are identified based on ICO's and project objectives.

As the project concept develops, alternatives will begin to emerge. These should be noted for use in later phases.

The project record to be completed by Phase 10 will be started in this phase. Make preliminary public contacts and begin design of citizen's participation plan.

### c. Roles

(1) Line Officer. Participates in identification of ICO's, skills needed, and interested publics. Makes decision on project objectives.

(2) Project Leader. Facilitates interaction and manages the IRM process.

(3) Support Staff. Represents their respective resource or functional areas; participates in identification of ICO's, skills needed, and interested publics. Recommends project objectives.

### d. Products of Phase

(1) List of ICO's.

(2) List of project objectives--specific and unique.

(3) List of skills needed, including publics.

(4) List of potentially affected and interested publics.

(5) Project record file established.

- (6) Notes on preliminary public contacts made.
  - (7) Notes on citizen's participation plan needs.
  - (8) List of preliminary evaluation criteria.
  - (9) Notes on emerging alternatives and monitoring needs.
3. Phase 3 - Conduct Extensive Reconnaissance
- a. Phase Objective. Visit the project area to determine whether the project concept developed in Phase 2 will work.
  - b. Narrative. Items to be checked in the field.
    - (1) Are ICO's sufficient?
    - (2) Are additional skills necessary?
    - (3) Have all affected or interested publics been identified?
    - (4) Can project objectives be met?
    - (5) Can Forest Plan objectives, constraints, standards, and guidelines be met?
    - (6) Should the interdisciplinary team proceed to Phase 4 or should Phase 2 be repeated?
    - (7) Are there additional alternatives?

Tools that are useful prior to and during extensive reconnaissance are aerial photos, orthophotos, contour maps, transportation plan and appropriate resource surveys. Invite members of the public who expressed an interest during preliminary contacts during Phase 1 and 2 to go along on field trips.

c. Roles. The project leader conducts extensive reconnaissance with whatever assistance is necessary, including interested members of the public.

Reports results to Line Officer and staff.

d. Products of Phase

- (1) Notes on verification, additions or changes to ICO's, interested publics, or project objectives.
- (2) Recommendation for or against proceeding with project analysis, reschedule Phase 2 if appropriate.
- (3) Map of project planning area on contour map or orthophoto base showing known resource information.



- (4) Notes on resource information, physical features, road conditions, right-of-way needs and any other special information that may be helpful during subsequent project phases.
  - (5) Notes on technical, economic, and public feasibility.
  - (6) Notes on public comments.
  - (7) Notes on additional emerging alternatives.
4. Phase 4 - Prepare Feasibility Report
- a. Phase Objective. Prepare a brief report demonstrating the proposed project's technical, economic, and public feasibility. Line officer decides whether or not to proceed based on report.
  - b. Narrative. A Project Feasibility Report (PFR) (for example, scoping report) is prepared as directed by the line officer. In timber sale planning, this report is called a "Position Statement." The PFR should record the results of scoping from the previous phases and serve as a decision document for making further project investments. Economics should play a role in the project feasibility determination. A major consideration of the project's feasibility is consistency with the Forest Plan's stated goals, objectives, standards and guidelines. If the project is not consistent with the Forest Plan, the project must be changed (go back to Phase 2) or the Forest Plan must be amended. The amendment will be formalized in Phase 9, but the determination of need to amend will be made here.
  - c. Roles
    - (1) Project Leader: Prepare PFR or at minimum, provide Phase 4 product information to line officer concerning the project's feasibility. Provide line officer with initial assessment of project's consistency with the Forest Plan.
    - (2) Line Officer: Decide whether to proceed with additional project investment.  
  
Approve feasibility report if decision is to proceed. Redefine project or drop it from implementation plan if project is not feasible. Recycle project back to Phase 1 or Phase 2 if necessary.
  - d. Products of Phase. Approved Project Feasibility Report. Items that should be included in report are:
    - (1) Description of project.
    - (2) Location of project, with base map.
    - (3) Statement of resource objectives.
    - (4) List of tentative alternatives.

- (5) Statement of Forest Plan consistency.
- (6) Statement of technical feasibility, including special skills necessary.
- (7) Statement of public feasibility including, cultural ICO's.
- (8) Statement of economic feasibility, including outputs, effects, activities, receipts, and costs.
- (9) Project development schedule.
- (10) List of evaluation criteria.
- (11) Description of other pertinent information.

5. Phase 5 - Update Forest Plan 10-Year Implementation Schedule.

a. Phase Objective. Verify that the proposed project is on the Forest's 10-year Implementation Schedule. Amend schedule as necessary. Provide a smooth orderly flow of projects by assuring sufficient project development lead time. Design detailed citizen's participation plan.

b. Narrative. Maintain an updated 10-year Implementation Schedule. At the Forest level, update the schedule as often as necessary to maintain a smooth orderly flow of projects with appropriate lead times.

Project leaders ensure that all interested parties, internal and external, are aware of the project schedule. Resource specialists and program managers interested in these projects must keep informed of implementation schedules. Those interested in providing input into the project design coordinate their schedules with the project leader. Assign project development tasks with time lines for their completion.

The 10-year Implementation Schedule is a primary tool for keeping the public informed. Other schedules, (for example, 5-year timber sale action plan, capital investment plans, and so forth) should be incorporated into the 10-year Implementation Schedule.

Prepare the detailed citizen's participation assessment and plan at this phase.

c. Roles.

(1) Project Leader. Develop and present to District and Forest personnel, the District's project action plans and citizen's participation plan. Keeps everyone informed of project work schedules.

(2) Line Officer. Approve project action plans. Validate that proposals are incorporated in the Forest's 10-year Implementation Schedule to ensure project funding and adequate project development lead time. Continue involvement in process to ensure quality project design and implementation is the result. Has

primary responsibility for keeping all interested parties notified of 10-year Implementation Schedule changes.

(3) Support Staff. Note that project is approved for implementation and assess impacts. Be prepared to provide input during subsequent project phases.

d. Products of Phase

(1) Updated project action plans.

(2) Updated Forest 10-year Implementation Schedule.

(3) Detailed citizen's participation plan.

(4) Schedule of project activities through Phase 8.

6. Phase 6 - Conduct Intensive Reconnaissance, Survey, or Design

a. Phase Objective. Acquire specific on-the-ground knowledge of the project planning area and its resources to design a project that addresses the ICO's and project resource objectives.

b. Narrative. Intensive reconnaissance is the most critical phase of project preparation. In this phase, sufficient on-the-ground knowledge is gained to design a project to its unique location, its unique objectives, and to interrelate the various resources which exist within the area.

During intensive reconnaissance, the project leader conducts an intensive field inspection to identify project design specifics. Collect all site specific information needed for the project environmental analysis during this phase (for example; road location, cultural resource survey, fence location, problem soil areas, riparian areas, and so forth). Identify and gather inventory information which will be used to monitor project results in Phase 13.

If there are interested "publics" who are concerned about the effects or impacts of the project, a field trip to the project will usually help to resolve the conflict. It is an excellent technique for receiving site specific input from the public, for understanding their concerns, and for helping the interested parties understand the project more fully.

c. Roles

(1) Project Leader. Ensures that all input necessary for project design is received from various resource specialists.

Directs specialists to specific problem sites.

Conducts field trip(s) with interested "publics" to receive their input and demonstrates and explains project on the ground.

(2) Support Staff. Provide input on resources, on planning area in general, and on specific project "problem" sites. Conduct needed surveys of project, delineating sensitive sites on-ground with "flagging" for later painting of boundaries during layout phase (Phase 12).

(3) Line Officer. Directs and monitors project design as the Intensive Reconnaissance phase progresses.

d. Products of Phase.

(1) Activity unit boundaries marked on-the-ground by topography features, roads, streams or "flagged" lines sufficient enough so that they can be located. Resource input is recorded.

(2) Project transportation plan. Include "Right-of-Way" needs and Resource Access objectives.

(3) All needed roads are "flagged" with "control points" and "critical points" clearly identified and marked.

(4) Land lines needing surveying and posting identified.

(5) Cultural resource survey completed and sites identified.

(6) Borrow pits or rock sources located.

(7) Refined ICO's.

(8) Notes on project monitoring needs.

#### 7. Phase 7 - Generate and Compare Alternatives

a. Phase Objectives. Develop and compare a reasonable range of alternatives including a "No Action" alternative.

b. Narrative. There is no secret formula for the number alternatives that should be considered. Alternatives for projects tiered to the Forest Plan Environmental Impact Statement (EIS) will be narrower in range than preplan alternatives. The "No Action" alternative must be considered in detail for all project environmental analysis (FSH 1909.15, Chapter 20).

Modify alternatives or develop new alternatives when necessary as the analysis proceeds. Alternatives must specify activities that may produce important environmental changes, and they must address management requirements, mitigation measures, and monitoring of environmental effects.

The Interdisciplinary (ID) Team should develop the alternatives and make the alternative comparisons. Alternatives will emerge from early phases. This phase finalizes the alternatives considered and ensures that a reasonable range of

alternatives was considered. Gaps in the range of alternatives are filled in. Note alternatives generated earlier, but dropped from consideration, for inclusion in Phase 9 documentation. The alternatives are compared and evaluated at this phase. The last step of this phase is the ID Team's development of their recommended course of action. Do not prepare formal environmental documentation until the line officer makes a decision on the required documentation (Phase 8).

c. Roles. The project ID Team develops and compares alternatives. Recommends to the line officer a course of action.

d. Products of Phase.

(1) Notes on environmental analysis including alternatives generated, and environmental effects comparison.

(2) Notes on recommended course of action including environmental documentation.

#### 8. Phase 8 - Select Alternative.

a. Phase Objectives. Line officer selects alternative to be implemented

b. Narrative. The phase marks the completion of the "environmental analysis" portion of the NEPA process. An alternative to be implemented is selected by the appropriate line officer. The line officer may include instructions to modify or refine any or all of the previously conducted analysis, which will require recycling back to previously conducted phases.

Another important line officer role during this phase is to determine the appropriate level of NEPA documentation. Potential documentation products to be completed in Phase 9 include Environmental Assessment (EA), Finding of No Significant Impact (FONSI), Decision Notice (DN), Decision Memo (DM), Notice of Intent (NOI), Environmental Impact Statement (EIS), and Record of Decision (ROD). If no significant environmental effects were discovered during the environmental analysis, it may be appropriate to "categorically exclude" the analysis from preparation of an EA or EIS. However, the decision on how to document is left to the line officer and documentation in an EA or EIS may be appropriate for reasons other than NEPA compliance.

In some cases where analysis and documentation are being done at a lower level, the responsible line officer may only decide on the level of documentation and ask for a preferred alternative from the project ID Team at this phase. The selected alternative may be the preferred alternative or a modification. Final selection of the alternative to be implemented would then occur in Phase 9 and be documented in the appropriate decision document. While this phase marks the completion of analysis, Phase 8 and Phase 9 can be blended together, depending on how each Forest manages their process.

c. Roles.

- (1) Line Officer. Select the alternative to be implemented and provide Interdisciplinary Team rationale for his decision.
- (2) Ensure environmental analysis is adequate.
- (3) Determine the appropriate form of documentation of the environmental analysis.
- (4) Ensure monitoring actions are described.

d. Products of Phase.

- (1) Selected alternative to be implemented.
- (2) Determination of documentation for Phase 9.

9. Phase 9 - Prepare National Environmental Protection Act Documentation.

a. Phase Objectives. Complete environmental documentation as directed by line officer (Phase 8). Notify public of the decision and resolve any post-decision public conflicts (for example; appeals).

b. Narrative. Documentation should be prepared as directed in FSM 1950 and FSH 1909.15. Notify the public of the decision to comply with NEPA and to clearly establish the "Date of Decision" for the administrative appeals process.

Public concerns (for example, appeals) with the decision may result even though the public has fully participated throughout the previous eight phases. These concerns should be resolved by the deciding line officer. Appeals should be viewed as notice that prior citizens participation has not been complete. Sufficient "lead time" for accomplishment of Phases 1 through 8 with citizens participation will facilitate resolving conflicts that may result during this phase. If conflicts can not be successfully resolved, follow standard appeal process procedures and time frames.

c. Roles.

- (1) Project ID Team. Prepare final environmental documentation.
- (2) Line Officer. Approve final environmental documentation and Forest Plan amendment if needed.

Notify the public of the decision.

Resolve post-decision conflicts.

d. Products of Phase.

- (1) Environmental documents EA, FONSI, DN, EIS, ROD.
- (2) Categorical Exclusion. Develop Decision Memo.



- (3) Conflict resolution documentation or appeal decision if necessary.
- (4) Public notification of decision (letter, newspaper article, and so forth).
- (5) Amended Forest Plan if needed.

10. Phase 10 - Create Project Record.

a. Phase Objectives. Validate that all pertinent information concerning the project is in a single packet at one location for easy access. Incorporate project level information into the Geographical Information System (GIS) and related data bases.

b. Narrative. Start the project record in Phase 2. It should be stored in a single "packet" (may be a folder, drawer, box, notebook or binder, or whatever else you prefer that is commensurate with the volume of material). By Phase 10, this packet should contain such items as maps, photos, ICO's, project objectives, feasibility report, all site specific data, including designs and summary forms from intensive reconnaissance, reports, from supporting functions (for example; transportation plan), clearances and consultation documents, and any environmental documentation.

Final project design and data will be incorporated into the Forest Geographic Information System and related data bases. The existing directives system may require some cross filing of certain types of documentation.

c. Roles. The Project Leader creates and maintains project record, assuring that all pertinent data, specialists reports, clearances, and documents are collected and stored in an orderly fashion.

d. Products of Phase.

(1) A single project packet which includes all information pertinent to the project and supporting the final decisions made in earlier phases. Documents created after this phase should also be included as they are ready; therefore, room should be set aside for them.

(2) Digitized geographic information reflecting final project design incorporated in Forest GIS.

(3) Related resource data bases updated to reflect final project design for example; Stand File, RAnge Management Information System (RAMIS), and so forth.

11. Phase 11 - Prepare Project Action Plan.

a. Phase Objectives. Produce a work schedule for project implementation on the ground, specifying who does what, when, where, and how.

b. Narrative. The project work plan (implementation plan) is assembled by gathering together all of the specific instructions necessary to carry out the project in the manner specified by the final decision. It should specifically designate who

should accomplish each item and establish both the sequence and time frame for each activity.

c. Roles.

(1) Project Leader. Complete final maps or plat designs using most detailed base available (for example, contour maps).

Complete any necessary forms and finish any required documents, licenses, and so forth.

Develops the schedule for all activities including layouts, surveys, designs, contracts, appraisals, final prescriptions or plans, and so forth, and schedules the unit, function, or individual responsible for completing each activity.

Schedule post project monitoring and evaluation.

(2) Support Staff. Provide any necessary input to project including any clearances, maps, photos, designs, specific final prescriptions, or other pertinent information.

Schedule any time necessary to assist the carrying out of the project for their unit, function, or speciality.

(3) Line Officer. Approves final project work plan and schedule.

d. Products of Phase.

(1) Final maps, photos, and designs.

(2) Final detailed prescriptions.

(3) Specific schedule of all activities associated with the project (project work plan).

(4) Final clearances, licenses, permits, forms, and so forth.

(5) Post project monitoring and evaluation schedule.

(6) Contract documents if appropriate.

12. Phase 12 - Implement Project.

a. Phase Objectives. Accomplish the project in accord with the final decision.

b. Narrative. This is the "do it" phase of any project. The design is "laid out" on the ground, final checks are made by the design team or responsible official, appraisals are completed, any necessary contracts are written and awarded, and/or the agency people accomplish the project along with any necessary protection of other resources. This is the move from the paper product to the ground.

c. Roles.

(1) Project Leader. Responsible for supervision of overall process and assurance that final prescriptions are actually implemented on the ground. Monitors project for needed adjustments as it is being implemented.

(2) District Ranger. Approves final design standards and assures that final decision is completed and carried out successfully.

(3) Support Staff. Provide necessary support and advice in a timely manner. Look for ways to facilitate project accomplishment in an efficient manner, including inspections.

d. Products of Phase.

(1) Completed project with appropriate project administration.

(2) Resource objectives met.

(3) Forest Plan implemented.

(4) Project design amended as needed.

13. Phase 13 - Monitor and Evaluate Results.

a. Phase Objectives. Monitor and evaluate project implementation to determine success or failure of project design in meeting project and Forest Plan resource objectives.

b. Narrative. First, as the project is being accomplished, monitor implementation to ensure the project is being done according to design standards. Implementation must be monitored to ensure that project designs are adjusted when on-the-ground conditions warrant (for example, finding a previously unknown spotted owl territory or cultural resource site).

Second, after a successful project design using this process is accomplished, the recycling of knowledge concerning "what works and what doesn't work" should be done. Continually reassess to improve project designs. Internal information sharing concerning project design is vital to provide quality on the ground management.

A spin-off benefit of monitoring is better definition of significance of environmental effects (NEPA definition). Better understanding of what constitutes a significant effect will reduce the need for NEPA documents and give the deciding officer additional information on whether to "categorically exclude" project documentation or to prepare an environmental document (Phase 8 decision). This information will also aid in improving future environmental analysis that is required for every project proposal.

Final project design data will be verified and GIS and related data bases updated.

c. Roles.

(1) Line Officer. Assures project is accomplished as designed. Validates what monitoring efforts should be accomplished during and after project implementation as described in Phase 8.

(2) Project Leader. Accomplishes monitoring, coordinates field review, and writes any required reports. Ensures that results are shared with all interested parties, both internally and externally.

d. Products of Phase.

(1) Project Monitoring Report that provides documentation of project design results. Line officers should monitor projects each year using an interdisciplinary review approach as scheduled in Phase 11.

(2) Updated 10-year implementation schedule showing project accomplished.

(3) Updated GIS and related data bases.

(4) Forest Plan monitoring information.

### **11.3 - Integrated Resource Management (IRM) Phases and Best Management Practices (BMP)**

1. Phase 1 - Review Forest Plan. The Forest Land Management Plan (FLMP) and any tiered plan will be reviewed for water quality and soil productivity related priorities that were identified for the management area. The State will be notified so that they can identify any water quality or soil productivity concerns they have for the management area.

2. Phase 2 - Develop Project Concept. Identify water quality and soil productivity related ICO's, standards, and guidelines specific to the project. State concerns will be added to the list.

3. Phase 3 - Conduct Extensive Reconnaissance. Identify beneficial uses, points of downstream use, state water quality standards, and soil productivity. Identify streams that are out of compliance with State and Federal water quality standards. Identify activity that impacts water quality and soil productivity (temporary and long-term, on-site and off-site). Identify soils that are in unsatisfactory watershed or soil condition. Identify riparian areas in unsatisfactory condition. Identify current management practices that are in conflict with soil and water conservation practices (for example, transportation systems that have portions of roads located in streams or streamside management zones). Describe the potential for improving or degrading water quality or soil productivity. Invite the State to help with this task.

4. Phase 4 - Prepare Feasibility Report. Provide information from item 2 to project leader for use in feasibility statement.

5. Phase 5 - Update Forest Plan 10-Year Implementation Schedule. Review the Forest Implementation Schedule for water quality and soil productivity targets. Identify those water

and soil targets that will be accomplished by the actions proposed or need to be adjusted because of the proposed action. Identify "publics" that have water and soil interest that are effected by the proposed action.

6. Phase 6 - Conduct Intensive Reconnaissance, Survey, or Design. Gather on-site watershed data necessary to formulate BMP's. Invite the State to assist in the effort.

7. Phase 7 - Generate and Compare Alternatives. Evaluate activity generated impacts. Propose soil and water conservation practices common to all alternatives and those that are specific to an alternative. Describe how soil and water conservation practices will improve water quality or mitigate/prevent non-point source pollution. Estimate the cost for implementing soil and water conservation practices. If water quality standards will not be met by any of the alternatives, propose new alternatives that will achieve water quality goals. The State may want to be an ID Team participant.

8. Phase 8 - Select Alternative. Review final preferred alternative, ensure soil and water conservation practices are identified and that they will be sufficient to meet water quality standards.

9. Phase 9 - Prepare NEPA Documentation. Review final documents, ensure that non-point source pollution, including cumulative effects is adequately addressed. Send documents to the State for review.

10. Phase 10 - Create Project Record. Include documentation from State and other publics concerning water quality. Start storage of water quality data, if it is decided in Phase 8 to monitor water quality in the EPA STOrage and RETrieval (STORET) computer system and see if water quality data can be retained in GIS.

11. Phase 11 - Prepare Project Action Plan. Ensure that the BMP comprising the soil and water conservation practices are carried forward.

12. Phase 12 - Implement Project. Assist project personnel in on-the-ground implementation of the BMP.

13. Phase 13 - Monitor and Evaluate Results. Monitor BMP implementation. Evaluate effectiveness of the implemented BMP in preventing non-point pollution using methods identified in Phase 7 and 8. The State may want to assist.

## **12 - MANAGEMENT PRACTICES DOCUMENTATION.**

The following chapters identify soil and water conservation practices which can be used in the IRM process to develop a BMP. The practices described in these chapters were compiled from Forest Service manuals, handbooks, contract and permit provisions, and policy statements.

These practices are neither detailed prescriptions nor solutions for specific problems. They are action initiating mechanisms which will help in the development of detail prescriptions and solutions. They identify management standards, guidelines, and considerations which will be considered in the formulation of alternatives for land management actions using the IRM

process. They serve as checkpoints to consider in formulating a plan, a program, and/or a project.

The format for the practice descriptions is as follows:

Heading	-	Content
Practice	-	Includes the number of the practice and a brief title.
Objective	-	Describes the desired results or attainment of the practice as it relates to water quality protection.
Explanation	-	Further defines the brief title and expresses how the practice is applied. Describes criteria or standards used when applicable.
Implementation	-	Describes where the practice is applied, who is responsible for application, direction and supervision, and when the practice is employed.



## CHAPTER 20 - RESOURCE MANAGEMENT ACTIVITIES

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## **21 - PESTICIDE USE MANAGEMENT AND COORDINATION.**

The Forest Service uses pesticides very judiciously, safely, and effectively. Base actual use and recommended use on analysis of effectiveness, specificity, environmental impacts, and economic efficiency. The Forest Service may use only pesticides registered or otherwise permitted in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act, as amended.

### **21.1 - Pesticide Use Planning Process.**

1. Objective. To introduce water quality and hydrologic considerations into the pesticide use planning process.

2. Explanation. The Pesticide Use Planning Process is the framework for incorporation of hydrologic considerations contained in a Best Management Practices (BMP) developed for pesticide use projects. An environmental analysis addresses these considerations in terms of impacts and mitigation measures. Project work and safety plans then specify management direction.

3. Implementation. The Interdisciplinary (ID) Team evaluates the project in terms of site response, social and environmental impacts, and the intensity of monitoring needed. The responsible line officer then prepares the appropriate National Environmental Protection Act (NEPA) documentation, Project Plan, and Safety Plan. Approval authority for proposed pesticide projects is contained in the R-3 supplement to FSM 2150.

### **21.11 - Pesticide Application According to Label Directions and Applicable Legal Requirements.**

1. Objective. To avoid water contamination by complying with all label instructions and restrictions.

2. Explanation. Directions found on the label of each pesticide are detailed and specific, and include legal requirements for use.

3. Implementation. Constraints identified on the label and other legal requirements of application are incorporated into project plans and contracts. For in-service projects, responsibility for ensuring that label directions and other applicable legal requirements are followed rests with the Forest Service's project supervisor who shall be a certified commercial applicator. For contracted projects, it is the responsibility of the Contracting Officer or the Contracting Officer's Representative (COR) to ensure that label directions and other applicable legal requirements are followed.

### **21.12 - Pesticide Application Monitoring and Evaluation.**

1. Objective.

- a. To determine whether pesticides were applied safely, restricted to intended target areas, and deposited at the recommended application rates. To also, evaluate if non-target species were affected.

- b. To document and provide early warning of possible hazardous conditions resulting from possible contamination of water or other non-target areas by pesticides.
  - c. To determine the extent, severity, and probable duration of any potential hazard that might exist.
2. Explanation. This practice documents the placement accuracy, amount applied, and any water quality affects of the pesticide application. Monitoring methods include spray cards, dye tracing, and direct measurement of pesticide on vegetation and in or near water. Type of pesticide, type of equipment, application difficulty, public concern, beneficial uses, monitoring difficulty, availability of laboratory analysis, and applicable Federal, State and local laws, and regulations are all factors considered when developing the monitoring plan.
3. Implementation. The need for a monitoring plan is identified during the pesticide use planning process as part of the project environmental analysis. The water quality monitoring plan will specify:
- a. Who will be involved and their roles and responsibilities.
  - b. What parameters will be monitored and analyzed.
  - c. When and where monitoring will take place.
  - d. What methodologies will be used for sampling and analysis.
  - e. The rationale behind each of the preceding specifications.

A water quality specialist and the project director/COR will evaluate and interpret the water quality monitoring results in terms of compliance with and adequacy of project specifications.

### **21.13 - Pesticide Spill Contingency Planning.**

1. Objective. To eliminate contamination of water that may occur from accidental spills.
2. Explanation. The Forest Oil and Hazardous Substances Pollution Contingency Plan prepared by each Forest consists of predetermined actions to be implemented in the event of a spill. The plan lists who will notify whom and how, time requirements for the notification, guidelines for spill containment, and who will be responsible for cleanup. Site-specific planning that involves hazardous substances requires a spill plan which is contained in the project safety plan. Guidance on pesticides spill prevention and planning can be obtained in the FSH 2109.12.
3. Implementation. Spill contingency planning is incorporated into the Project Safety Plan. The environmental analysis process provides the means for including public and other agency involvement in plan preparation. The plan will list the responsible authorities.

#### **21.14 - Cleaning and Disposal of Pesticide Containers.**

1. Objective. To prevent water contamination resulting from cleaning or disposal of pesticide containers.

2. Explanation. The cleaning and disposal of pesticide containers must be done in accordance with Federal, State and local laws, regulations, and directives. Specific procedures for the cleaning and disposal of pesticide containers are documented in State and local laws and in the Pesticide Storage, Transportation, and Spills Handbook, FSH 2109.12.

3. Implementation. The Forest or District Pesticide Use Coordinator will approve proper rinsing procedures in accordance with State and local laws and regulations, and arrange for disposal of pesticide containers when the pesticide is applied by in-service personnel. When the pesticide is applied by a contractor, the contractor is responsible for proper container disposal in accordance with label directions and Federal, State, and local laws.

#### **21.15 - Streamside and Wet Area Protection During Pesticide Spraying.**

1. Objective. To minimize the risk of any pesticide inadvertently entering waters or unintentionally altering the riparian area or wetlands.

2. Explanation. When spraying pesticides for the purposes of meeting non-riparian area land management objectives, an untreated strip (buffer strip) of land and vegetation shall be left alongside surface waters, wetlands, and riparian areas. Strip widths are established by the ID team. Factors considered in establishing buffer strip widths are beneficial water uses, adjacent land use, rainfall, wind speed, wind direction, terrain, slope, soils and geology. The persistence, mobility, acute toxicity, bio-accumulation, and formulation of the pesticide are also considered. Equipment used, spray pattern, droplet size, application height, and past experience are other important factors. Pesticide label precautions directed toward water quality protection are followed.

3. Implementation. The perennial and intermittent surface waters, wetlands or riparian areas are identified from on-site observation and mapped by an ID team during project planning. When included as part of the final NEPA documentation and Project Work Plan, surface water, wetland, or riparian area protection is the responsibility of the project supervisor for in-service projects and the COR for contracted projects. The certified commercial applicators are briefed about the location of surface waters, wetlands, or riparian areas. Buffer strip boundaries are flagged or otherwise marked when necessary to aid identification from the air.

#### **21.16 - Controlling Pesticide Drift During Spray Application.**

1. Objective. To minimize the risk of pesticide falling directly into water or non-target areas.

2. Explanation. The spray application of pesticide is accomplished according to a prescription which accounts for terrain, and that specifies the following: spray exclusion areas,

buffer areas, and factors such as formulation, equipment, droplet size, spray height, application pattern, flow rate, and the limiting factors of wind speed and direction, temperature, and relative humidity.

3. Implementation. The prescription is prepared using the Integrated Resource Management (IRM) process and involves the Forest or District Pesticide Use Coordinator. On in-service projects, the Forest Service's project supervisor is responsible for ensuring the prescription is followed during application and for closing down the application when specifications are exceeded. These responsibilities belong to the Contracting Officer or the COR.

## **22 - RANGE MANAGEMENT.**

The use of National Forest System (NFS) lands for grazing in the Southwestern Region generally predates the establishment of individual Forests. Grazing continues as a recognized tool for vegetation management on NFS lands and is considered a compatible use of public lands. Designated ranges are managed to accommodate grazing along with other uses. NFS rangelands are divided into allotments for administration. Allotments are used by rancher permittees who pay a mandated fee for each month of use for each animal (and its 6 month or older offspring).

Range vegetation management involves such activities as range analysis, allotment management planning and improvement, and a grazing permit system. It includes controlling overall livestock numbers, season of use, livestock distribution, constructing structural and non-structural improvements, maintaining or enhancing diverse landscapes for the benefit of the overall biological aspects of the ecosystem including fish and wildlife and other resources, and restoration of deteriorated rangelands. The actual physical activities include grazing, trampling, ponding, salting, fencing, sediment traps, fuelwooding, prescribed burning, using herbicides, site preparation, seeding, and other activities associated with forage establishment. Livestock can be an effective tool in managing vegetation.

Successful range vegetation management is measured by the results on-the-ground through production utilization surveys (range inspections) and compared to the environmental protection attainment identified and addressed in range analyzes and allotment plans made by interdisciplinary teams through the IRM process.

Water and soil management concerns can be effectively included into the Range Management Planning Process when the Allotment Management Plan is written or revised. Allotment planning is accomplished using the Region's IRM process and must be consistent with the Forest's Land Management Plan.

### **22.1 - Range Analysis, Allotment Management Plan, Grazing Permit System, and Permittee Operating Plan.**

1. Objective. To manage rangelands through IRM and ensure they are meeting Forest Land Management Plan objectives.

2. Explanation. An analysis of a potential and/or existing grazing area is conducted by an interdisciplinary team to evaluate its productive capabilities, inherent hazards, resource values, and uses for the purpose of meeting Forest Land Management Plan objectives. Following this analysis the Forest Service, in cooperation with the permittee, prepares a written allotment management plan and authorizes livestock grazing as per stipulations in the management plan. These documents include measures to protect other resource values, such as water quality, riparian area resource management, and to coordinate livestock grazing with other resource uses. Specific methods for controlling when, where, amount of utilization, and numbers of livestock to be grazed are covered in the plan. Also included are needed rangeland improvements, monitoring methods, and an implementation schedule. A permittee operating plan is prepared, reviewed, and revised annually to reflect direction in the allotment management plan. The amount of livestock use is determined primarily through measurement of vegetative utilization.

Allowable use is set to meet the objectives of the Forest Land Management Plan. The maintenance of soil productivity and stability is considered in determining allowable use.

3. Implementation. The District Ranger is responsible for analysis of range allotments, completion of environmental assessment reports, preparation of management plans, and processing of grazing applications. The Forest Supervisor or District Ranger approves management plans and issues grazing permits with stipulations and conditions. Most permits are issued for 10 year terms. Revise allotment management plans as needed to meet the Forest Land Management Plan objectives. Annually prepare a operating plan with the permittee to allow for current allotment conditions. The permittee carries out the plans under the immediate direction and review of the District Ranger. Take corrective action if a permittee does not comply with grazing permit conditions designed to protect soil and water resources.

## **22.11 - Controlling Livestock Numbers and Season of Use.**

1. Objective. Safeguard water and soil resources under sustained forage production. Managed forage utilization by livestock to maintain healthy ecosystems for all resource objectives.

2. Explanation. In addition to proper stocking rate and season of use specified in the grazing permit, periodic field checks are made to identify needed adjustments in season and livestock numbers. Checks include:

- a. Range readiness evaluations to assure that the soil is not too wet and that sufficient forage growth has occurred.
- b. Stock counts to assure that only permitted livestock enter the allotment.
- c. Forage utilization measurements to provide data, for grazing use pattern, improved livestock distribution, and stocking.
- d. Assessment of rangeland to verify soil and vegetative condition and trend.



- e. Assessment of streambanks to assure banks are not being degraded and contributing sediment to water courses.

When standards for allowable utilization are established they are incorporated into the allotment management plan.

3. Implementation. Allotments are administered by the District Ranger. Provisions are carried out by the grazing permittee as permit requirements. Field check and measurements are made periodically by the Forest Service. Livestock numbers and seasons of use may be changed annually to reflect current years climatic condition.

## **22.12 - Controlling Livestock Distribution.**

1. Objective. To manage sustained forage production and forage utilization by livestock while protecting soil and water resources. Maintaining healthy ecosystems for wildlife and other resources.

2. Explanation. Livestock use within allotments is typically not uniform due to variations in topography, water availability, vegetation type and condition. Several techniques are used to achieve proper distribution, or lessen the impact on areas which are sensitive or which would naturally be overused. These techniques include:

- a. Construction of fences, and implementation of seasonal or pasture systems of management.
- b. Water development in areas that receive little use and closing off water developments when proper use has been achieved.
- c. Riding and herding to shift livestock locations.
- d. Using salt or supplement feed as tools to gain proper distribution of livestock.
- e. Range improvements, prescribed burning, trail construction, or seeding.
- f. Prevention of intensive livestock grazing or concentrated livestock use on soils that have low bearing strength and are wet.

Open herding, limiting trailing, and use of new bed grounds are additional techniques used for sheep. Developing sufficient watering places is one way to limit the amount of trailing. Livestock distribution needs are determined through evaluations of range conditions and trends, including watershed condition assessments and utilization studies.

3. Implementation. Livestock distribution practices are carried out by the permittee under the direction and review of the District Ranger. Direction is incorporated in the allotment management plan and the annual operating plan, which are integral parts of the grazing permit and provides current Forest Service instructions. The instructions reflect current allotment conditions and vegetative trends.

### **22.13 - Rangeland Improvements.**

1. Objective. To improve, maintain or restore range resources, including soil and water through the use of rangeland improvements.

2. Explanation. Rangeland improvements are intended to enhance forage quality, quantity, and/or availability, and to provide protection to the other resources. Building fences to control the movement of livestock, improve watershed condition, and develop watering sites are just a few of the types of rangeland improvements implemented by the permittee or Forest Service as identified in the allotment plan. If a structure is causing soil erosion or water quality degradation the allotment plan will identify it and state corrective measures. Other measures may include stream channel stabilization efforts such as riprapping, gully plugging, and planting; or mechanical treatments such as pitting, chiseling, or furrowing. Reseeding and/or fertilization may be done alone or in conjunction with any of these measures.

3. Implementation. The permittee is involved as a cooperator in rangeland improvements and may actually complete the work under Forest Service direction. Implementation may also be done by Forest Service crews or contractors. Range improvement needs are recognized in the range allotment planning process and are scheduled for implementation in the allotment plan and the 10-Year Forest Plan Implementation Schedule.

### **22.14 - Determining Grazing Capability of Lands.**

1. Objective. To maintain or improve soil stability, soil productivity, and water quality by grazing the land within its capability.

2. Explanation. This practice is an administrative and preventative control. Soil condition classes, based on the relationship of current and natural soil loss tolerances, are used to determine grazing capability. Only land with soils in stable condition are considered as "full capability" range. Grazing capability ratings are then used in conjunction with other grazing considerations to determine the actual grazing capacity of an area.

3. Implementation. Soil condition class is determined by qualified soil scientists using Terrestrial Ecosystem Survey (TES). A range conservationist will use the soil condition class in determining the grazing capacity.

### **22.15 - Revegetation of Areas Disturbed by Grazing Activities.**

1. Objective. To establish a vegetative cover on disturbed sites to prevent accelerated erosion and sedimentation.

2. Explanation. Where soil has been severely disturbed by past overgrazing and the establishment of vegetation is needed to minimize erosion, the appropriate measures shall be taken to establish an adequate cover of grass or other vegetation acceptable to the Forest Service and outlined in the allotment management plan. This measure is applied where it is expected that disturbed soils in parts of the area will require vegetative cover for stabilization and the problems will not be mitigated by other management plan provisions.

3. Implementation. Through the IRM process an estimate of the need is determined and included in the allotment plan. Where the ground cover is needed, objectives that will provide for vegetative establishment will be included in the allotment plan. The Forest Service shall identify on-the-ground disturbed areas that must be treated.

The Forest Service, shall provide instruction as to soil preparation and the application of suitable seed mixtures, mulch, and fertilizer, and the timing of such work. It is the responsibility of the District Ranger to make sure that revegetation work is done correctly and in a timely manner.

### **22.16 - Erosion Control Structure Maintenance.**

1. Objective. To ensure that constructed erosion control structures are stabilized and working.

2. Explanation. Erosion control structures are only effective when they are in good repair and stable conditions. It is necessary to provide follow-up inspection and structural maintenance in order to avoid these problems and ensure adequate erosion control.

3. Implementation. During the period of grazing the permittee will implement and adhere to the Forest Service prescribed grazing protection measures.

### **23 - RECREATION MANAGEMENT.**

Recreation on NFS lands occurs in developed sites, on trails, rivers, roads, and in general forest areas. Developed recreation area is the term used to describe recreation areas that are designed and built to provide facilities to the user. An example is a constructed campground; where tables, fire places and toilets and so forth, have been provided, recreational residences, resorts, ski areas, and similar facilities are also developed recreation areas.

All other recreation is considered dispersed and occurs in forest and rangeland outside of developed sites. Facilities are, however, often required to protect resources, enhance the quality of visitor experiences, and disperse users.

#### **23.1 - Sampling and Surveillance of Designated Swimming Sites.**

1. Objective. To ensure the health and safety of water contact recreationists at designated National Forest swimming sites, and to provide an indicator of possible nonpoint source pollution.

2. Explanation. The monitoring and evaluation of bacterial water quality is mandatory at all developed, designated swimming sites. Analysis values are tested against state water quality standards for primary contact recreation. Optional monitoring may be considered at other areas where swimming occurs (often associated with developed campgrounds or picnic areas) but where swimming sites have not been designated.

Monitoring results may indicate a need to complete a watershed condition evaluation to identify possible nonpoint source pollution.

3. Implementation. Each forest with designated swimming sites assigns a functional area (such as Watershed, Engineering, or Recreation) to develop a swimming area water quality monitoring plan. This plan will identify swimming water monitoring locations, data requirements, monitoring frequency, procedures, data analysis and interpretations, and reporting. All data will be entered onto the EPA STORage and RETrieval (STORET) computer system.

### **23.11 - Control of Sanitation Facilities.**

1. Objective. To protect surface and subsurface water from unacceptable levels of bacteria, nutrients, and chemical pollutants resulting from the collection, transmission, treatment, and disposal of waste water and sewage at Forest Service and special use permitted facilities.

2. Explanation. Toilet facilities are provided at developed recreation sites. The type and number depends on the capacity of a given site. Sanitation facilities will be planned, located, designed, constructed, operated, inspected, and maintained to minimize the possibility of water contamination. Waste water includes water from showers and faucets.

3. Implementation. Field investigations will be performed by the appropriate disciplines to evaluate soil, geological, vegetative, climatic, and hydrological conditions. The location, design, inspection, operation and maintenance will be performed or controlled by qualified personnel who are trained and familiar with the sanitation system and operational guidelines. Federal, state and local regulations will be met in the installation of new sanitation facilities or modifications of existing facilities. Disposal of collected sewage at designated sewage treatment plants is required.

### **23.12 - Control of Refuse Disposal.**

1. Objective. The objective is to protect water from unacceptable levels of nutrients, bacteria, and chemicals associated with solid waste disposal.

2. Explanation. The users of National Forest recreation facilities are encouraged to cooperate in the proper disposal of garbage and trash. Receptacles are provided for garbage and trash at most developed sites. Garbage and trash must be "packed out" by those who use general forest and wilderness areas.

3. Implementation. The public education effort is a continuing process accomplished through the use of signs, printed information, mass media, and personal contact. Public cooperation is vital.

Garbage containers are placed in areas which are convenient for recreationists and are easily maintained. Authorized Forest Officers may issue citations to violators. The final disposal of collected garbage will be at a properly designed and operated county or state sanitary landfill meeting Federal, state, and local regulations.

### **23.13 - Sanitation at Hydrants and Water Faucets Within Developed Recreation Sites.**

1. Objective. To maintain high water quality standards around hydrants and faucets which provide water for consumptive use in developed recreation sites.

2. Explanation. The cleaning or washing of any personal property, fish, animal, or food at a hydrant or at a water faucet not provided for that purpose is prohibited. The public must be informed of their responsibilities concerning sanitary regulations. Acceptable designated cleaning areas are those that are located away from consumptive water sources and where effluent from the washing operation can be disposed of properly.

3. Implementation. Recreation staff, with the aid of public affairs personnel will seek public cooperation in meeting the objective in a positive manner through the implementation of BMP's and appropriate signing for the site. If necessary, authorized Forest Officers will issue citations to violators.

### **23.14 - Protection of Water Quality Within Developed and General Forest Recreation Areas.**

1. Objective. To comply with Federal and state water quality standards by regulating the discharge and disposal of pollutants.

2. Explanation. Placing in or near a stream, lake, or other water body (including ephemeral, or intermittent streams), substances which may degrade water quality must be prevented.

This includes, but is not limited to, human and animal waste, petroleum products, and other hazardous substances. Areas may be closed in order to restrict use in problem areas.

3. Implementation. The public will be encouraged through positive signs, pamphlets, and public contacts to conduct their activities in ways that will not degrade water quality. Officers will issue citations to violators.

### **23.15 - Location of Pack and Riding Stock Facilities.**

1. Objective. To avoid unacceptable soil erosion loss and degradation of water quality from pack and riding stock facilities.

2. Explanation. This practice directs the location of pack and riding stock facilities at safe distances away from springs, streams (including ephemeral or intermittent streams), lakes, wet meadows, and any other surface waters. The facilities will be located outside of stream management zones (filter strips).

3. Implementation. Forest Supervisors will authorize the construction and installation of facilities that have been identified and approved in the wilderness implementation plan or

other such planning effort, if they are necessary in connection with pack stock operation. During the planning and construction effort, location and drainage of these facilities will be laid out to avoid streamside management zones.

Patrol personnel check for compliance with the use of authorized areas.

### **23.16 - Management of Off-Road Vehicle Use.**

1. Objective. Manage Off-Road Vehicle (ORV) use to prevent unacceptable soil erosion and adverse effects on water quality.

2. Explanation. ORV use has the potential to cause severe erosion due to soil disturbance and water channelization on steep terrain, in riparian areas, and ephemeral and intermittent streamcourses. Unmanaged use can result in a high density of trails.

3. Implementation. Forest Plans provided for the initial direction on managing ORV use. This direction is being implemented through the Resource Access Travel Management (RATM) process. Monitoring ORV use is a tool which can help to identify areas contributing or likely to contribute to water quality degradation. Corrective action may include signing or barriers to redistribute use, placing restrictions on areas, rotation of use on areas, closure to vehicles that are causing problems (including mountain bicycles), or total closure. Structural measures to minimize contact with streamcourses, such as bridges or culverts, and the closure and obliteration of parallel or redundant trails may also be considered. Preventative actions include development, construction and maintenance of ORV trails and trailheads that limit soil erosion, public information designed to encourage use on ORV trails and discourage use in areas that are susceptible to erosion. Closure can be done by authority of the Forest Supervisor.

### **23.17 - Public Awareness.**

1. Objective. To comply with Federal and state water quality standards by enlisting public participation in the implementation of soil and water conservation practices directed at the impacts resulting from recreation use of the National Forests.

2. Explanation. Since Forest Service resources available to monitor and gain compliance of public related BMP's are limited, voluntary public compliance is the key to water quality protection. Voluntary compliance is best gained through public education efforts and positive public contacts which explain the importance of complying with Federal and state water quality standards and how such protection is achieved.

3. Implementation. Positive education efforts and public contacts can be done through various forms of media such as radio, television, newspapers, brochures, signs, and personal contacts. Recreation staff, in conjunction with public affairs staffs and other Forest Service personnel, develop and distribute information and make personal contacts.

## **24 - TIMBER MANAGEMENT.**

Timber harvesting and reforestation are the culmination of several years of timber resource assessment and detailed project planning. The actual physical activities consist of felling,



bucking, skidding, yarding, loading and hauling, site preparation, tree planting, and other activities associated with stand establishment.

One of the most effective points to include water and soil management concerns into the timber sale planning process is when silvicultural prescriptions are being written. Writing and approving silvicultural prescriptions is the responsibility of certified silviculturist at the District level in consultation with soil and water specialists.

Timber sale planning starts 5 to 6 years before the timber is sold for harvesting. The proposed sale must follow the guidelines written in the Forest Land and Resource Management Plan. Preparation of the sale follows IRM process.

Successful timber harvest is measured by the results on the ground compared to the environmental protection attainment identified and addressed by the interdisciplinary team in the IRM process.

#### **24.1 - Timber Harvest Unit Design.**

1. Objective. To ensure that timber harvest cutting unit design will secure favorable conditions of water flow and water quality.

2. Explanation. This is an administrative and preventative practice. The proposed timber harvest units are evaluated to estimate the response of the watersheds involved to the proposed timber sale. This includes a field examination of the ability of the watershed to absorb the impacts of the proposed harvest. Characteristics to be evaluated can include the recovery from past harvests; the protection of channels; the number, size, and location of harvest units; estimated location and size of roads and skid trails; logging system design; the condition of the protective ground cover in filter strips; and the potential natural recovery rate of the watershed. Where adverse water quality impacts and undesirable streamflows can result, the harvest unit design should be modified, and/or the natural recovery rate can be accelerated using watershed treatment measures.

3. Implementation. The hydrologic survey and evaluation of proposed timber harvest is accomplished through the IRM process. Incorporate prescriptions to assure acceptable conditions of water flow into the project plan.

On-the-ground accomplishment of the project plan direction is carried out by the Sale Preparation Forester, the Timber Sale Administrator, and the administrator of sale slash disposal and cultural activities, with follow-up review by qualified resource specialists. Identify the need for water quality monitoring in the project plan when necessary for water quality control.

#### **24.11 - Use of Terrestrial Ecosystem Survey Timber Harvest Limitation Rating.**

1. Objective. To identify severe and moderate erosion hazard areas and other soil limitations in order to adjust treatment measures to prevent downstream water quality degradation.

2. Explanation. This is a preventative practice. The Region 3 Terrestrial Ecosystem Survey (TES) contains a timber harvest limitation rating which evaluates the potential erosion and soil disturbance hazards due to timber harvest. Moderate and severe ratings point to the need to consider various mitigation measures to improve and maintain water quality in order to comply with Federal and state water quality standards, such as minimizing the use of ground disturbing equipment or restrictions on operating season.

3. Implementation. Timber Harvest Limitation ratings are available through published TES surveys or can be made by soil scientists or other personnel specifically trained to perform these evaluations. Such information is then utilized in the IRM project design process.

24.12 - Use of Sale Area Maps for Designating Water Quality Protection Needs.

1. Objective. To delineate the location of protection areas and available water sources as a guide for both the Purchaser and the Sale Administrator, and to ensure their recognition and proper consideration and protection on the ground.

2. Explanation. The following features are designated on the Sale Area Map, which is an integral part of the Timber Sale Contract:

- a. Location of non-riparian ephemeral and intermittent streamcourses to be protected with filter strips.
- b. Wetlands (wet meadows, lakes, pot holes, and other riparian areas) which have a riparian streamside management zone or a filter strip to protect them.
- c. Boundaries of harvest units.
- d. Specified roads.
- e. Roads where log hauling is prohibited or restricted (for example, roads located in filter strips and streamcourses).
- f. Structural improvements.
- g. Areas where method of skidding and yarding is designated.
- h. Sources of rock for road work, riprapping, and so forth.
- i. Water sources available for Purchaser's use.
- j. Other features required by Division "C" contract provisions.

This is an administrative and preventative practice.

3. Implementation. The IRM process results in identification of these and other features. The Sale Preparation Forester will include them on the Sale Area Map at the time of contract preparation. The areas are reviewed on the ground by the Purchaser and the Sale Administrator prior to harvesting.

### **24.13 - Limiting the Operating Period of Timber Sale Activities.**

1. Objective. To ensure that the Purchaser conducts operations, including but not limited to erosion control work, road maintenance, and log landing drainage in a timely manner, within the time period specified in the Timber Sale Contract.

2. Explanation. The C6.3 "Plan of Operation" provision is required in all Timber Sale Contracts. This provision states that the Purchaser must submit a general plan of operation which will set forth planned periods for and methods of road construction, timber harvesting, completion of slash disposal, erosion control work, and other contractual requirements. Forest Service written approval of the Plan of Operation is a prerequisite to the commencement of the Purchaser's operation.

The contract provision B6.31 "Operation Schedule" requires that the Purchaser shall provide an annual schedule of anticipated activities such as road maintenance and erosion control work.

Provision B6.6 can be used to suspend operations because of wet or saturated soils in order to protect soil and water resources.

3. Implementation. Limited operating periods are identified and recommended during the IRM process. The sale preparation officer prepares the contract to include provision C6.314. Provisions B6.3, B6.31, and C6.3 are all mandatory provisions of the Timber Sale Contract. Provision C6.3 is only mandatory for sales over a two-year contract period. The Purchaser must submit a general plan and annual plans to the Forest Service. The Purchaser may commence operations only after written Forest Service approval of the general plan under C6.3.

### **24.14 - Protection of Extremely Unstable Lands.**

1. Objective. To provide for special treatment of unstable areas or soils with severe erosion hazard and thereby avoid unacceptable erosion and sedimentation.

2. Explanation. This practice is an administrative and preventative control. Where extremely unstable lands (landslide areas) and highly erodible soils (severe erosion hazard) are delineated, they are taken out of suitable forest lands and are reclassified as unsuitable forest land. Using existing harvesting technologies, unsuitable forest lands cannot be managed for timber production because irreversible damage to soils, productivity, or watershed conditions may occur. Timber harvesting is deferred until improved harvesting technologies are developed and proven.

### **24.15 - Prescribing the Size and Shape of Even-Age Regeneration Cuts.**

1. Objective. To control the physical size and shape of even-age regeneration cuts as a means of reducing stream sedimentation.

2. Explanation. This is an administrative and preventative practice. The National Forest Management Act, October 22, 1976, Section 6, contains the following:

"(F) ensure that clearcutting, seed tree cutting, shelterwood cutting and other cuts designed to regenerate an even-aged stand of timber will be used...only where...(iv)

they are established according to geologic areas, forest types, or other suitable classifications the maximum size limits for areas to be cut in one harvest operation including provision to exceed the established limits after appropriate public notice and review by the responsible Forest Service officer one level above the Forest Service officer who normally would approve the harvest proposal: Provided, that such limits shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm; and (v) such cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and esthetic resources, and the regeneration of the timber resource."

The limitation on even-age regeneration cut opening size in the Southwestern Region is 40 acres. Unless the Regional Forester approves a specific request for a larger unit.

3. Implementation. The size and the shape of the proposed even-age regeneration units shall be reviewed on the ground in the IRM process. A map showing proposed units is included in the sale plan, which is reviewed and approved by the appropriate line officer. The timber sale should not be delineated on the ground (roads staked, timber marked) until after the NEPA document and sale plan is approved.

#### **24.16 - Streamside Management Zone (Filter Strip) Designation.**

1. Objective. To designate a zone along streams (including ephemeral and intermittent streams, wet areas, meadows, riparian areas, or any area that has the hydrological characteristics of carrying water on or near the surface and that the delivery of sediments to this area can effect water quality) where management actions are designed to minimize adverse effects on water and related resources.

2. Explanation. Factors such as stream class, existing ground cover conditions, soil erosion hazard, channel aspect, channel stability, side slope steepness, and slope stability are considered in determining the constraints of activities and width of streamside management zones. Fisheries habitat condition and its estimated response to the proposed activities are also evaluated in determining the need for and width of the streamside management zone. The streamside management zone is not a zone of closely managed activity. It is a zone which acts as an effective filter and absorptive zone for sediment; maintains shade; protects aquatic and terrestrial riparian habits; protects channel and streambanks; and promotes floodplain stability.

3. Implementation. Identify the streamside management zone requirements during the IRM process. Contracted projects are implemented by contractors or operators. Compliance with environmental analysis criteria, contract specification, and operating plans is assured by the Contracting Officers Representative or Timber Sale Administrator.

#### **24.17 - Determining Tractor Loggable Ground.**

1. Objective. Comply with Federal and state water quality standards when tractor logging.

2. Explanation. This practice is intended to minimize soil erosion, subsequent sedimentation and water quality degradation. The Timber Harvest Limitation rating provided by the TES is the basic method of determining tractor loggable ground.

3. Implementation. The TES is utilized by a trained and qualified Forest Service representative during the on-the-ground assessment of the timber sale. Consider the resulting Timber Harvest Limitation rating during the selection of logging and silvicultural methods and use it in determining acceptable intensity of and restrictions for land disturbance activities. Give interpretations of the considerations in the NEPA documentation. Provisions in the Timber Sale Contract specify the areas determined by the TES upon which tractors can operate. Tractor logging is generally not permitted on slopes exceeding 40 percent. Exceptions may be made after a thorough investigation of on site conditions and inclusion of special specified mitigation prescriptions in the timber sale contract. Tight administrative control of such operations is also required.

#### **24.18 - Tractor Skidding Location and Design.**

1. Objective. To minimize erosion and sedimentation by designing skidding patterns to best fit the terrain. To maintain the integrity of the streamside management zones, riparian areas, and other sensitive watershed areas.

2. Explanation. This is a preventative practice. The watershed factors that are considered include slope, soil stability, exposure, vegetative cover and any factor that may affect the peak flow and sediment yield potential of the land. The careful control of skidding patterns serves to minimize on site erosion and downstream channel damage by preventing the concentration of runoff in skid trails.

Proper skid pattern management involves such things as locating skid trails to avoid stream courses and restriction of skidders to designated trails.

Two complementary methods of complying with water quality standards when tractor skid trails are design:

a. End-Lining. This method involves winching the log directly out of the sensitive areas (streamside management zone, wet meadow, riparian area, and so forth) with a cable operated from outside the sensitive area.

b. Felling To The Lead. This method involves felling trees toward a predetermined skid pattern. Soil disturbance, compaction, and residual stand and site damage are minimized when this method is used.

c. Implementation. For skid trail design, identify and evaluate sensitive areas in the environmental assessment review during the IRM process. A special Timber Sale Contract provision can be included in the Timber Sale Contract for the location of skid trails. The Sale Administrator locates the skid trails with the timber Purchaser or by agreeing to the Purchaser's proposed locations prior to construction. Guidelines for skid trail locations are referenced in the sale plan, the Timber Sale Administration

Handbook (FSH 2409.23), the Timber Sale Contract, and on the Presale Cutting Unit Summary card (R3-2400-50).

#### **24.19 - Suspended Log Yarding in Timber Harvesting.**

1. Objective. To protect the soil mantle from excessive disturbance. To maintain the integrity of the streamside management zone, riparian areas, and other sensitive watershed areas.

2. Explanation. Suspended log yarding includes cable or aerial yarding systems which suspend logs either partially or wholly off of the ground. The systems are used on steep slopes or other areas sensitive to excessive disturbance. All of the systems result in less soil disturbance since heavy machinery is not used over the sale area. In most cases these systems require fewer roads. Fewer roads and less soil disturbance will result in less impact on the water resource.

3. Implementation. Areas where suspended log yarding is to be used shall be determined during the pre-sale planning process and designed in the sale plan. The specific systems are included in the contract and designated on the Sale Area Map by the Sale Preparation Officer. The Timber Sale Administrator shall oversee the project operation using the guidelines and standards established in the Timber Sale Contract and Sale Administration Handbook with reference to the sale plan.

#### **24.2 - Log Landing Location.**

1. Objective. To locate landings so creation of unsatisfactory watershed conditions which lead to water quality degradation is avoided.

2. Explanation. This practice is both administrative and preventative. Location of all landings shall be agreed to by the Forest Service and Purchaser prior to construction. The following criteria are used in evaluating landings:

- a. The cleared or excavated size of landings shall not exceed that needed for safe and efficient skidding and loading operations.
- b. Landing locations are selected which minimize the amount of excavation and on-site soil loss.
- c. Where possible, landings are located so that felled timber lying between drainages can be skidded to the landing without crossing channels.
- d. Landings are located where the least number of skid roads are required, and side cast will neither enter drainages nor damage other sensitive areas.
- e. Landings are positioned such that the skid road approach will be nearly level or less than 3 percent grade, far enough back to allow for good drainage.
- f. Landings are located so a minimum number of tractor roads enter the landing.
- g. Landings are not located in streamside management zones.



3. Implementation. Landing locations chosen by the contractor must be agreed to by the Timber Sale Administrator (SA). The SA can negotiate with the Purchasers' representative to select mutually acceptable landing locations. To be an acceptable landing, it must meet the above criteria. Should agreement not be reached, the decision of the Forest Service shall prevail within the limitations of law.

#### **24.21 - Erosion Prevention and Control Measures During Timber Sale Operations.**

1. Objective. To ensure that the Purchaser's operations shall be conducted reasonably to minimize soil erosion.

2. Explanation. Timber is purchased by individuals or companies who either harvest the timber themselves or contract harvest to other parties. Therefore, it is necessary to ensure that purchasers understand and adhere to water quality prescriptions arrived at in the timber sale planning process. This is accomplished by setting forth the Purchaser's and the Forest Service's responsibilities in the Timber Sale Contract.

3. Implementation. Equipment shall not be operated when soil conditions are such that accelerated soil erosion will result. The kinds and intensity of control work required of the Purchaser shall be adjusted to soil and weather conditions and the need for controlling runoff. Erosion control work shall be kept current immediately preceding expected seasonal periods of precipitation or runoff.

If the Purchaser fails to do seasonal erosion control work prior to any seasonal period of precipitation or runoff, the Forest Service may temporarily assume responsibility for the work, and any unencumbered deposits may be used by the Forest Service to do the work.

#### **24.22 - Special Erosion Prevention Measures on Disturbed Land.**

1. Objective. To prevent accelerated on-site soil loss and sedimentation of streamcourses.

2. Explanation. This is an administrative and preventive treatment. When required by the contract, the Purchaser shall give adequate treatment by spreading slash or wood chips (or, by agreement, some other treatment) on portions of tractor roads, skid trails, landings, or temporary road fills. This provision is to be used only for sales which contain soil stabilization problems which are not expected to be taken care of by the normal methods prescribed under other contract provisions.

3. Implementation. The ID team shall identify the treatment areas in the IRM process and in the timber sale plan. The District Timber Sale Preparation Officer shall identify the acreage to be treated in the legend of the Sale Area Map (SAM) and prepare a special provision for the contract. The specific acreage to be treated shall be designated on-the-ground by the Forest Service.

### **24.23 - Revegetation of Areas Disturbed by Harvest Activities.**

1. Objective. Establish a vegetative cover on disturbed sites to prevent accelerated on-site soil loss and sedimentation of streamcourses.

2. Explanation. Where soil has been severely disturbed by Purchaser's operations, and the establishment of vegetation is needed to minimize erosion, the Purchaser shall take appropriate measures normally used to establish an acceptable vegetative groundcover, or take other agreed stabilization measures.

This measure is applied in contracts where it is expected that disturbed soils in parts of the sale area will require vegetative cover for stabilization and the problems will not be mitigated by other contract provisions. Apply this measure on soil with moderate and severe erosion hazard ratings.

3. Implementation. Through the IRM process, an estimate of the need for vegetative cover is determined and included in the sale plan, and in the timber sale appraisal. Where the establishment of vegetation is needed, use provision C6.6 in the Timber Sale Contract. The Forest Service shall designate on-the-ground the disturbed soils, such as skid trails, landings, and temporary roads, and so forth, that must be treated.

The Forest Service, shall provide instructions as to soil preparation and the application of suitable seed mixtures, mulch, and fertilizer, and the timing of such work. It is the responsibility of the Sale Administrator (SA) to make sure that revegetation work is done correctly and in a timely manner.

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#### **24.24 - Log Landing Erosion Prevention and Control.**

1. Objective. To minimize on-site soil loss and subsequent sedimentation of streamcourses, from log landings.

2. Explanation. This practice employs administrative, preventive, and corrective controls to meet the objective. After landings have served the Purchaser's purpose, the purchaser shall ditch or slope the landings to permit the drainage and dispersion of water. Landings will be properly drained when constructed before timber sale operations begin. Provisions are also made for revegetation. Other provisions may include ripping, scarifying, smoothing and sloping construction of drainage ditches, prevention of water draining off roads from reaching a landing, spreading slash, covering with wood chips, or applying straw mulch. Unless agreed otherwise, cut and fill banks around landings shall be sloped to remove overhangs and otherwise minimize erosion. The specific work needed on each landing will depend on the actual ground conditions. As part of the IRM process the interdisciplinary team assesses the need for stabilization.

3. Implementation. Timber Sale Contract requirements provide for erosion prevention and control measures on all landings. It is the responsibility of the Timber SA to ensure that this practice is properly implemented on-the-ground.

#### **24.25 - Erosion Control on Skid Trails.**

1. Objective. To comply with Federal and state water quality standards by minimizing on-site soil loss and sedimentation of streamcourses derived from skid trails.

2. Explanation. This practice employs preventive measures in order to meet the objective. The Timber Sale Contract requires the installation and maintenance of erosion control measures on skid trails, tractor roads, and temporary roads. Normally, the work involves constructing cross ditches and water spreading ditches. Grass seeding may also be required. This can be added to the Timber Sale Contract by use of contract clause C6.601. These areas are designated on-the-ground as logging and temporary access construction progresses.

3. Implementation. Location of all erosion control measures are designated and agreed to on-the-ground by the SA. The SA will identify site-specific preventive work to be required of the Purchaser. The Purchaser is obligated to maintain erosion control structures after construction, specified in contract provisions for one year unless maintenance need is caused by other National Forest users.

#### **24.26 - Meadow Protection During Timber Harvesting.**

1. Objective. To avoid unacceptable groundcover, a reduction of soil productivity, soil compaction, severe soil erosion, and water not being in compliance with Federal and state water quality standards in meadows.

2. Explanation. This is an administrative and preventive action. Unauthorized operation of vehicular or skidding equipment in meadows that are designated on SAM's and marked on-the-ground is prohibited. Vehicular or skidding equipment shall not be used on meadows except where roads, landings, and tractor roads are approved. Unless otherwise agreed, trees felled into meadows shall be removed by end-lining. Logging slash shall be removed from the meadow.

3. Implementation. The concerns and constraints mentioned above are set forth in Timber Sale Contract requirements. It is the responsibility of the Timber SA to ensure that this practice is properly implemented on-the-ground.

#### **24.27 - Streamcourse Protection.**

1. Objective. To protect the natural flow of streams (including ephemeral and intermittent). To provide unobstructed passage of stormflows. To reduce sediment and other pollutants from entering streams. To restore the natural course of any stream as soon as practicable where diversion of the stream may occur as a result of timber management activities.

2. Explanation. This management practice employs administrative, preventive, and corrective measures to meet the objectives. The following points are fundamental to protecting streams and streamcourses:

a. Location and method of streamcourse crossings must be agreed to prior to construction. This is done when locations of skid trails, tractor roads, and temporary roads are agreed on by the Forest Service and the Purchaser.

b. Purchaser shall repair damage to a streamcourse, including damage to banks and channel.

c. All timber sale debris shall be removed from streamcourses within 48 hours, unless otherwise agreed, and in an agreed manner that will cause the least disturbance.

d. Equipment shall not operate within streamside management zones as determined in the IRM process. Streamside management zone boundaries may be modified by the SA to meet unforeseen operation conditions.

e. When ground skidding systems are employed, logs will be end-lined out of streamside management zones. Equipment is permitted to cross streamside management zones and streamcourses only at locations agreed to by the SA and the Purchaser.

f. Lead-out ditches, water bars and other erosion control structures will be located so as not to channelize drainage water directly into streamcourses. Energy dissipators will be located at the end of these structures to spread the water. This allows the sediments to drop out and the water to infiltrate.

g. Logs will be fully suspended in cable log harvesting operations within the streamside management zone when required.

h. All streamcourses are to be protected with a streamside management zone.

3. Implementation. The SA works with the Purchaser's representative to ensure that the Timber Sale Contract clauses covering the above items are carried out on-the-ground. Specialists can be called upon to help the SA with decisions. In the event Purchaser causes debris to enter streamcourses in amounts which adversely affect the natural flow of the stream, water purity, or fishery resources, Purchaser shall remove such debris as soon as practicable, but not to exceed 48 hours and in an agreed-upon manner that will cause the least disturbance to streamcourses.

#### **24.28 - Erosion Control Structure Maintenance.**

1. Objective. To ensure that constructed erosion control structures are stabilized and working.

2. Explanation. Erosion control structures are only effective when they are in good repair and stable condition. Once the erosion control structures are constructed and seeded, there is a possibility that they may not be adequately vegetated or they may be damaged by subsequent harvest activities or large storms. It is necessary to provide follow-up inspection and structural maintenance in order to avoid these problems and ensure adequate erosion control.

3. Implementation. During the period of the Timber Sale Contract, the Purchaser shall provide maintenance of soil erosion control structures constructed by the Purchaser until they become stabilized, but not for more than one year after construction. If erosion control structures are damaged by other National Forest uses, the Purchaser is not responsible. The Forest Service may agree to perform such structure maintenance under B4.225 (Cooperative Deposits), if requested by the Purchaser, subject to agreement on rates. If the Purchaser fails to do seasonal maintenance work, the Forest Service may assume the responsibility and charge the Purchaser accordingly.

#### **24.29 - Acceptance of Timber Sale Erosion Control Measures Before Sale Closure.**

1. Objective. To assure the adequacy of required erosion control work on timber sales.

2. Explanation. The effectiveness of soil erosion prevention and control measures is determined by the results found after sale areas have been exposed to the elements one or more years after a cutting unit or the entire timber sale has been closed. Although a careful check is required before a timber sale is closed to assure that planned erosion work has been completed to the standard prescribed, the erosion prevention work done in previous years should be periodically inspected during the life of the timber sale. These inspections will help determine whether the planned work was adequate, if maintenance work is needed, the practicability of the various treatments used, and the necessity for modifying present standards or procedures.

3. Implementation. "Acceptable" erosion control means that established standards have been met. SAs shall not accept erosion control measures which fail to meet set standards.



### **24.3 - Slash Treatment in Sensitive Areas.**

1. Objective. To comply with Federal and state water quality standards by protecting sensitive areas (including streamside management zones, landslide areas, and so forth) from degradation which would result from using mechanized equipment for slash disposal.

2. Explanation. Special slash treatment may be prescribed in sensitive areas to facilitate slash disposal without use of mechanized equipment. Meadows, wetlands, streamside management zones, and landslide areas are typically sensitive areas where equipment use is normally prohibited. Slash treatment methods identified during the IRM process are indicated for each cut unit on the SAM.

3. Implementation. An assessment of the sale area shall be made in the timber sale planning process. Sensitive areas needing protection are identified. Results shall be documented in the sale plan and identified in the Timber Sale Contract and on the SAM. The Timber SA shall inspect the treatment for correct and satisfactory slash disposal accomplishment.

#### **24.31 - Five-Year Reforestation Requirement.**

1. Objective. To assure a continuous forest cover and to limit disturbance on areas with limited regeneration potential.

2. Explanation. When timber production is a land management objective, regeneration cutting of timber is not permitted where the site cannot be reforested within five years of final harvest. If the timber cutting is for other resource objectives this constraint does not apply. Regeneration areas will be planted with trees within five years if natural regeneration is not expected to occur within the five-year period.

3. Implementation. During the IRM process, the ID team assesses the capability of proposed areas to achieve reforestation within the prescribed period. The soil scientist uses information (for example, soil productivity, depth, and available moisture holding capacity) to determine the potential for reforestation. TES provides the reforestation potential rating for both artificial and natural reforestation. When TES is available, the silviculturist and soil scientist will use the information it contains, along with field observations, to determine whether lands are suitable, unsuitable, or unproductive for timber production. This information, along with pertinent information contained in Sale Area Improvement plans, harvest plans and compartment inventory analyses, is used to determine harvesting and regeneration methods.

#### **24.32 - Non-recurring "C" Provisions That Can Be Used For Water Quality Protection**

1. Objective. To comply with Federal and state water quality standards where standard "B" or "C" provisions of the Timber Sale Contract do not apply or are inadequate to protect watershed values.

2. Explanation. Special "C" contract provisions are sometimes needed to meet management objectives on a particular sale area. They are written and proposed by District Rangers or Forest Supervisors and approved by the Regional Forester. Such authorization shall apply only to the sale for which approval was given.

An example of a "C" provision which is commonly used for complying with Federal and state water quality standards is the provision concerning the directional felling of timber. This provision is used for riparian areas where it is important to avoid felling trees into streams or into important areas of riparian vegetation or residual timber.

Another example is the use of a "swing yarding" special provision in situations where such a method would help protect water quality. Swing yarding refers to the use of more than one yarding system to accomplish a difficult yarding problem. In one situation, it might be possible to avoid building a stream crossing by using a tractor to yard logs to a point where they could then be lifted across the stream to a road by a skyline yarder.

This practice can be used for a variety of special situations which may occur on any timber sale. There are no standard or set provisions that can be referenced, since each Special "C" provision is unique and specific to one sale.

3. Implementation. The need for Special "C" provisions shall be identified and recommended during the IRM process by the ID team. The Sale Preparation Officer shall prepare Special "C" provision needed and submits it through line officers to the Regional Forester for approval. The Regional Forester will prepare appropriate contract wording of the provision and returns the approved provision to the district. The Special "C" provision shall be applied by the SA in the same manner as the standard contract provisions.

### **24.33 - Modification of the Timber Sale Contract.**

1. Objective. To modify the Timber Sale Contract if new circumstances or conditions indicate that the timber sale will irreversibly damage soil and water values.

2. Explanation. Once timber sales are sold, they are harvested as planned via the Timber Sale Contract. At times, however, it may be necessary to modify a Timber Sale contract because of new concerns about the potential affects of land disturbance on the water resource. If new evidence raises serious concerns to the Forest Service representative, an interdisciplinary team will be assigned to assess the evidence and implications. The environmental document prepared for the timber sale shall then be amended to reflect the findings of the ID team. The team will make recommendations to the appropriate Line Officer on whether the timber sale, as currently planned, will (1) irreversibly damage watershed conditions, or (2) inadequately protect streams (including ephemeral and intermittent), streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of watercourses, and deposits of sediment.

3. Implementation. If the timber sale, as determined by the appropriate Line Officer, will unacceptably affect watershed values, corrective actions must be taken which may include

contract modification. The timber sale modification can be accomplished by agreement with the timber sale Purchaser, or unilaterally by the Forest Service using an amended environmental document prepared by an interdisciplinary team.

#### **24.4 - Site Preparation for Reforestation.**

1. Objective. To provide appropriate erosion and sedimentation protection for sites disturbed during site preparation. To protect existing erosion control structures or to replace damaged structures during and after site preparation.

2. Explanation. Site preparation has the potential to increase compaction and reduce groundcover. The possible result of such activity is an increase in the concentration of surface water along with its associated erosive forces. Additional erosion control work may be needed after site preparation. The quality of erosion control work required under the timber sale contract needs to be upheld through completion of site preparation.

3. Implementation. Specific requirements for erosion control are included in each environmental assessment and timber sale contract. All these requirements need to be brought forward into site preparation contracts. The COR is responsible for enforcing contract provisions that pertain to erosion prevention and control during site preparation.

#### **25 - WATERSHED MANAGEMENT.**

The objective of watershed management is to protect watersheds by implementing practices designed to retain soil stability, improve or maintain site productivity, secure favorable conditions of water flow, and preserve or enhance aquatic values. The watershed management program is oriented towards maintenance or improvement of watershed conditions, restoration of National Forests lands damaged by catastrophic events or degraded by past use, and monitoring of soil and water quality.

#### **25.1 - Watershed Restoration.**

1. Objective. To reduce the potential for nonpoint source pollution by improving hydrologic function, soil stability, and soil productivity.

2. Explanation. Watershed restoration is a corrective measure to:

- a. Increase ground cover (for example, vegetation and litter).
- b. Increase infiltration.
- c. Slow overland flow and conserve the soil resource.
- d. Stabilize streambanks and stream channels.
- e. Enhance soil productivity.

- f. Reduce flood occurrence and flood damage.
- g. Improve water quality to ensure compliance with state and Federal water quality standards.
- h. Reduce on-site soil loss to within acceptable soil loss values.
- i. Improve stream channel stability.
- j. Protect watershed restoration projects until the areas have stabilized.

The following factors shall be considered during development of restoration projects; predicted changes in water quality, downstream values, site productivity, threats to life and property, any direct or indirect economic returns and social or scenic benefits.

3. Implementation. This management practice is implemented through the development of a watershed improvement needs inventory and integrated watershed improvement project plans.

Planning and implementation will be done using the IRM Process. Pursue multifunctional funding of projects where improvement of watershed conditions will benefit multiple resource areas. The actual work may be done by Forest Service crews, through contract, or by volunteers.

### **25.11 - Conduct Floodplain and Wetland Hazard Analyses and Evaluations**

1. Objective. To minimize the long- and short-term adverse impacts to hydrologic function associated with the occupancy and modification of floodplains.

2. Explanation. The condition of floodplains and wetlands plays an important role in the hydrologic functioning of a watershed. Development in the floodplain frequently has an adverse effect on hydrologic function. Forest Service policy is to recognize floodplains and wetlands as specific management areas, and to avoid adverse impacts which may be associated with the occupancy and modification of floodplains and with the destruction, loss, or degradation of wetlands.

3. Implementation. Floodplain analysis and evaluation are part of the environmental analysis process. Make flood hazard analysis and evaluation prior to acquisition or exchange of land within floodplains. A floodplain analysis and evaluation must be made when sites within floodplains are being considered for structures or developments. Include recommendations for alternative ways to achieve exchange, acquisition, or project goals, and protect hydrologic function in project designs and NEPA documents.

### **25.12 - Protection of Wetlands and Riparian Areas.**

1. Objective. To avoid adverse impacts, including impacts to water quality, associated with disturbance or modification of wetlands.

2. Explanation. The Forest Service recognizes the beneficial values of wetlands, and will, in accordance with Executive Order 11990 of May 24, 1977, take action to minimize destruction, loss, or degradation of wetlands.

3. Implementation. During project planning, all potentially impacted wetlands are mapped. Wetland values are considered and evaluated as an integral part of the project planning process. Mitigating measures are incorporated into project plans and designs to maintain the hydrologic and biologic function of the wetlands.

### **25.13 - Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control and Countermeasure (SPCC) Plan.**

1. Objective. To prevent contamination of waters from accidental spills.

2. Explanation. A contingency plan is a predetermined organization and action plan to be implemented in the event of a hazardous substance spill. Factors considered for each spill are the specific substance spilled, the quantity, its toxicity, proximity of the spill to waters, and the hazard to life and property.

The SPCC Plan is a document which requires appropriate measures (40 CFR 112) to prevent oil products from entering the navigable waters of the United States. An SPCC Plan is needed if the total oil products on-site above-ground storage exceeds 1320 gallons or if a single container exceeds a capacity of 660 gallons.

3. Implementation. Each forest shall be responsible for designating emergency spill coordinators and documenting names and telephone numbers of agencies to call regarding cleanup of spills in the contingency plan. Individual Forests should maintain an inventory of materials to use during the cleanup of a spill. Disposal methods and sites must be coordinated with Environmental Protection Agency (EPA), state, and local officials responsible for safe disposal.

All Forests shall maintain a Spill Contingency Plan and SPCC Plans are required for Forest Service owned and special use permitted facilities, as well as by timber sale operators and other contractors who store petroleum products.

### **25.14 - Control of Activities Under Special Use Permit.**

1. Objective. To protect surface and subsurface water quality from physical, chemical, and biological pollutants resulting from activities that are under special use permit.

2. Explanation. Many activities and uses take place on National Forest System (NFS) lands which are not directly related to Forest Service management activities. Some examples are: electronic sites, highway and railroad rights-of-way, wastewater treatment and disposal, solid

waste disposal, and power transmission lines. There are other uses which are recognized Forest Service land management activities which are achieved through permits to a public or private agency, group, or individual. Examples of these types of uses are; organization camps, recreation residence tracts, and ski areas.

Activities on lands withdrawn under Federal Energy Regulatory Commission (FERC) authority may be exempt from Forest Service control. When the FERC permit is renewed, the Forest Service makes a complete restudy of water quality and quantity impacts and updates the constraints with which the permittee must operate. (FSM 2726.11)

3. Implementation. The special use permit under which agencies, groups, or individuals operate, shall detail the conditions they must meet to continue operating including measures necessary to comply with state and Federal water quality standards. The permittees shall conform to all applicable State and Local regulations governing water quality and sanitation. The regulations may in turn require the permittee to obtain a waste discharge permit from the state. Failure on the part of the permittee to meet the conditions of the special use permit may result in the permit being revoked.

### **25.15 - Water Quality Monitoring.**

1. Objective. To verify the effectiveness of BMP through the collection of representative water samples.

2. Explanation. Water quality monitoring is a mechanism which evaluates the effectiveness of a management prescription in protecting water quality. A water quality monitoring plan may be made a part of an environmental assessment, a management plan, a special use permit, or it may be developed in response to other needs.

3. Implementation. If it is determined in the IRM process that a water quality monitoring plan is needed, a plan is written or reviewed by a hydrologist. The plan may be implemented by the hydrologist or by other qualified Forest personnel. The actual analysis of the samples are done by the hydrologist, State certified laboratory or other trained Forest personnel. Interpretation of the data and any reporting is also done by the hydrologist or trained personnel. Use the EPA STORage and RETrieval computer system (STORET) system for computer storage of all water quality data collected.

### **25.16 - Soil Moisture and Wetland Limitations for Equipment Operation Vehicle Use.**

1. Objective. The objective of this measure is to prevent compaction, rutting, and gullyng which may result in site degradation, sediment production, and turbidity.

2. Explanation. This is a preventative measure that reduces surface disturbance by equipment operating during wet soil conditions. Soil erodibility, climatic factors, soil/water relationships, and mass stability are factors used by soil scientists, and hydrologists during the



environmental analysis process to make recommendations on equipment limitations during wet seasons.

3. Implementation. The COR is responsible for determining when the soil moisture is such that the soil surface is unstable and susceptible to damage. The COR is also responsible for suspending or terminating operations for contracted projects when soil moisture content warrants. The project supervisor is responsible for determining when the soil surface is susceptible to damage, and is then responsible for terminating operations when Forest Service personnel or volunteers are used to accomplish a project. Project planners are responsible for including appropriate contract provisions and management requirements in project work plans and environmental documents.

### **25.17 - Slope Limitations for Equipment Operation and Vehicle Use.**

1. Objective. The objective is to reduce erosion and associated sediment production by limiting equipment and vehicle use on steep slopes.

2. Explanation. This is a preventative measure that limits excessive surface disturbance and surface erosion. This measure facilitates proper drainage of disturbed areas by limiting equipment and vehicle operation to slopes where corrective measures such as water bars can be installed.

3. Implementation. The need for slope limitation is determined in the IRM process. The COR is responsible for ensuring implementation of the contract provisions that pertain to equipment operation on steep slopes. The project planners have the responsibility to ensure that appropriate tractor operation provisions are included in the contract. This practice is implemented on all vegetative manipulation projects where appropriate. The project supervisor is responsible for identifying areas where operations should be limited on projects accomplished by Forest Service people or volunteers. The supervisor's direction is taken from the project work plan and environmental documentation.

### **25.18 - Revegetation of Surface Disturbed Areas.**

1. Objective. To comply with state and Federal water quality standards by minimizing soil erosion through the stabilizing influence of vegetative ground cover.

2. Explanation. This is a corrective practice to stabilize the soil surface of a disturbed area. The vegetation selected will be a mix of species that is best suited to meet the erosion control objective, with consideration for range, wildlife, timber, or fuels management objectives. Fertilization and irrigation, along with placement of a tackifier, jute netting or other soil surface stabilizing material may be necessary to ensure vegetation is established.

3. Implementation. When developing project plans using the IRM process, assess surface disturbed areas and prescribe vegetative species mix needed for revegetation. Monitor projects to assess their effectiveness, and need for follow-up action.

### **25.19 - Contour Disking, Contour Furrowing, Contour Terracing, Harrowing, and Ripping**

1. Objective. The objective of these practices is to reduce on-site soil losses and associated sediment production by reducing overland flow.
2. Explanation. These measures reduce the concentration of surface water and its associated erosive forces by enhancing soil infiltration rates.
3. Implementation. Determine the need and suitability of these practices using the IRM process. The COR is responsible for enforcing the contract provision for contracted projects. The project supervisor is responsible for enforcing management requirements provided in the project NEPA documentation for in-service projects. The project planners are responsible for appropriate contract provisions or management requirements, including work plans, NEPA documents, and contracts.

### **25.2 - Evaluation of Cumulative Watershed Condition Effects.**

1. Objective. To protect the beneficial uses of water from adverse effects of multiple land management activities.
2. Explanation. Watershed condition is a description of the health of a watershed in terms of water quality, quantity, and timing. Many management activities have an effect, either positive or negative, on watershed condition. Usually the effects of management activities are temporary, or declining in magnitude over time. Natural events may also have a positive or negative effect on watershed condition.

The ability and rate of a watershed to recover from negative effects is determined primarily by climate and soil. Each watershed has some tolerance for negative effects. When this tolerance is exceeded, permanent impairment to the watershed may result. Measures of groundcover, estimates of erosion, road density, water yield or macro-invertebrate diversity, can be used as indicators of the management effects on watershed condition. These indicators can also be used to set watershed tolerances. When a watershed tolerance will be exceeded by a proposed activity, managers will consider changing the activity, changing the activity schedule, or employing mitigative measures to reduce the effects.

3. Implementation. Conduct the cumulative watershed condition effects evaluation as part of the IRM process.

### **25.21 - Soil Quality Monitoring.**

1. Objective. To assure that management practices do not allow significant or permanent impairment of the productivity of the land.
2. Explanation. Soil quality monitoring is used to evaluate the effects of management activities on soil productivity, and determine if soil management objectives have been achieved. Monitoring can be either implementation, effectiveness, or validation types of monitoring.

3. Implementation. Soil scientists and other trained personnel routinely conduct implementation monitoring. Additional effectiveness or validation monitoring may be identified through the IRM Process, in which case a complete Soil quality monitoring plan will be prepared by the soil scientist or other trained Forest personnel.

## **26 - WILDLIFE AND FISHERIES MANAGEMENT.**

The objective of wildlife and fisheries management is to protect, maintain, and enhance habitat for wildlife and fisheries resources.

### **26.1 - Control of Channel Disturbance from Fish Habitat Improvement Structures.**

1. Objective. To minimize sediment in streamcourses during construction and placement of fish habitat improvement structures.

2. Explanation. Installation of fish habitat improvement structures such as logs sills, wing deflectors, and bank cover structures commonly dislodges or exposes sediments creating a potential for erosion. This disturbance can be minimized by limiting the extent and duration of impact by utilizing techniques such as installing structures during low flow periods, using staged construction, limiting the total amount of installation activity at any given time, construction of temporary sandbag or rock coffer dams around the areas, diverting or piping streamflow around or through the site, minimizing use of heavy machinery operating in the channel, and/or using rubber tired equipment when operating in the channel.

3. Implementation. Water quality protection needs and techniques are identified through the IRM process. The project manager is responsible for ensuring techniques are entered as contract provisions for contracted projects with subsequent implementation by COR. The project manager will communicate to Forest Service personnel or volunteer personnel to ensure correct implementation when projects are accomplished in-house.

### **26.11 - Control of Sedimentation from Wildlife Habitat Improvements.**

1. Objective. To minimize sediment production resulting from soil movement associated with construction of wildlife habitat improvement structures.

2. Explanation. Installation of wildlife habitat improvement structures such as wildlife waters, waterfowl nesting islands, dams, dikes, channels, and so forth, sometimes require excavation. Disturbance can be minimized by limiting the extent and duration of impact by utilizing techniques such as installing structures during dry periods, using staged construction, limiting the total amount of installation activity at any given time, minimizing use of heavy machinery, and using rubber tired equipment.

3. Implementation. Water quality protection needs and techniques are identified through the IRM process. The project manager is responsible for ensuring techniques are entered as contract provisions for contracted projects with subsequent implementation by COR. The project manager will communicate to Forest Service personnel or volunteer personnel to ensure correct implementation when projects are accomplished in-house.

## **27 - MINING AND MINERALS MANAGEMENT.**

Mineral (including oil, gas, and geothermal resources) exploration and development activities on National Forest System lands fall into the following categories:

1. Locatable. Activities authorized under the U. S. Mining Laws, Act of May 10, 1872, as amended. This law applies to most hard rock and placer mineral deposits in National Forest System lands reserved from the public domain.
2. Leasable. Activities authorized by various mineral leasing acts. Generally applies to all minerals, except mineral materials, in acquired National Forest System lands and to energy minerals in National Forest System lands reserved from the public domain.
3. Salable Mineral Materials. Activities administered under the Act of July 31, 1947, and several other Acts. Mineral materials such as sand, stone, gravel, pumice, cinders, and clay located in National Forest land may be disposed of by one of the following means:
  - a. Sale to companies and individuals.
  - b. Free use permits to other government units and to nonprofit associations and individuals.
  - c. Forest Service force account or contract to carry out Forest Service programs (for example, timber sale contracts).

### **27.1 - Water Resources Protection on Locatable Mineral Operations**

1. Objective. To comply with state and Federal water quality standards and prevent water quality degradation by physical and chemical pollutants resulting from locatable mineral exploration, development, production, and associated activities.
2. Explanation. It is the Forest Service's objective to ensure that all mineral activities are conducted in an environmentally sound manner and that lands disturbed by mineral activities are reclaimed for other productive uses (FSM 2802).

Since a mining operation usually involves activities such as site clearance and road construction, soil and water conservation practices should be implemented as warranted.

3. Implementation. Seven instruments may be used in controlling the impact on surface resources, including the water quality, of locatable mineral activities on NFS administered lands. It is not necessary to use all of them in every case; they are:
  - a. Notice of Intention to Operate
  - b. Plan of Operations
  - c. Environmental Analysis and appropriate NEPA documentation

- d. Guarantee to Perform Reclamation Work
- e. Special Use Permit
- f. Road Use Permit
- g. Notice of Noncompliance

A Notice of Intention to Operate (NIO) is required from those intending to conduct mining operations which have the potential to cause disturbance of surface resources, including surface waters, on National Forest System lands. The NIO must include sufficient information concerning the mining activity to allow for an environmental analysis and determination of the need for a detailed Plan of Operations. A Plan of Operations is required from operators when mining actions will likely cause a significant disturbance of surface resources, including surface waters. The plan must be approved prior to commencing any work.

The District Ranger reviews the operating plan, assures that it contains the necessary protective practices. These practices include proper disposal of solid wastes, erosion control measures during road construction and maintenance, reclamation of disturbed sites, and prevention of hazardous substance spills. In addition the operator may be required to furnish a security bond as a guarantee that reclamation work will be performed. Through the use of the "Notice of Intent," "Plan of Operations," and provisions in any "Special Use Permit" issued, the Forest Officer checks for compliance with prescribed measures. Legal remedies are available if mutual cooperation fails.

### **27.11 - Administering Terms of BLM Issued Permits or Leases for Mineral Exploration and Extraction on National Forest System Lands .**

1. Objective. To assure that other resource values, including water quality, are protected during mineral exploration, extraction, processing, and reclamation activities carried out on National Forest land under the terms of Prospecting Permits and Mineral Leases.

2. Explanation. Through the NEPA process, the Forest Service (FS) and Bureau of Land Management (BLM) make a determination as to whether or not to issue a BLM prospecting permit or lease. The decision is based on the Forest Plan's management direction, prescriptions, and standards and guidelines, including those for soil and water protection. The lease/permits contain standard stipulations or terms to protect soil and water. In addition, the FS and the BLM review each lease to determine the need for any additional lease stipulation required for soil/water protection.

After a lease is issued, if the lessee proposes to conduct any actual on-the-ground operations, additional FS and BLM review and environmental analysis of the proposed operation is required. There are numerous BLM regulations and requirements which provide the authorities to protect soil and water resources during and after lease operations. In addition, FS practices to protect soil and water resources (including reclamation requirements) are part of the review and approval process and are incorporated as needed in operating plans.

3. Implementation. Implementation is primarily by two interagency agreements (IA) between the BLM and the FS. The 1984 IA provides the policy and procedures for FS/BLM cooperation in the processing of BLM issued leases and permits to federally owned minerals on NFS lands. The agreements provides for NEPA compliance and stipulation on development and use. The 1987 IA provides the policy and procedures for FS/BLM cooperation in the processing, approval, and supervision of leasable mineral operations on NFS lands. The agreement provides for NEPA compliance and the development and use of conditions of approval for lease operations.

The Federal On-Shore Oil/Gas Leasing Reform Act of 1987 provides the FS with new authority in regard to oil/gas lease issuance and operations. The FS has approval authority for lease issuance and for approval and enforcement of Surface Use Plans including appropriate measures to protect water quality.

### **27.12 - Administering Forest Service Mineral Material Regulations (36 CFR 228C) for Disposal of Mineral Materials (Common Variety Minerals).**

1. Objective. To assure that resource values, including water quality, are protected during the exploration and development of common variety minerals.

2. Explanation. Forest Service mineral materials regulations provide the mechanism for protecting soil and water resources in the disposal of mineral materials. Forest Service policy is to make mineral materials on National Forest System lands available to the public and to local, State, and Federal government agencies where reasonable protection of, or mitigation of effects on, other resources is assured, and where removal is not prohibited.

The authorized officer must ensure that an environmental analysis is conducted for all planned disposal of mineral materials.

Decisions to authorize the disposal of mineral materials must conform to approved land and resource management plans.

Adequate measures must be taken to protect, and minimize damage to the environment. Mineral materials may be disposed of only if the authorized officer determines that the disposal is not detrimental to the public interest. Reclamation requirements are included for all pits and quarries.

3. Implementation. Water protection measures (including reclamation requirements) are identified during the review and environmental analysis of any proposed permit, contract, or plan for mineral materials.

The authorized officer can deny approval of any permit or contract in which reasonable protection of, or mitigation of effects on, water resources (or other resources) cannot be assured. Review of proposed permits and contracts by interdisciplinary teams provides for development of contract or permit terms to protect water resources.



### **27.13 - Mined Land Reclamation.**

1. Objective. To reduce on-site soil loss to within tolerable soil loss limits and protect surface and groundwater quality from toxic substances through reclamation of mined lands.

2. Explanation. Mined lands are often devoid of vegetation and, in some instances, may produce acidic or toxic leachate which can contaminate groundwater or nearby streams. Reclamation is a required part of all mining operations on NFS lands. Aside from these mined lands which are routinely reclaimed, there are some mined lands which were abandoned decades ago, were acquired by land exchanges, or for other reasons are considered abandoned mined lands. Reclamation plans for reducing impacts to soil and water resources may be developed for abandoned mines. Reclamation may include such measures as surface drainage control, reshaping, and revegetation. A thorough analysis of chemical and physical properties of soils and spoil/tailing materials must be done to determine if soil amendments are needed and to select species which will successfully revegetate these areas.

3. Implementation. Land reclamation is typically implemented through coordination with the State, since they have programs and funds available to accomplish restoration of abandoned mined lands. First identify mined lands needing reclamation. If the claim is still active or if the claimant can be located, reclamation should be performed by the claimant. If the mined land is truly abandoned, then notify the State, and reclamation is pursued through that means. If this is unsuccessful then a reclamation plan should be developed by the Forest Service using the IRM process, and alternate sources of funding pursued. The Forest Service also implements this objective by coordinating with EPA on the Federal Facilities Compliance Program as mandated by the Comprehensive Environmental Response, Compensation, Liability Act (CERCLA) and its amendments, the Superfund Amendments and Reauthorization Act (SARA).

## CHAPTER 30 - RESOURCE PROTECTION ACTIVITIES

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## **31 - FIRE SUPPRESSION AND FUELS MANAGEMENT.**

Emergency fire suppression activities on National Forest lands are conducted to reduce resource losses (including, the loss of soil productivity and degradation of water quality) and to minimize threats to life and property both on and off-site. Suppression activities include hand and dozer fireline construction, access road construction, firing operations, and use of fire retardants and suppressants.

Water and soil objectives are considered during the development of fire suppression strategies.

Burned area rehabilitation surveys, to assess fire damages, are conducted by an interdisciplinary (ID) team on all wildfires larger than 300 acres. District Rangers may request an interdisciplinary assessment for smaller fires if significant resource damage has, or could occur.

Fuels management activities, which may include the use of prescribed burning intended to reduce the size, cost, and damage from wildfire, are planned and designed with water and soil protection as criteria.

### **31.1 - Fire and Fuel Management Activities.**

1. Objective. To reduce public and private losses which result from wildfires and/or subsequent flooding and erosion, by reducing the frequency, intensity, and destructiveness of wildfire.

2. Explanation. Administrative, corrective and preventive measures include:

- a. Fuelbreak construction.
- b. Vegetation management.
- c. Greenbelt establishment to separate urban areas from wildlands.
- d. Fuel reduction blocks and corridors.
- e. Access roads for rapid ingress and egress.
- f. Fire suppression.
- g. Fuel utilization and modification programs.
- h. Public information and education programs.

3. Implementation. Fuel Management is implemented through normal program planning and budgeting and the Integrated Resource Management (IRM) process. Fuel management projects are planned, evaluated, and documented by an ID team. Management constraints and multiple resource protection measures and monitoring requirements are prescribed by the ID team and are documented in the project environmental analysis. Application of constraints and protection measures are the responsibility of the project officer.

### **31.11 - Consideration of Water Quality in Formulating Fire Prescriptions.**

1. Objective. To provide for water and soil resource protection while achieving management objectives through the use of prescribed fire.

2. Explanation. Prescription elements will include such factors as weather, slope, aspect, soils and soil moisture, fuel type and amount, and fuel moisture which influence the fire intensity and thus have a direct effect on whether or not a litter layer remains after burning, and whether or not a water repellent layer is formed. Spatial distribution and contiguous size of the planned burn area in a watershed are considered in developing prescriptions to reduce the effects of peak flow change on channels.

3. Implementation. The prescription elements are defined by the ID team during project planning using the IRM process. Field investigations are conducted as required to identify site-specific conditions which may affect the prescription. Both the optimum and tolerable limits for water quality needs should be established. Additional monitoring requirements established through IRM, will be used to verify or deny the validity of prescriptions.

### **31.12 - Protection of Water Quality from Prescribed Burning Effects.**

1. Objective. To maintain soil productivity, minimize erosion, and prevent detrimental amounts of ash, sediment, nutrients, and debris from entering water bodies.

2. Explanation. Some of the techniques used to prevent water quality degradation are:

- a. Construct water bars in firelines.
- b. Reduce fuel loading in drainage channels.
- c. Maintain the integrity of the streamside management zone.
- d. Avoid intense fires on sensitive soils, which may promote water repellency, nutrient leaching, and erosion.
- e. Modify desired fire behavior prescriptions relative to burn unit location in watersheds.
- f. Retain or plan for sufficient groundcover to prevent erosion of the burned site.

3. Implementation. The ID team identifies streamside management zones and soils with hydrophobic tendencies as part of the project plan. Forest Service and/or other crews are used to prepare and implement prescribed burning plans.

### **31.13 - Minimizing Watershed Damage from Fire Suppression Efforts.**

1. Objective. To avoid watershed damage in excess of that which would be caused by the fire itself.

2. Explanation. Heavy equipment operation on fragile soils, sensitive areas, and steep slopes is avoided when possible and acceptable under objectives identified in the "Escaped Fire Situation Analysis." The analysis will be prepared by the local line officer and staff. Watershed considerations must be part of the analysis. Major project fires utilize a Resource Advisor to advise the Incident Commander of resource values and objectives during the suppression effort.

3. Implementation. A Resource Advisor is assigned by the Forest Supervisor and works for the Incident Management Team, as a member of the command staff (agency or unit liaison), or for the Planning Section Chief. Technical resource people are available to identify fragile soils, sensitive and unstable areas and would be assigned to the fire as a technical specialist under the Planning Section Chief.

### **31.14 - Repair or Stabilization of Fire Suppression Related Watershed Damage.**

1. Objective. To stabilize all areas that exhibit a significant increase in erosion potential, or a drainage pattern altered by suppression related activities.

2. Explanation. Treatments for fire-suppression damages include, but are not limited to, installing water bars and other drainage diversions in fire roads, fire lines, and other cleared areas; seeding, planting, and fertilizing to provide vegetative cover, spreading slash or mulch to protect bare soil; repairing damaged road drainage facilities; and clearing stream channels of structures or debris that was deposited by suppression activities.

3. Implementation. This work may be done by the fire fighting forces either as a part of the suppression effort or before personnel and equipment are taken off the fire lines. The Incident Commander may be responsible under the direction of the local line officer for repair of suppression related resource damage. Post incident area rehabilitation may be required on burned areas of significant size (300 acres or larger).

### **31.2 - Emergency Rehabilitation of Watersheds Following Wildfires.**

1. Objective. To provide for immediate rehabilitation of watersheds following wildfire. This includes stabilizing soil and directing water flow to reduce sediment and debris movement.

2. Explanation. Emergency rehabilitation is a corrective measure that involves a variety of treatments. Treatments may include:

- a. Seeding grasses or other vegetation to provide a protective cover as soon as possible.
- b. Fertilizing.
- c. Fencing to protect new vegetation from wildlife and livestock.

- d. Clearing debris from stream channels.
- e. Constructing trash racks, channel stabilization structures, and debris retention structures.

Treatments are selected on the basis of on-site values, downstream values, probability of successful implementation, social environmental considerations, and cost as compared to benefits.

3. Implementation. Burned-area surveys of all fires larger than 300 acres shall be conducted by an ID team. Team members normally include a hydrologist, a soil scientist, and representatives of other disciplines as needed. If the rehabilitation project is needed, a project supervisor and restoration team will begin work with the objective of project completion before damaging storms occur. Rehabilitation projects are evaluated following major storms and runoff events and until the watershed is stabilized. The evaluation determines the effectiveness of the rehabilitation measures and indicates if followup actions are needed.



## CHAPTER 40 - RESOURCE ACCESS AND FACILITIES

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### **41 - ACCESS AND TRANSPORTATION SYSTEMS AND FACILITIES.**

Road planning is a complex process that assures that roads are located and designed to meet Forest management objectives. General objectives are developed by legislation, policy, directives, and in Forest Land Management Plans. Project-specific resource objectives are developed by an interdisciplinary (ID) team using the road development Project Implementation Process (PIP), a specific utilization of Integrated Resource Management (IRM).

Generally, most of the Forest Service roads in the Southwestern Region are built under Timber Sale Contracts. However, roads may also be constructed under Public Works Contracts or under special use permits. The process of planning these roads is essentially the same no matter which resource purposes they serve.

Transportation planning is normally conducted using the road development PIP, with the objectives of locating roads both to service individual timber sale areas and to serve Forest long-range transportation needs. Existing roads that are used for the timber sale go through the same

interdisciplinary scrutiny. Inadequate roads are upgraded to reduce adverse environmental effects, improve user safety, and reduce user cost.

Design engineers design access and transportation systems according to the selected design standards identified in the IRM process. At times, members of the ID team may be involved in the road design phase to assist in meeting the selected resource objectives.

The implementation phase of road development includes road design and construction inspection.

When road construction is in progress, the Engineering Representative, Contracting Officers Representatives, and/or Construction Inspector are frequently on the project area. These inspectors, along with a Forest or construction industry representative, assure that the project is carried out according to the specifications in the contract. Various ID team members may be called upon to review proposed design modifications during construction.

Forest Service crew leaders and supervisors are responsible for ensuring that projects accomplished by Forest Service organizations meet design standards.

Facilities normally encountered on National Forests System lands are administrative sites, such as guard and fire stations, work centers, ranger stations, or Visitor Information Service centers. Other proposals come from the private sector to build such facilities as: ski areas, marinas, concession buildings, or waste disposal areas. Proposed facilities are evaluated using the IRM process.

#### **41.1 - Erosion Control Plan.**

1. Objective. To minimize erosion and sedimentation through effective planning prior to initiation of construction activities and through effective contract administration during construction.

2. Explanation. Land disturbing activities including pioneer roads (routes cleared of vegetation before road construction is started) usually result in some erosion. By effectively planning for erosion control, water quality impacts can be reduced. Practices, locations of practices, and specifications for practices will be used to minimize erosion and sedimentations. Erosion control objectives usually require a combination of practices that promote the re-establishment of vegetation on exposed slopes, provide physical protection to exposed soil, prevents the downslope movement of soil, or controls drainage.

3. Implementation. Detailed practices are developed, using an IRM process; the measures are incorporated in the contract's specifications and provisions.

##### **41.11 - Timing of Construction Activities.**

1. Objective. To comply with state and Federal water quality standards.

2. Explanation. Scheduling operations during periods when the probabilities for rain and runoff are low is an essential element of effective erosion control. Equipment shall not be operated when ground conditions are such that unacceptable soil compaction or displacement result.

Erosion control work is kept current. Construction of drainage facilities and performance of other contract work which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with earthwork operations or as soon thereafter as practicable. The area being graded at a site at any one time should be limited, and the time that an area is without protective cover (for example, vegetation, jute matting, and so forth) should be minimized. Erosion control work must be kept current when construction occurs outside of the normal operating season.

3. Implementation. Detailed mitigative measures, including operation scheduling, are developed using the IRM process and are incorporated into the National Environmental Protection Act (NEPA) documentation and contracts.

#### **41.12 - Road Slope Stabilization.**

1. Objective. To prevent on-site soil loss from exposed cut slopes, fill slopes, and spoil disposal areas.

2. Explanation. Depending on various factors such as slope angle, soils, climate, and proximity to waterways, fill slopes, cut slopes, and spoil disposal areas will require vegetative and/or mechanical measures to provide soil stability. The level of stabilization effort needed must be determined on a case-by-case basis.

Vegetation measures include the seeding of herbaceous species (grass, legumes, or browse species), or the planting of brush or trees. Vegetative measures may include fertilization and mulching to ensure success.

Mechanical measures may include, but are not limited to: wattling, erosion nets, terraces, side drains, blankets, mats, riprapping, mulch, tackifiers, pavement, soil seals, and retaining walls.

3. Implementation. Initial project location, mitigative measures, and management requirements and needs are normally developed during the IRM process. These requirements and needs are translated into project plans, contract provisions and specifications. Forest Service crew leaders, road inspectors, and their supervisors typically monitor work accomplishment and effectiveness, to help ensure that design standards, project plan constraints, and mitigative measures are met.

Mechanical and vegetative surface stabilization measures shall be periodically inspected, as necessary, to determine effectiveness. In some cases, additional work may be needed to ensure

that the vegetative and/or mechanical surface stabilization measures continue to function as intended.

#### **41.13 - Dispersion of Subsurface Drainage from Cut and Fill Slopes.**

1. Objective. To minimize the possibilities of cut or fill slope failure and the subsequent production of sediment.

2. Explanation. Roadways may change the subsurface drainage characteristics of a slope. Since the angle and height of cut and fill slopes increase the risk of instability, it is often necessary to provide subsurface drainage to avoid moisture saturation and subsequent slope failure. Where it is necessary because of slopes, soil, aspect, precipitation amounts, inherent instability or other related characteristics, one of the following dispersion methods should be used:

- a. Pipe under-drains.
- b. Horizontal drains.
- c. Stabilization trenches.

Dispersal of collected water should be accomplished in an area capable of withstanding increased flows. Energy dissipators may need to be placed below pipes carrying large volumes of water.

3. Implementation. Project location and detailed mitigative measures are determined by the design engineers, using the IRM process.

#### **41.14 - Control of Road Drainage.**

1. Objective.

- a. To minimize the erosive effects of concentrated water flows caused by road drainage features.
- b. To disperse runoff from disturbances within the road clearing limits.
- c. To lessen the sediment load from roaded areas.
- d. To minimize erosion of the road prism by runoff from road surfaces and from uphill areas.

2. Explanation. A number of measures can be used (alone or in combination) to control road drainage. Methods used to reduce erosion may include such things as properly placed

culverts, cross drains, water bars, dips, energy dissipators, aprons, downspouts, gabions, and/or debris racks, and armoring of ditches and drain inlets and outlets.

Dispersal of runoff can be accomplished by such means as rolling the grade, insloping, outsloping, crowning, installation of water spreading ditches, contour trenching, or overside drains, and so forth. Dispersal of runoff also reduces peak downstream flows and associated high water erosion and sediment transport.

Sediment loads can be reduced by installing such things as: sediment filters, settling ponds, and contour trenches. Soil stabilization and dispersed water flows on borrow and waste areas, cut and fill slopes, and road shoulders can minimize sedimentation.

3. Implementation. Project location, design criteria and detailed mitigative measures are determined through the IRM process.

#### **41.15 - Timely Erosion Control Measures on Incomplete Roads and Streamcrossing Projects.**

1. Objective. To minimize erosion and sedimentation from road construction sites where final drainage structures have not been completed.

2. Explanation. The best drainage design can be useless if projects are incomplete at the end of the normal operating season. Affected areas can include roads, fills, tractor trails, skid trails, landings, streamcrossings, bridge excavations, and firelines. Preventative measures include:

- a. The removal of water controlling devices that will not carry anticipated seasonal water runoffs, such as temporary culverts, culvert plugs, diversion dams, or elevated streamcrossing causeways.
- b. The installation of temporary devices that will carry anticipated seasonal water runoffs, such as culverts, side drains, flumes, cross drains, diversion ditches, energy dissipators, dips, sediment basins, berms, debris racks, or other facilities needed to control erosion.
- c. The removal of debris, obstructions, and spoil material from channels and floodplains.
- d. Grass seeding, planting deep-rooted vegetation, and/or mulching.

3. Implementation. Apply protective measures to all areas of disturbed, erosion-prone, unprotected ground that is not to be further disturbed in the present year. When conditions permit operations outside of the Normal Operating Season, erosion control measures must be kept current with ground disturbance, to the extent that the affected area can be rapidly "closed" if weather conditions deteriorate. Do not abandon areas for the winter with remedial measures incomplete.

Project mitigative measures and location are developed and documented during the IRM process.

#### **41.16 - Construction of Stable Embankments (Fills).**

1. Objective. To construct embankments with materials and methods which minimize the possibility of failure and subsequent water quality degradation.

2. Explanation. The failure of road embankments and the subsequent deposition of material into waterways may result from a lack of compaction during the construction of the embankment, as well as from the use of inappropriate placement methods.

To minimize this occurrence, the roadway should be designed and constructed as a stable and durable earthwork structure with adequate strength to support the pavement structure, shoulders, and traffic. Proper slope ratio design will promote stable embankments.

3. Implementation. Project constraints and mitigative measures are developed through the IRM process. The appropriate method of embankment placement is chosen during this process.

#### **41.17 - Control of Sidecast Material.**

1. Objective. To minimize sediment production from sidecast material during road construction, reconstruction, or maintenance.

2. Explanation. Unconsolidated sidecast material can be difficult to stabilize and is susceptible to erosion and/or mass instability. Site-specific limits or controls for the sidecasting of uncompacted material should be developed through interdisciplinary input, and shown on the plans. Loose, unconsolidated sidecast material should not be permitted to enter streamside management zones. Sidecasting is not an acceptable construction alternative in areas where it will adversely affect water quality. Prior to commencing construction or maintenance activities, waste areas should be located where excess material can be deposited and stabilized.

3. Implementation. Project location, selected disposal areas, and mitigative measures are developed through the IRM process.

Forest Service crew leaders and work supervisors are responsible for ensuring that projects accomplished by Forest Service organizations meet design standards and project NEPA analysis criteria. Road Maintenance Plans are developed for each Forest which include needed slide and slump repairs, and, in critical areas, disposal site location for excess material.

Contracted projects are implemented by the contractor or timber sale operator. Compliance with project criteria, contract specifications, and operating plans is assured by the Forest Service Contracting Officer's Representative (COR) or engineering representative (ER).



Timber sale contracts include C5.4 and T-Road Maintenance Specifications which address slide and slump repair, surface blading, and ditch cleaning.

#### **41.18 - Servicing and Refueling of Equipment.**

1. Objective. To prevent pollutants such as fuels, lubricants, bitumens, raw sewage, wash water, and other harmful materials from being discharged into or near rivers, streams, and impoundments, or into natural or man-made channels leading thereto.

2. Explanation. During servicing or refueling, pollutants from logging or road construction equipment may enter a watercourse. This threat is minimized by selecting service and refueling areas well away from wet areas and surface water, and by using berms around such sites to contain spills. Spill prevention, containment, and countermeasures (SPCC) plans are required if the volume of fuel exceeds 660 gallons in a single container or if total storage at a site exceeds 1320 gallons.

3. Implementation. The COR/ER or SA will designate the location, size, and allowable uses of service and refueling areas. They will also be aware of actions to be taken in case of a hazardous substance spill, as outlined in the Forest Hazardous Waste Contingency Plan. Any SPCC needs to be reviewed and certified by a registered professional engineer.

#### **41.19 - Diversion of Flows Around Construction Sites.**

1. Objective. To ensure that all stream diversions are carefully planned. To comply with state and Federal water quality standards. To restore stream channels to their natural grade, condition, and alignment.

2. Explanation. Flow must sometimes be guided or piped around project sites. Typical examples are bridge and dam construction. Flow in streamcourses will be diverted, if necessary, to protect water and related resources. Such a diverted flow shall be restored to the natural streamcourse as soon as practicable and, in any event, prior to the major storm season.

3. Implementation. Where and when diversions are required will be determined in the Integrated Resource Management (IRM) process. Design shall include mitigative measures necessary to protect fishery values and other downstream uses. The IRM process may require project review by other Federal, State, and/or local agencies and private parties, to ensure that all factors are considered.

#### **41.2 - Streamcrossings on Temporary Roads.**

1. Objective. To keep temporary roads from unduly degrading water quality, damaging streams, disturbing channels or impeding fish passage, so that state and Federal water quality standards are complied with.

2. Explanation. Culverts, coarse rock fills, hardened fords (using such features as rocked approaches), low water crossings, and temporary bridges shall be evaluated in the IRM process for each sensitive streamcrossing. Such facilities shall be designed to provide for unobstructed flows and the passage of fish, and to minimize damages to streamcourses. The number of crossings shall be kept to the minimum needed for access. Channel crossings shall be as perpendicular to streamcourses as possible. Streambank excavation shall be kept to the minimum needed for use of the crossings, and entry and exit ramps may need to be rocked. Fords or turnpike crossings hardened with washed rock or landing mats are sometimes an acceptable alternative, depending on fishery and hydrological considerations. Crossing facilities will be removed when the facility is no longer needed or, if the crossing obstructs high flows, prior to closing down operations for the season.

3. Implementation. Project location and mitigated measures are developed using an IRM process.

#### **41.21 - Controlling In-Channel Excavation.**

1. Objective. To minimize sedimentation and turbidity resulting from excavation for in-channel structures, so as to comply with state and Federal water quality standards.

2. Explanation. Excavation is a common requirement for the installation of bridges, culverts and minor streamside structures such as weirs, check dams, riprapping or fish barriers. Spoil material developed in such operations should neither obstruct the streamcourse (including natural floodplains) nor the efficiency of the associated structures. If spoil or imported material is needed within the wetland as defined by Corps of Engineers, then a 404 permit will need to be secured from the Corps. Preventative measures include:

- a. Keeping excavated materials out of streamcourses (including ephemeral and intermittent).
- b. Removing any materials stacked or stockpiled on floodplains prior to high water.
- c. Diversion of flowing water around work sites to minimize erosion and downstream sedimentation.
- d. Suitably locating bypass roads with plans made for their subsequent obliteration and stabilization when needed.
- e. Importing fill material for better soil compaction. Original fill may have to be exported to a disposal site.

For streams designated as important fisheries by the Forest Service wildlife specialists, culverts will be installed only during flow periods specified in the project plan. Normally, this work would occur during minimum flow periods when water could be more easily diverted; work may not be allowed during spawning periods. Downstream sediment basins may be necessary to mitigate impacts on low flows.

3. Implementation. Project location and detailed mitigative measures are developed during the design process to meet the project criteria, using an IRM process.

#### **41.22 - Disposal of Right-of-Way and Roadside Debris.**

1. Objective.

- a. To comply with state and Federal water quality standards.
- b. To ensure that debris generated during road construction is kept out of streams and to prevent slash and debris from subsequently obstructing channels.
- c. To ensure debris dams are not formed which obstruct fish passage or which could result in downstream damage from high water flow surges after dam failure.

2. Explanation. As a preventative measure, construction debris and other newly generated roadside slash developed along roads near streams (in the streamside management zone) shall not be deposited in stream channels (including ephemeral and intermittent). Some disposal methods are:

a. On site:

- (1) Piling and burning.
- (2) Chipping,
- (3) Burying.
- (4) Scattering.
- (5) Windrowing.
- (6) Disposal in cutting units.

b. Removal to approved disposal sites (especially stumps from the road prism).

c. Large limbs and cull logs may be bucked into manageable lengths and piled alongside the road for fuelwood.

3. Implementation. Disposal of right-of-way and roadside debris criteria are established in the project plan by the responsible forest official with the help of the ID team. Project location and detailed mitigative measures are developed using the IRM process.

#### **41.23 - Specifying Riprap Composition.**

1. Objective. To minimize sediment production associated with the installation and utilization of riprap material. To comply with state and Federal water quality standards.

2. Explanation. Riprap is commonly used to armor streambanks and drainage ways from the erosive forces of flowing water. Riprap must be sized and installed in such a way that it effectively resists erosive water velocities. On occasion, this may require the use of filter blankets or other methods to prevent the undermining of fines. Stone used for riprap should be free from weakly structured rock, soil, organic material and materials of insufficient size, all of which are not resistant to streamflow and would only serve as sediment sources.

3. Implementation. Project location and detailed mitigative measures are developed through the IRM process and design process to meet the constraints and requirements of the project plan.

#### **41.24 - Water Source Development Consistent With Water Quality Protection.**

1. Objective. To supply water for roads and fire protection while maintaining existing water quality. To comply with state and Federal water quality standards.

2. Explanation. Water source development is normally needed to supply water for road construction, dust control, and fire control. Problems may arise when cofferdams or water holes are built in streams. In many instances earth fill is used as a dam. This practice creates sediment problems during installation and removal. Cofferdams and water holes should be built out of sandbags filled with clean sand or gravel, or other methods that will not contribute to nonpoint source pollution. Also, at no time shall downstream water flow be reduced to a level that may be detrimental to aquatic resources, fish passage, or other established uses. Damage to resources caused by Purchaser's or Contractor's Operations or fire suppression activities shall be repaired by Purchaser, Contractor, or fire suppression crews in a timely and agreed manner to the extent practical to restore and prevent further resource damage.

Overflow from water holding developments should be piped directly back to the stream. Approaches should be kept as close to perpendicular as possible to the stream. Streambank excavation should be kept to a minimum needed for entry and exit, and may be gravel surfaced as appropriate.

3. Implementation. Timber sale administrators and engineering representatives in conjunction with a hydrologist and fisheries biologist should evaluate streams in which water developments may be constructed. Water holes and other improvements shall be put into a condition, prior to a rainy season or winter, to avoid resource damage. Project location and detailed mitigative measures are developed by the design engineer, using the IRM process to meet project criteria.

#### **41.25 - Maintenance of Roads.**

1. Objective. To maintain roads in a manner which provides for water quality protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities (all of which can cause sedimentation and erosion).

2. Explanation. Roads normally deteriorate because of use and weather impacts that are not corrected with maintenance. This deterioration can be minimized through adequate maintenance and/or restriction of use. Our goal is to maintain all system roads so as to protect the road investment and to see that damage to adjacent land and resources is held to minimum. Maintenance scheduling requires an annual inspection to determine what work, if any, is needed to keep drainage functional and the road stable. Higher levels of maintenance may be chosen to reflect greater use or administrative needs. Additional maintenance measures could include resurfacing, outsloping, clearing debris from dips and cross drains, armoring of ditches and spot rocking.

For maintenance of roads on active timber sales, the Forest Service and the Purchaser shall annually agree at the beginning of the operating season on an Annual Road Maintenance Plan outlining responsibilities and timing. If the road is subjected to commercial use, the Forest Service may collect deposits to facilitate road maintenance and to equitably assess maintenance cost of each user.

3. Implementation. The work is controlled by the Forest Engineer who develops a road maintenance plan. Maintenance levels are declared for each road in a timber sale area, and are documented in the sale plan. On timber sales, maintenance is a Purchaser responsibility, compliance with standards is assured by the COR or ER. On system roads outside of active timber sales, Forest Service crews or contract crews perform road maintenance under supervision of an engineering representative.

#### **41.26 - Road Surface Treatment to Prevent Loss of Materials.**

1. Objective. To minimize sediment production and erosion from road surface materials. To comply with state and Federal water quality standards.

2. Explanation. Unconsolidated road surface material is susceptible to erosion during precipitation events. Likewise, dust derived from road use may settle onto adjacent water bodies. On timber sale roads, the Purchaser shall undertake measures to prevent excessive loss of road material if the need for such action is identified.

Road surface treatments are prescribed based on traffic levels, road design standards, soils, and geology. These treatments include watering, dust oiling, penetration oiling, magnesium chloride, lignin sulfonate, calcium chloride, aggregate surfacing, chip-sealing, or paving.

3. Implementation. Project location and detailed mitigative measures are developed, using the IRM process to meet project criteria.

#### **41.27 - Traffic Control During Wet Periods.**

1. Objective. To reduce road surface disturbance and rutting of roads. To lessen sediment washing from disturbed road surfaces.

2. Explanation. The unrestricted use of many National Forest roads during wet weather often results in rutting and churning of the road surfaces. Runoff from such disturbed road surfaces often carries a high sediment load. The damage/maintenance cycle for roads that are frequently used when wet can create a road surface that is a continuing sediment source.

Roads that must be used during wet periods should have a stable surface and sufficient drainage should be provided to allow such use with a minimum of resource impact. Rocking, oiling, paving, and armoring are measures that may be necessary to protect the road surface and reduce material loss. Roads that are not needed for public access or forest administrative use should be closed to use during the wet season. In many cases, use can be discouraged, but not prevented. Where rainy season field operations are planned, roads may need to be upgraded, use restricted to low ground pressure vehicles, or maintenance intensified to handle the traffic without creating excessive erosion and damage to the road surfaces.

3. Implementation. Road closures and traffic control measures should be used outside active timber sale areas. Project-associated implementation procedures can be enforced by District personnel. Hauling activity can be controlled by the sale administrator within active timber sales. The decision for closure is based on local soil moisture conditions and other criteria.

Detailed mitigative measures are developed using the IRM process.

#### **41.28 - Snow Removal Controls to Avoid Resource Damage.**

1. Objective. To minimize the impact of melt water on road surfaces and embankments and to reduce the probability of sediment production resulting from snow removal operations.

2. Explanation. This is a preventative measure used to protect resources and indirectly to protect water quality. Forest roads are sometimes used throughout the winter for a variety of



reasons. For such roads, the following measures are employed to meet the objectives of this practice:

- a. The contractor is responsible for snow removal in a manner which will protect roads and adjacent resources.
  - b. Rocking or other special surfacing and/or drainage measures may be necessary, before the operator is allowed to use the roads.
  - c. Snow berms shall be removed or placed to avoid accumulation or channelization of melt water on the road and prevent water concentration. If the road surface is damaged the Purchaser or cooperator shall, prior to road use, replace lost surface material with similar quality material and repair structures damaged in blading operations, unless climatic conditions prevent necessary work from being accomplished or as otherwise agreed to in writing.
3. Implementation. Project location and detailed mitigative measures are developed using the IRM process.

#### **41.3 - Obliteration of Roads.**

1. Objective. To reduce sediment generated from unneeded roads, roads that run in streambeds, and roads that are located in streamside management zones by closing them to vehicle use and restoring them to productivity.

2. Explanation. Roads that are no longer necessary for public access or management purposes need to be obliterated. Roads that were located in streambeds or streamside management zones need to be relocated and closed. Roads that are allowed to exist without proper maintenance are subject to continued, uncorrected damage and can become chronic sediment sources.

Effective obliteration is generally achieved through a combination of these measures:

- a. Road effectively drained and blocked.
  - b. Temporary culverts and bridges removed and natural drainage configuration re-established.
  - c. Road returned to resource production through revegetation (including ripping, scarification, fertilizing, and seeding.)
  - d. Sideslopes reshaped and stabilized.
  - e. Natural means
3. Implementation. Identification of roads no longer necessary for public access or management purposes and roads that were located in streambeds or streamside management zones is accomplished using the IRM process and the Resource Access Travel Management assessment.

In timber sale areas, road closure, removal of culverts and bridges, and stabilization is accomplished by the timber purchaser or K-V funds. Compliance with plans and the Timber Sale Contract is assured by the sale administrator. Further revegetation needs are addressed in Sale Area Improvement Plans. The sale administrator may request the advice of a soil and water specialist in determining the most appropriate relocation and stabilization measures required.

Road obliteration is also accomplished through Forest Service funding provided for watershed, wildlife, and range improvement. In this case, Forest Service supervisors or contracting officers representations oversee restoration work and ensure road obliteration objectives are being met.

#### **41.4 - Restoration of Borrow Pits and Quarries.**

1. Objective. To minimize sediment production from borrow pits and quarry sites.
2. Explanation. Borrow pits and quarries are often susceptible to erosion due to steep sideslopes, lack of vegetation, and/or their proximity to water courses. Prior to excavation of the site, top soil should be removed and stockpiled for surface dressing in the post-operation period. Once excavation has been completed final treatment and erosion control for the site will be guided by the future land use. Site slope grading, seeding and mulching will be required. Sediment basins should be considered. Access roads to the site should be ripped, drained, blocked to traffic and seeded unless other treatment is required by the design.
3. Implementation. Project location and mitigative measures are developed through the IRM process.

#### **41.5 - Surface Erosion Control at Facility Sites and Recreation Sites.**

1. Objective. Reduce the amount of surface erosion taking place in conjunction with developed sites, and minimize the amount of sediment entering streams.
2. Explanation. On lands developed for administrative sites, ski areas, campgrounds, summer homes, parking areas, or waste disposal sites some ground is usually cleared of vegetation. Erosion control methods must be implemented to minimize erosion and sedimentation. Some examples of erosion control methods that could be applied at a site for keeping the soil in place would be applying grass seed, jute mesh, tackifiers, hydromulch, paving, or rocking of roads, water bars, cross drains, or retaining walls. Potential negative effects to the balance of the natural drainage pattern should be mitigated; sediment basins and sediment filters should be established to filter surface runoff where such runoff may enter streams; and diversion ditches or berms should be built to divert surface runoff around bare areas. Construction activities should be scheduled to avoid periods of precipitation and runoff.
3. Implementation. This management practice is used as a preventative and remedial measure for any land development project that will remove the existing vegetation and ground cover and leave bare soil. Erosion control measures are developed in the IRM process and incorporated in the project by the design engineer.

**APPENDIX C.2**

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**DESIGN FEATURES, BEST MANAGEMENT PRACTICES, REQUIRED PROTECTION MEASURES, AND MITIGATION MEASURES FOR INVASIVE SPECIES CONTROL**

Available online at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)

# Appendix B - Design Features, Best Management Practices, Required Protection Measures, and Mitigation Measures

## Design Features for Integrated Weed Treatment Projects

- Establish 1-mile limited spray zones adjacent to communities, private lands, recreation sites, trailheads, and scenic overlooks identified by public meetings with the MCS community. Nonherbicidal treatment methods will be prioritized in these areas; only if these treatments are not successful will herbicides be used on deep-rooted perennial weeds.
- Any proposed use of herbicides in right-of-way corridors under national forest jurisdiction will be coordinated, publicly posted, and completed in such a manner that alternate routes will remain accessible until the manufacturer's re-entry period is met, so individuals with multiple chemical sensitivities and other people vulnerable to chemicals can still access recreational and other facilities found within the project area.
- Public posting will include signs at trailheads leading to or near herbicide application sites and on the trail before encountering herbicide application sites adjacent to forest trails.
- Hold a yearly meeting to discuss spraying goals and locations and alternative travel areas around sprayed zones to allow chemically sensitive people freedom to travel for the year ahead and to listen to concerns from the MCS community as the project proceeds.
- No mixing, loading, and equipment cleaning will be done within the limited spray zones, nor within 300 feet of the limited spray zones or private land.
- An 800 number will be available with weekly updates of all herbicide applications on the Prescott, Kaibab or Coconino National Forests.
- Plan the timing of herbicide applications to coordinate with times of low public use (for example mid-week or during forest or area closures if timing is effective for weed species control).
- Use dye markers with herbicides to raise awareness of the physical spray location on the weeds.
- Develop "Adopt an Area" program for concerned citizens to take responsibility for weed control in locations where herbicides are not preferred as a control method.

## **Integrated Weed Management Practices** (Coconino, Kaibab, & Prescott National Forests Noxious and Invasive Weed Strategic Plan 1998, Amended 2002)

### **Introduction**

Preventing the introduction and spread of noxious weeds is one objective of integrated weed management programs on National Forest System lands throughout the United States. This guide to integrated weed management practices provides a comprehensive directory for use in planning and wildland resource management activities and operations. This guide will help managers and cooperators identify weed management practices that mitigate identified risks of weed introduction and spread for a project or program.

### **Supporting Direction**

Development of weed management prevention practices is supported by Forest Service noxious weed policy and strategy. Forest Service policy identifies prevention of the introduction and establishment of noxious weed infestations as an Agency objective. This policy directs the Forest Service to: (1) determine the factors that favor establishment and spread of noxious weeds, (2) analyze weed risks in resource management projects, and (3) design management practices to reduce these risks. The Forest Service Noxious Weed Strategy identifies development of practices for prevention and mitigation during ground-disturbing activities as a long-term emphasis item. The February 1999 Executive Order on invasive species requires Federal agencies to use relevant programs and authorities to prevent introduction of invasive species and not authorize or carry out actions that are likely to cause introduction or spread of invasive species unless the Agency has determined, and made public, documentation that shows that the benefits of such actions clearly outweigh the potential harm, and all feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions.

This guide uses the term “*weed*” to include the National Invasive Species Council definition of all plants exotic to the relevant ecosystem that have the potential to cause economic or ecological harm. The term “*noxious weed*” has legal definitions by Forest Service policy:

“ . . .plants designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being native or new to or not common to the United States or parts thereof.” (FSM 2080.5)

The Coconino, Kaibab, and Prescott National Forests use the Arizona State-defined noxious weed list (R3-4-244 and 245) as well as the region/forest designated invasive weed lists. The listed weed species are the priority for implementing weed management in cooperation with neighbors and partners as specified in CFR 222.8.

The following table replaces Tables 3 and 5 in the 1998 “Noxious Weeds Strategic Plan Working Guidelines, Coconino, Kaibab and Prescott National Forests.”

**General Integrated Weed Management Practices for  
All Site-disturbing Projects and Maintenance Programs**

Objective	Best Known Practice
<p>1. Incorporate weed prevention and control into project layout, design, alternative evaluation, and project decisions.</p>	<p>1.1 – Environmental analysis for projects and maintenance programs will need to assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices. Determine prevention and maintenance needs, including the use of herbicides if needed, at the onset of project planning.</p> <p>1.2 – Coordinate with other agencies and adjacent landowners to prevent and control weeds. (CFR 222.8)</p>
<p>2. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.</p>	<p>2.1 – Before ground-disturbing activities begin, <b>inventory</b> and <b>prioritize treatment</b> of invasive weeds in project operating areas and along access routes, or within reasonably expected potential invasion vicinity. Do a risk assessment accordingly; control weeds as necessary.</p> <p>2.2 – After completing “Practice 2.1” above, reduce risk of spreading and creating weed infestations. Plan operating areas and access routes to avoid heavy infestation areas, plan closure of access routes at finish of project, and/or begin project operations in uninfested areas before operating in weed-infested areas. Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict to those periods when spread of seed or propagules are least likely.</p> <p>Equipment Wash Station – Centralized wash station areas will be developed in several locations throughout the CNF. They must have a filter system, for example at least 6 inches of large cinder or gravel spread over an area 10' x 30'. Filter cloth may be used for temporary stations. The area will be a perched drainage to allow excess moisture to drain after being filtered and must be at least 200 yards from a natural drainage to avoid contamination. All wash station locations must be monitored annually and all weed materials removed as soon as possible.</p> <p>2.3 – Remove mud, dirt, and plant parts from project equipment before moving it into a project area. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean all equipment before entering National Forest System lands; a forest officer, in coordination with the unit invasive species coordinator, needs to approve use of on-forest cleaning sites in advance. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on a clean roadway. Seeds and plant parts need to be collected when practical and incinerated.</p> <p>2.4 – If operating in areas infested with weeds, clean all equipment before leaving the project site. To minimize time spent cleaning equipment, time all work in infested areas last and concurrently, designate a “contaminated” parking lot where project vehicles working in the infested area may be parked for the duration of the project. This area should be monitored in followup mitigation and should be near a “clean” vehicle/equipment lot. Identify sites where equipment and vehicles can be cleaned before leaving the site at the end of the project. Seeds and plant parts need to be collected when practical and incinerated.</p>



<b>Objective</b>	<b>Best Known Practice</b>
	<p>2.5 – Workers need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment after being trained to recognize the priority species in the area. Proper disposal means bagging the seeds and plant parts and incinerating them.</p> <p>2.6 – Coordinate project activities between resources and between agencies (such as city, county, ADOT, ASLD) with any nearby weed treatments, including herbicide applications, to maximize cost effectiveness of weed treatments.</p>
<p>3. Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest Service, contractor and cooperator operations.</p>	<p>3.1 – Inspect material sources on site annually, and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication, and strip, stockpile, and treat contaminated material before using pit materials.</p> <p>3.2 – Inspect and document the areas where materials are used (including those from treated weed-infested sources) annually for at least 3 years after project completion to ensure that any weeds transported to the site are promptly detected and controlled.</p> <p>3.3 – Maintain stockpiled, uninfested material in a weed-free condition.</p> <p>3.4 – Work with the responsible transportation agencies to adopt these practices for maintenance of roads that cross National Forest System lands.</p>
<p>4. Avoid creating soil conditions that promote weed germination and establishment.</p>	<p>4.1 – Minimize soil disturbance to the extent practical, consistent with project objectives.</p> <p>4.2 – In those vegetation types that have relatively closed canopies as a natural condition, retain shade to the maximum extent possible to suppress weeds and prevent their establishment and growth in and around project activity.</p>
<p>5. Where project disturbance creates bare ground, establish vegetation to minimize favorable conditions for weeds.</p>	<p>5.1 – Treat disturbed soil (except surfaced projects) in a manner that optimizes native plant establishment for that specific site. Define for each project what constitutes disturbed soil and objectives for plant cover revegetation.</p> <p>5.2 – Revegetation may include topsoil replacement, native seedbank promotion, planting, seeding, fertilization, and/or weed seed-free mulching as necessary. Use local native material where appropriate and feasible (or specifically identify why not used). Always use certified weed-free and weed seed-free hay or straw. Always use certified materials in areas closed by administrative order. Where practical, stockpile weed seed-free topsoil from the project area and replace it on disturbed areas (e.g. road embankments, staging areas, wash stations, or landings).</p> <p>5.3 – Use local seeding guidelines to determine detailed procedures and appropriate mixes. To avoid weed contamination, a certified seed laboratory needs to test each lot against the all-State noxious weed list to Association of Seed Technologists and Analysts (AOSTA) standards, and provide documentation of the seed inspection test. Seed lots labeled as certified weed seed-free at time of sale may still contain some weed seed</p>

<b>Objective</b>	<b>Best Known Practice</b>
	<p>contamination.</p> <p>5.4 – Monitor and document all limited term ground-disturbing operations near weed infested areas for at least five growing seasons, or the documented seed viability for the species of concern following completion of the project. For ongoing projects, continue to monitor until reasonable certainty is obtained that no weeds have occurred. Provide for followup treatments based on inspection results.</p> <p>5.5 – Evaluate options, including closure, to minimize future infestations on sites where desired vegetation needs to be established.</p>
<p>6. Improve effectiveness of prevention practices through weed awareness and education.</p>	<p>6.1 – Provide information, training and appropriate weed identification materials to people potentially involved in weed introduction, establishment, and spread on National Forest System lands, including agency managers, employees, forest workers, permit holders, and recreational visitors. Educate them to an appropriate level in weed identification, biology, impacts, and effective prevention measures. Educate resource level managers to allow them to incorporate weed prevention practices in their planning of projects and daily activities.</p> <p>6.2 – Provide proficient weed management expertise at each administrative unit. Expertise means that necessary skills are available and corporate knowledge is maintained.</p> <p>6.3 – Develop incentive programs encouraging weed awareness, detection, reporting, and for locating new invaders.</p>
<p>7. Set the example; maintain weed-free administrative sites.</p>	<p>7.1 – Treat weeds at administrative sites and use weed prevention practices to maintain sites in a weed-free condition.</p>

**Integrated Weed Management Practices for  
Fire Management Projects and Maintenance Programs**

Objective	Best Known Practice
<b>Pre-incident - Training and Planning</b>	
<p>FM-1. Improve effectiveness of prevention practices through weed awareness and education for incident management teams.</p>	<p>1.1 – Increase weed awareness, weed identification and weed prevention in all fire training.</p> <p>1.2 – Include weed risk factors and weed prevention practices in resource advisor duties on all incident management teams and burn rehabilitation teams.</p> <p>1.3 – Assign a local weed specialist or include in resource advisor duties to the incident management team when wildfire or control operations occur in or near an area infested with weeds.</p> <p>1.4 – Resource advisors need to provide briefings that identify operational practices to reduce weed spread (for example: avoiding known weed infestation areas when locating fire lines). Include this information in shift briefings.</p> <p>1.5 – Provide weed identification aids to field observers.</p>
<b>Wildfires, General – All wildfire weed prevention goals apply except in instances where human life or property is at risk.</b>	
<p>FM-2. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.</p>	<p>2.1 – Ensure that all outside (rental, other agency or unit) equipment is free of weed seed and propagules before it is accepted by the contracting officers representative.</p> <p>2.2 – Maintain a network of airports, helibases, camps, and staging areas in a weed-free condition. Coordinate with local weed specialists to locate and treat practice jump areas to make them weed free.</p> <p>2.3 – Monitor and treat weeds that establish at equipment cleaning sites after fire incidents.</p> <p>2.4 – If safety precautions allow, inspect and clean all fire equipment (boots, shovels, tents, rigs, tankers, water buckets, etc..) prior to moving from weed infested lands or lakes to areas that are not infested. If not possible beforehand, then power wash all equipment in a designated/mapped/monitored wash site (4-6” of cinder/gravel with controlled drainage).</p>
<p>FM-3. Avoid creating soil conditions that promote weed establishment.</p>	<p>3.1 – Use appropriate suppression tactics to reduce suppression-induced disturbances to soil and vegetation while minimizing seedbed creation due to disturbance from fire effects.</p>

Objective	Best Known Practice
<b>Prescribed Fire</b>	
<p>FM-4. Manage fire as an aid in control of weeds to prevent new weed infestations and the spread of existing weeds.</p>	<p>4.1 – Pre-inventory project area and evaluate weeds present with regard to the effects on the weed spread relative to the fire prescription. Remove weeds (live plants and seed sources) before project initiation.</p> <p>4.2 – Plan to avoid or remove existing sources of weed seed and propagules. Avoid ignition and burning in areas at high risk for weed establishment or spread due to burn aftereffects. Treat weeds that establish or spread because of unplanned burning of weed infestations.</p> <p>4.3 – Burn noninfested areas first before entering weed infested sections of the burn. Clean all equipment when project is completed. Or treat and burn all infested areas first to remove seed source then clean equipment and proceed to uninfested areas.</p>
<p>FM-5. Avoid creating soil conditions that promote weed germination and establishment.</p>	<p>5.1 – Time burns to promote native species and to hinder weed species germination.</p> <p>5.2 – Consult weed species specific information and consider effects of current local conditions on species growth.</p>
<b>Fire Rehabilitation</b>	
<p>FM-6. Incorporate weed management into project layout and design.</p>	<p>6.1 – Evaluate weed status and risks in burned area emergency rehabilitation (BAER) plans. When appropriate, apply for burned area emergency rehabilitation and restoration funding to inventory, control, and monitor weeds. If the presence of weed seed is suspected, request BAER funds to inspect and document for spring emergence.</p>
<p>FM-7. Encourage vegetation establishment as appropriate to the site objectives.</p>	<p>7.1 – To minimize weed spread, treat weeds in burned areas as part of the burned area emergency rehabilitation plan. For adjacent known infestations that will likely spread, remove the potential contaminating seed source and encourage competitive species.</p> <p>7.2 – Inspect and document weed establishment at fire access roads, cleaning sites, all disturbed staging areas, and within burned areas; control infestations to prevent spread within burned areas.</p> <p>7.3 – Seed and straw mulch to be used for burn rehabilitation (for wattles, straw bales, dams, etc.) all need to be inspected and certified free of weed seed and propagules.</p> <p>7.4 – Regulate human, pack animal, and livestock entry into burned areas at risk for weed invasion until desirable site vegetation has recovered sufficiently to resist weed invasion.</p>

**Integrated Weed Management Practices for  
Lands Stewardship Projects and Maintenance Programs**

Objective	Best Known Practice
<b>VEGETATION MANAGEMENT</b>	
<b>Timber Harvest Operations and Stewardship Contracting</b>	
<p>VM-1. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.</p>	<p>1.1 – Treat weeds on contracted projects, emphasizing treatment of weed infestations on existing landings, skid trails, and helibases before activities commence.</p> <p>1.2 – Train contract administrators to identify weeds and select lower risk sites for landings and skid trails.</p> <p>1.3 – Encourage operators to maintain weed-free mill yards, equipment parking, and staging areas.</p> <p>1.4 – Use standard timber sale contract clauses such as WO-C/CT 6.36 to ensure appropriate equipment cleaning.</p>
<p>VM-2. Retain native vegetation in and around project activity and minimize soil disturbance.</p>	<p>2.1 – Minimize soil disturbance to no more than needed to meet project objectives. Logging practices to reduce soil disturbance include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Over-snow logging</li> <li>• Skyline or helicopter logging</li> <li>• Reuse landings, skid trails and helibases when they are weed free</li> </ul> <p>2.2 – Minimize period from end of logging to site preparation, revegetation, and contract closure.</p>
<b>Post Vegetation Management Operations</b>	
<p>VM-3. Retain native vegetation in and around project activity and minimize soil disturbance.</p>	<p>3.1 – Minimize soil disturbance to no more than needed to meet vegetation management objectives. Prevention practices to reduce soil disturbance include, but are not limited to:</p> <p>Minimizing heat transfer to soil in burning by:</p> <ul style="list-style-type: none"> <li>• Treating fuels in place (broadcast burning) instead of piling</li> <li>• Using small, tall steep piles</li> <li>• Minimizing fireline construction</li> </ul> <p>Minimizing soil disturbance by logging techniques:</p> <ul style="list-style-type: none"> <li>• Preference for forwarders that carry logs, rather than skidders that drag logs</li> <li>• Using hand fellers instead of machines</li> <li>• Using hand piling rather than machine piling</li> <li>• Avoiding decking logs in the woods</li> <li>• Using low PSI (impact) equipment (big tires)</li> </ul>

<b>Objective</b>	<b>Best Known Practice</b>
VM-4. Encourage native vegetation on bare ground.	<p>4.1 – Recognize the need for prompt growth of native vegetation, long-term restoration and weed suppression where forested vegetation management has created openings.</p> <p>4.2 – Allow natural seedbank to provide vegetation if possible, next preference is for native seed grown from local collections. All seed must be certified weed seed-free for all species on the forest noxious or invasive weed list.</p>
<b>RANGE MANAGEMENT</b>	
<b>Grazing</b>	
RM-1. Consider weed prevention and control practices in the management of grazing allotments.	<p>1.1 – Include weed prevention practices, inspection and reporting direction, and provisions for inspection of livestock concentration areas in allotment management plans and annual operating instructions for active grazing allotments.</p> <p>1.2 – For each grazing allotment containing existing weed infestations, include prevention practices focused on preventing weed spread and cooperative management of weeds in the annual operating instructions. Prevention practices may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Maintaining healthy vegetation</li> <li>• Preventing weed seed transportation</li> <li>• Minimize potential ground disturbance - altering season of use or exclusion</li> <li>• Weed control methods</li> <li>• Revegetation</li> <li>• Inspection and Monitoring</li> <li>• Reporting</li> <li>• Education</li> </ul>
RM-2. Minimize transport of weed seed into and within allotments.	<p>2.1 – If livestock are potentially a contributing factor to seed spread, schedule units with existing weed infestations to be treated prior to seed set before allowing livestock on those units. Schedule these infested units to be the last in the rotation.</p> <p>2.2 – If livestock were transported from a weed-infested area, corral livestock with weed-free feed, and annually inspect and treat allotment entry units for new weed infestations.</p> <p>2.3 – Designate pastures as unsuitable range to livestock grazing when infested to the degree that livestock grazing will continue to either exacerbate the condition on site or contribute to weed seed spread.</p>
RM-3. Maintain healthy, desirable vegetation that is resistant to weed establishment.	3.1 – Through the allotment management plan or annual operating instructions, manage the timing, intensity (utilization), duration, and frequency of livestock activities associated with harvest of forage and browse resources to maintain the vigor of desirable plant species and



<b>Objective</b>	<b>Best Known Practice</b>
	<p>retain live plant cover and litter.</p> <p>3.2 – Manage livestock grazing on restoration areas to ensure that vegetation is well established. This may involve exclusion for a period of time consistent with site objectives and conditions. Consider practices to minimize wildlife grazing on the areas if needed.</p>
<p>RM-4. Minimize ground disturbances.</p>	<p>4.1 – Include weed prevention practices that reduce ground disturbance in allotment management plans and annual operating instructions. Consider for example: changes in the timing, intensity, duration, or frequency of livestock use; location and changes in salt grounds; restoration or protection of watering sites; and restoration of yarding/loafing areas, corrals, and other areas of concentrated livestock use.</p> <p>4.2 – Inspect known areas of concentrated livestock use for weed invasion. Inventory and manage new infestations.</p>
<p>RM-5. Promote weed awareness and prevention efforts among range permittees.</p>	<p>5.1 – Use education programs or annual operating instructions to increase weed awareness and prevent weed spread associated with permittees’ livestock management practices.</p> <p>5.2 – To aid in their participation in allotment weed control programs, encourage permittees to become certified pesticide use applicators.</p>
<b>WATERSHED MANAGEMENT</b>	
<p>WM-1. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.</p>	<p>1.1 – Inspect and document for early detection of weed establishment and spread in riparian areas and wetlands. Eradicate new infestations before they become established.</p> <p>1.2 – Address weed risks in watershed restoration projects and water quality management plans.</p> <p>1.3 – Pay particular attention to practices listed under “General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs” and “Aquatic Weed Management Practices.”</p>
<b>WILDLIFE AND FISHERIES</b>	
<p>WM-2. Avoid creating soil conditions that promote weed germination and establishment.</p>	<p>1.1 – Periodically inspect for weeds and document those areas where wildlife concentrate in the winter and spring resulting in overuse or soil scarification.</p> <p>1.2 – Use weed-free materials at big game baiting stations.</p> <p>1.3 – For wildlife openings and habitat improvement projects, follow the practices outlined in “General Weed Prevention Practices” and “Vegetation Management.”</p>

**Integrated Weed Management Practices for  
Engineering/Roads/Minerals Projects and Maintenance Programs**

Objective	Best Known Practice
<b>ENGINEERING/ ROADS/ MINERALS</b>	
<b>Project Planning</b>	
<p>ERM-1. Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.</p>	<p>1.1 – Include weed surveys at the project planning stage as outlined in “General Weed Management Practices”</p> <p>1.2 – For timber sale purchaser road maintenance and decommissioning, use standard timber sale contract clauses such as WO-C/CT 6.36 to ensure appropriate equipment cleaning.</p> <p>1.3 – For new and reconstruction of roads conducted as part of public works (construction) contracts and service contracts include contract language for equipment cleaning such as is in WO-C/CT 6.36.</p> <p>1.4 – Include weed prevention measures—including project inspection and documentation—in minerals operation and reclamation plans.</p>
<b>Project Implementation</b>	
<p>ERM-2. Prevent conditions favoring weed establishment, minimize bare soil conditions and promote vegetation on bare ground.</p>	<p>2.1 – Ensure that all outside (rental, other agency or unit) equipment brought onto the forest is free of weed seed and propagules before it is accepted by the contracting officers representative.</p> <p>2.2 – Schedule and coordinate all earth-moving or soil-disturbing activities (such as pulling of invasive weed-infested roadsides or ditches) in consultation with the local weed specialist. Do not blade or pull roadsides and ditches that are infested with weeds unless doing so is required for public safety or protection of the roadway. If the ditch must be pulled, ensure the weeds remain onsite. Blade from least infested to most infested areas. When it is necessary to blade weed-infested roadsides or ditches, schedule the activity when seeds or propagules are least likely to be viable and spread. Minimize soil surface disturbance and contain bladed material on the infested site.</p>
<b>Decommissioning and Maintenance</b>	
<p>ERM-3. Minimize roadside sources of weed seed that could be transported to other areas.</p>	<p>3.1 – Retain bonds until reclamation requirements are completed, including weed treatments, based on inspection and documentation. Require followup monitoring based on seed viability in soil of known and potential weed species.</p> <p>3.2 – Periodically inspect system roads and rights-of-way for invasion of weeds. Train road maintenance staff to recognize weeds and report locations to the local weed specialist. Inventory weed infestations and schedule them for treatment.</p> <p>3.3 – Avoid acquiring water for dust abatement from weed-infested areas.</p> <p>3.4 – For timber sale purchaser road maintenance and decommissioning,</p>

Appendix B - Design Features, Best Management Practices,  
 Required Protection Measures and Mitigation Measures

<b>Objective</b>	<b>Best Known Practice</b>
	<p>use contract clauses for equipment cleaning such as in WO-C/CT 6.36.</p> <p>3.5 – For road maintenance and decommissioning conducted as part of public works (construction) contracts and service contracts include contract language for equipment cleaning such as in WO-C/CT 6.36.</p> <p>3.6 – Treat weeds in road decommissioning and reclamation projects before roads are made impassable. Re-inspect and plan followup monitoring and treatment based on initial inspection and documentation.</p>

**Integrated Weed Management Practices for Public Services and Aquatic Projects**

<b>Objective</b>	<b>Best Known Practice</b>
<b>Recreation, Wilderness, and Special Management Areas</b>	
<p>PS-1. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.</p>	<p>1.1 – On designated public lands, issue closure orders that specify the use of weed free or weed seed-free feed, hay, straw, and mulch. Refer to 36 CFR 251.50. Cooperate with State, county, tribal governments, and other agencies to develop and support publicly available weed-free materials.</p> <p>1.2 – Where they exist, post and enforce weed-free feed orders. (FSM 2081.03)</p> <p>1.3 – Encourage backcountry pack and saddle stock users to feed stock only weed-free feed for several days before travel on National Forest System lands.</p> <p>1.4 – Inspect, brush, and clean animals—especially hooves and legs—before entering public land. Inspect and clean tack and equipment.</p> <p>1.5 – Tie or hold stock in ways that minimize soil disturbance and avoid loss of desirable native vegetation.</p> <p>1.6 – Annually inspect all campgrounds, trailheads, and recreation areas that are open to public vehicle use for weeds; document and treat new infestations.</p> <p>1.7 – Maintain trailheads, boat launches, outfitter and public camps, picnic areas, airstrips, roads leading to trailheads, and other areas of concentrated public use in a weed-free condition. Consider high use recreation areas as high priority for weed eradication.</p> <p>1.8 – Consider seasonal or full-time closure of campgrounds, picnic areas, and other recreation use areas until weeds are reduced to levels that minimize potential for spread.</p> <p>1.9 – In areas susceptible to weed infestation, limit vehicles to designated maintained travel routes. Inspect and document inspections on travel ways for weeds and treat as necessary.</p>
<p>PS-2. Promote weed prevention practices through public awareness and education.</p>	<p>2.1 – Educate public land users to identify common invasive weeds and to avoid recreating in infested areas. If weeds are encountered, the public should inspect and clean motorized and mechanized trail vehicles of weeds and their seeds.</p> <p>2.2 – Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and forest portals.</p> <p>2.3 – In weed-infested areas, post weed awareness messages and prevention practices at roadsides.</p>
<b>Lands and Special Uses</b>	
<p>PS-3. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.</p>	<p>3.1 – Consider weed status of lands when making land acquisition or disposal decisions.</p> <p>3.2 – Conduct weed inventories of all lands considered for acquisition.</p> <p>3.3 – Land acquisition decisions may require weed control as a condition of sale or exchange.</p> <p>3.4 – Include a weed prevention and control provision in all special use permits,</p>

Objective	Best Known Practice
	<p>authorizations, or other grants involving ground-disturbing activities. Include this provision in existing ground-disturbing authorizations that are being amended for other reasons; consider including this provision by amending existing ground-disturbing authorizations as necessary.</p> <p>3.5 – Require weed prevention and control in operating and maintenance plans when authorized activities present a high risk for weed infestation or the location of the activity is vulnerable to weed introduction or spread.</p>
<p><b>Aquatic Management for Forest Projects and Special Use Permits.</b></p>	
<p>AM-1. To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules.</p>	<p>1.1 – Provide outreach to Arizona Game and Fish Department, counties, and other agencies concerning the unique prevention measures and control practices associated with aquatic weeds.</p> <p>1.2 – Rinse and inspect boats (including rafts), trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat launching facilities. Drain water from motor, live well, bilge, and transom wells while on land before leaving the vicinity. Wash and dry boats, tackle, downriggers, anchors, nets, floors of boats, props, axles, trailers, and other boating equipment to kill weeds not visible at the boat launch. Clean with high pressure or hot (90 degrees) water, or dry boat and equipment for at least 5 days.</p> <p>1.3 – Maintain a 100-foot buffer of aquatic weed-free clearance around boat launches and docks.</p> <p>1.4 – Promptly post sites if aquatic invasives are found. Confine infestation. Where prevention is infeasible or ineffective, close facility until infestation is contained.</p> <p>1.5 – Wash and dry tackle, downriggers, float tubes, waders, and other equipment to remove or kill harmful species not visible at the boat launch.</p> <p>1.6 – Avoid moving weed plants from one body of water to another.</p> <p>1.7 – Avoid running personal watercraft through aquatic plants near boat access locations. Instead, push or winch watercraft onto the trailer without running the engine. After the watercraft is out of the water, start the engine for 5-10 seconds to blow out any excess water and vegetation. After engine has stopped, pull weeds out of the steering nozzle. Inspect trailer and any other sporting equipment for weed fragments and remove them before leaving the access area. Wash or dry watercraft before transporting to another body of water.</p> <p>1.8 – Waterfowl hunters may use elliptical, bulb-shaped, or strap anchors on decoys, because these types of anchors avoid collecting submersed and floating aquatic plants. Inspect waders and hip boots, removing any aquatic plants and, where possible, rinse mud from them before leaving the water. Remove aquatic plants, animals, and mud attached to decoy lines and anchors.</p> <p>1.9 – Construct new boat launches and ramps at deepwater sites. Restrict motorized boats in lakes near areas that are infested with weeds. Move sediment to upland or quarantine areas when cleaning around culverts, canals, or irrigation sites. Clean equipment before moving to new sites. Inspect and clean equipment before moving from one project area to another.</p>

## **Soil, Water and Air Best Management Practices**

The Soil and Water Conservation Practices Handbook (FSH 2509.22) was developed in concert between the USDA Forest Service, Southwestern Region and both Departments of Environmental Quality from Arizona and New Mexico. It is a formalized agreement with the specific purpose to respond to the objectives defined by Congress in the Federal Water Pollution Control Act, as amended. The main objective of this law is to restore and maintain the chemical, physical, and biological integrity of the Nation's water.

Basically, the Forest Service has agreed to ensure that all project work contains site-specific best management practices (BMPs) developed through the National Environmental Policy Act process. The Forest Service has also agreed to implement a BMP monitoring strategy that includes implementation monitoring to ensure application of BMPs as specified in the project, as well as effectiveness monitoring to determine if the BMP met stated objectives.

A best management practice is defined as a practice or combination of practices, that is determined by the State after problem assessment, to be the most effective and practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to the level compatible with water quality goals (FSH 2509.22).

The following lists of BMPs have been developed for this project and are designed to minimize any potential water quality problems with approval of herbicide use on the forests. All BMPs are considered standard procedure and do not constitute deviation from normal planning or implementation processes. BMPs identified for this project are also listed in the Soil and Water Conservation Handbook (2509.22). Application of the BMPs will ensure compliance with the requirements of the Federal Water Pollution Control Act.

- 21.11: Pesticide Application According to Label Directions and Applicable Legal Requirements — All approved herbicides will be applied according to label instructions to avoid water contamination. Directions found on the label of each herbicide are detailed and specific and include legal requirements for use. These constraints will be incorporated into individual project plans and contracts. Responsibility for inservice projects rests with the Forest Service's project supervisor who shall be a certified applicator. For contracted projects, it is the responsibility of the contracting officer or the contracting officer's representative to ensure that label instructions and other applicable legal requirements are followed.
- 21.12: Pesticide Application Monitoring and Evaluation — The objective of this BMP is to determine whether pesticides were applied safely, restricted to intended target areas, and deposited at the right rates. It is also designed to evaluate if nontarget species were impacted. Another component is also to provide early warning of possible hazardous conditions and determine the extent, severity, and duration of any potential hazard that might exist. Monitoring methods include spray cards, dye tracing, and direct measurements of herbicides on plants or near water. Monitoring of existing herbicide concentrations will be conducted prior to any treatments in riparian corridors where perennial water is found.
- 22.13: Pesticide Spill Contingency Plan — The objective of this BMP is to eliminate contamination of water or the soil resource that may occur from accidental spills.

- 24.14: Cleaning and Disposal of Herbicide Containers — This BMP is designed to prevent water contamination from cleaning or disposal of herbicide containers. The cleaning and disposal of these items will be done in accordance with Federal, State, and local laws. The forest or district pesticide use coordinator will approve proper rinsing procedures in accordance with State and local laws and regulations, and arrange disposal of containers when inservice personnel apply the product. When a contractor applies the herbicide, the contractor is responsible for proper container disposal in accordance with label instructions.
- 21.16: Controlling Pesticide Drift During Spray Application — The objective of this BMP is to minimize risk of pesticides falling directly into water or nontarget areas. The spray application of herbicides is accomplished according to a prescription which accounts for terrain and that specifies the following: spray exclusion areas, buffer zones, and factors such as formulation, equipment, droplet size, spray height, application pattern, flow rate, and the limiting factors of wind speed and direction, temperature, and relative humidity. On inservice projects, the Forest Service project manager supervisor is responsible for ensuring the prescription is followed, whereas if contracted, the contracting officer is delegated the responsibility.



## **Weed Control Pesticide Safety and Spill Plan**

### **Information and Equipment**

The forest pesticide coordinators for the Coconino, Kaibab, and Prescott National Forests will fulfill the role as the certified pesticide applicator for the project. The regional pesticide coordinator will initially serve as the technical staff and advisor until forest personnel are trained and certified.

All participants will receive training on safety and application procedures prior to any spraying.

The certified applicator will supervise spraying operations as required.

A copy of the labels and material safety data sheets (MSDS) for all herbicides will be available at all times during project operations. Employees will be completely familiar with the information in these documents in case it is needed in the event of a spill or incident.

Required personal protective equipment (PPE) will be worn at all times when herbicides are being mixed and applied. Label requirements for specific herbicides will be followed. Applicators and handlers must wear long-sleeved shirt and long pants, waterproof and chemical-resistant gloves, and boots and socks.

An emergency spill kit, with directions for use, will be present when herbicides are being mixed, transported, and applied. Employees will be trained in the use of the spill kit prior to initiation of operations.

The spill kit will contain the following equipment:

- Shovel
- Broom
- Ten pounds of absorbent material
- Box of large plastic bags
- Nitrile gloves

### **Mitigations for Herbicide Use**

- Application personnel will be trained by, and all application will be under direct supervision of, a Forest Service certified pesticide applicator (Region 3 Supplement 2100-98-1). All applicators must wear protective clothing as described on the label.
- All herbicide applications will follow EPA label requirements, USDA policy, and Forest Service direction (e.g., FSM 2150 Pesticide Use Management and Coordination; FSH 2109.11 Pesticide Project Handbook; FSH 2109.12 Pesticide Storage, Transportation, Spills, and Disposal Handbook; and FSH 2109.13 Pesticide Project Personnel Handbook).
- Only herbicides labeled for use adjacent to water will be used within riparian zones and areas with shallow ground water.

- Suspension of broadcast herbicidal applications will occur when the following conditions exist. During these weather patterns, herbicide application methods will be limited to hand-held spot spraying or wick application:
  - Wind velocity exceeds 6 miles per hour for liquids or 15 miles per hour for granular herbicides, unless a lower maximum wind speed is specified on the label.
  - Snow or ice covers the target plant.
  - Precipitation is occurring or is imminent.
  - Fog significantly reduces visibility.
  - Air turbulence, such as thermal updrafts, is sufficient to affect the normal herbicide distribution pattern.
- Herbicides will be transported daily to the project site under the following conditions: (a) transport only the quantity needed for that day's work, and (b) transport concentrate only in containers in a manner that will prevent tipping or spilling, and in a compartment that is isolated from food, clothing, and safety equipment.
- Mixing, loading, and equipment cleaning must be done onsite and at least 300 feet from the edge of a "Limited Spray Zone" or from private land (unless the owner is cooperating in the project), open water, known wellheads, or sensitive areas. Mixing and cleaning water must be transported to the site in labeled containers that are separate from water used for other purposes.
- Nonherbicidal methods, except grazing, will be the preferred choice for 100 feet around wellheads. If herbicides must be used, treatments will be timed with the driest periods to prevent leaching of any herbicides directly into the wellhead and still have effective control.
- Safety and spill plans will be written for each project.
- All herbicide containers will be disposed of in accordance with label, State, and Federal requirements.
- Broadcast spray sites will be posted at all access points 2 weeks before, during, and 2 weeks following herbicide application.

### **Procedures for Herbicide Spill Containment**

Notify the supervisor's office and relevant district office of an incident or spill. Identify the nature of the incident and extent of the spill. Include the following information:

Product Name:	Tordon 22K	Reclaim
Chemical Name:	Picloram	Clopyralid
EPA Registration Number:	62719-6	62719-83

Remove any injured or contaminated person to a safe area. Remove contaminated clothing and follow instructions on the MSDSs. Do not leave an injured person alone. Obtain medical help for any injured employee.

Contain the spilled herbicide as much as possible on the site. Prevent the herbicide from entering ditches, gullies, wells, or water systems.

**Small Spills** (Less than 1 gallon of herbicide formulation or less than 10 gallons of herbicide mixture)

- Qualified employees will be present to confine a spill.
- Follow MSDS guidelines for emergency first aid procedures in the event of an accidental exposure.
- Restrict entry to the spill area by roping off and flagging.
- Contain spread of spill with earthen dikes.
- Cover spill with absorbent material.
- Place contaminated materials into leakproof containers and label them.
- Dispose of contaminated materials according to label instructions and State requirements.

**Large Spills** (More than 1 gallon of herbicide formulations or more than 10 gallons of herbicide mixture)

- Keep people away from the spill.
- Flag and rope off the spill area.
- Follow MSDS guidelines for emergency first aid procedures in the event of an accidental exposure.
- Contact Dow AgroSciences at 1-800-992-5994.
- Call Chemical Transportation Emergency Center (Chemtrec) at 1-800-424-9300 if DowAgroSciences cannot be reached.
- Notify the highway patrol or sheriff if the spill occurs on a highway.
- Contain spread of the spill with earthen dikes.
- Cover the spill with absorbent material.
- Spread the absorbent material around the perimeter of the spill and sweep toward the center.
- Call the direct supervisor or safety coordinator and the forest hazardous material coordinator for further instruction or action.

**Notification List of Key Personnel**

(To be updated for individual districts/projects)

Forest Supervisor (numbers for each SO): \_\_\_\_\_

District Offices (numbers): \_\_\_\_\_

Regional Pesticide Coordinator: Doug Parker at (505) 842-3280

National Forest Safety Officers: Name & number \_\_\_\_\_

National Forest Hazardous Materials Coordinator: Alan Anderson (928) 527-3590

Local hospital and number: \_\_\_\_\_

Chemtrec: 1-800-424-9300

## **Required Protection Measures for Weed Treatments in Identified Species Habitats**

Integrated Treatment for Noxious or Invasive Weeds on Coconino, Kaibab, and Prescott National Forests within Coconino, Gila, Mojave, and Yavapai Counties

Endangered Species Act Section 7 Consultation #2-21-01-I-0335

### **Species Conservation Measures (Project Design Features)**

RPMPA refers to the Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service (summarized in Tables 26 and 27) authored by J. Allen White, July 2004.

#### **General Project BMPs**

1. Implement integrated weed best management practices.
2. Survey T&E species' habitats to determine and prioritize the occupied and potential habitats that would be most vulnerable to encroachment of invasive and noxious weeds.
3. Use native species for seeding and planting during revegetating. An exception is the use of sterile hybrid grasses after careful analysis to provide immediate ground cover after wildfires.
4. FS will review "weed-free" certifications for seed and mulch to ensure they are "free" of the weed species to be controlled in the action area.
5. Treatments that are not within these design features would require additional analysis and may require additional coordination with the FWS (U.S. Fish and Wildlife Service).
6. Work cooperatively with adjacent landowners to manage noxious or invasive weeds to prevent their spread into NFS (National Forest System) lands.

#### **All Species**

1. Where specified, species breeding season timing restrictions and buffers are applicable to all treatment methods that are not commensurate with the designated uses.
2. Where two or more species' habitats occur, the more restrictive measures will take priority.
3. Noxious or invasive weed treatment methods during the breeding seasons for birds would be commensurate with designated uses (nonmotorized, motorized, livestock, etc.) in the treatment areas.
4. Adjuvants including surfactants and cleaners would be used or applied according to the adjuvant Table 27.
5. Forest Service would submit to the FWS an annual report of herbicide treatments occurring within T&E species' habitat.

**Arizona cliffrose (*Purshia subintegra*)**

1. Survey forest Arizona cliffrose habitat for noxious or invasive weeds.
2. Survey Arizona cliffrose habitat to determine and prioritize the occupied and potential seedling sites that would be most vulnerable to encroachment of invasive and noxious weeds.
3. Treatment crew members will be experienced in identifying Arizona cliffrose and FS sensitive species and will be supervised by a botanist.
4. Prior to initiation of weed treatments, survey each forest Arizona cliffrose treatment site for presence of seedlings of Arizona cliffrose.
5. Establish a buffer zone with a minimum radius equal to the height of the seedling when using manual/mechanical treatments where seedlings occur.
6. If application of herbicides is deemed necessary, conduct test treatments of the herbicide on ex situ Arizona cliffrose with varying distances for buffers to determine appropriate buffer zones to avoid adverse effects.
7. Only those herbicides reviewed and approved by the FS botanist may be used in or near Arizona cliffrose habitat.
8. Timing of herbicide treatments is critical: when effective for controlling weeds, treatments should be done in fall when Arizona cliffrose plants are not actively growing or not under water stress.
9. Do not use torching of noxious or invasive weeds in Arizona cliffrose habitat. Treatments with herbicide will be done without prior torching.

**Apache trout, Gila chub, Gila topminnow,  
Little Colorado spinedace in Small Riparian Habitats**

1. After a survey has been conducted, no restrictions on pesticide applications if USFWS concur that habitat is unoccupied by the species (RPMPA, pg. 73).
2. When streamflows are 100 cfs or greater, herbicides would be applied per guidelines for large aquatic habitats in RPMPA, pg. 76 (see Table 26 in RPMPA).
3. When streamflows are less than 100 cfs, herbicides would be applied per guidelines in RPMPA pg. 73 with the following modifications (see Table 26 in RPMPA).
  - Approved herbicides (aquatic formulations only): Glyphosate, Imazapic, and Imazapyr may be used within the riparian zone adjacent to but not in the aquatic habitat.
  - Spot applications to individual plants are permitted within the buffer zone.
  - For pool habitats, no pesticide applications may occur near pools when there is no surface flow of water in and out of the pool(s). Per the RPMPA, a 30-foot buffer would apply when there is no surface flow of water.
4. When streamflows exceed 100 cfs (cubic feet per second), may apply guidelines for large riparian habitats (see Table 26 in RPMPA).

**Colorado pike minnow, loach minnow, razorback sucker,  
spikedace and roundtail chub in large riparian habitats**

1. After a survey has been conducted, no restrictions on pesticide applications if USFWS concur that habitat is unoccupied by the species (RPMPA, pg. 76).
2. When streamflows are 100 cfs or greater, herbicides would be applied per guidelines for large aquatic habitats in RPMPA, pg. 76 (see Table 26 in RPMPA).
3. When streamflows are less than 100 cfs, herbicides would be applied per guidelines in RPMPA, pg. 73 with the following modifications (see Table 26 in RPMPA):
  - Approved herbicides (aquatic formulations only): Glyphosate, Imazapic, and Imazapyr may be used within the riparian zone adjacent to but not in the aquatic habitat.
  - Spot applications to individual plants are permitted within the buffer zone.
  - For pool habitats, no pesticide applications may occur near pools when there is no surface flow of water in and out of the pool(s). Per the RPMPA, a 30-foot buffer would apply when there is no surface flow of water.

**Southwestern willow flycatcher**

1. No biological control of tamarisk anywhere on the three forests (“SWWF Recovery Plan,” pg. 121) until further NEPA analysis and ESA Section 7 compliance is documented.
2. Treatment within patches will comply with the southwestern willow flycatcher recovery plan.
3. FS biologist will determine patch size for nesting areas per the “SWWF Recovery Plan” and identify sites on the ground prior to treatments.
4. FS biologist would confirm occupancy during the breeding season (April through August, “SWWF Recovery Plan,” pg. 21).
5. For occupied breeding patches, treatments adjacent to breeding patches would occur 100 meters from the edge of the patch (“SWWF Recovery Plan,” pg. H-21).
6. Herbicides would be applied per guidelines in RPMPA, pg. 64 (see Table 26 in RPMPA).

**Yellow-billed cuckoo**

1. Herbicides would be applied per guidelines in RPMPA, pg. 64 (see Table 26 in RPMPA).
2. FS biologist would determine patch size for nesting areas and identify sites on the ground prior to treatments.
3. FS biologist would confirm occupancy during the breeding season (May through August).
4. In occupied breeding areas, treatments adjacent to breeding areas would occur outside the time of occupancy.

### **Bald Eagle**

1. Breeding season is December 1 through June 30 (BECAS, pg. 32).
2. Nest occupancy confirmed by FS biologist.
3. No treatments may occur within one-half mile of occupied bald eagle nests (FWS per consultation) from the beginning of breeding season through occupancy for each breeding season as confirmed by FS biologist.
4. Specified herbicides may be applied along road rights-of-way within breeding areas during the breeding season (see Table 26 in RPMPA).
5. No treatments within 100 feet of occupied winter roosts (roosting season October 1 through March 30).

### **California Condor**

1. Forest Service will contact FWS immediately prior to herbicide applications in condor habitat to determine if any roosting or nesting condors are in the proposed application area. If condors are present, no herbicides will be used within 0.2 km (0.125 mi) for spot applications using hand-operated equipment, or within 0.4 km (0.25 mi) for mechanized ground applications of roost or nest sites to protect California condors from disturbance.

### **Mexican spotted owl**

1. Breeding season is March 1 through August 30.
2. No treatments may occur within occupied “No Activity Centers.” “No Activity Center” is the nest area from the MSO Recovery Plan, page 86. FS biologist to determine occupancy. If no surveys are done, MSO territories are assumed occupied until surveys are done to determine otherwise.
3. Specified herbicides may be applied along road rights-of-way in MSO PACs during the breeding season (see Table 26 in RPMPA).
4. Only specified herbicides may be applied within MSO PACs (see Table 26 in RPMPA).
5. Specified herbicides may be applied from FS system trails during the breeding season commensurate with the designated trail use (nonmotorized, motorized, livestock). Crews of two people may enter the PAC up to six times per breeding season for treatment purposes.
6. Specified herbicides may be applied during the breeding season to the remainder of the MSO PAC outside of the “No Activity Center” by nonmotorized methods.

### **Chiricahua, Northern, and Lowland leopard frogs**

1. Herbicides would be applied per guidelines in RPMPA, pg. 136 (see Table 26 in RPMPA).
2. If there is a high probability (80 percent chance) of local, moderate rain (0.25 inch or less within 24 hours), then applications should only occur when it is anticipated that there shall be sufficient time (at least 4 hours) for the application to dry before rainfall occurs. If rainfall of



more than a moderate amount (more than 0.25 inch) is predicted locally within 48 hours, applications will be discontinued until predictable local conditions improve. When plant cover is wet from recent rain, heavy dew, or frost, applications will be delayed until conditions are nearly dry.

#### **Yuma clapper rail**

1. Herbicides would be applied per guidelines in RPMPA, pg. 64 (see Table 26 in RPMPA).
2. FS biologist will determine nesting areas and identify the site on the ground prior to treatment.
3. FS biologist would confirm occupancy during the breeding season (March through July).
4. In occupied breeding areas, treatments adjacent to breeding areas would occur outside the time of occupancy.

#### **Black-footed ferret, brown pelican, Mexican gray wolf**

1. No herbicide limitations for this project per the RPMPA (pages 41, 28, and 109, respectively).

#### **Kanab ambersnail, Page springsnail, Verde Rim springsnail**

1. Herbicides would be applied per guidelines in RPMPA, pg. 69 (see Table 26 in RPMPA).
2. If there is a high probability (80 percent chance) of local, moderate rain (0.25 inch or less within 24 hours), then applications should only occur when it is anticipated that there shall be sufficient time (at least 4 hours) for the application to dry before rainfall occurs. If rainfall of more than a moderate amount (more than 0.25 inch) is predicted locally within 48 hours, applications will be discontinued until predictable local conditions improve. When plant cover is wet from recent rain, heavy dew, or frost, applications will be delayed until conditions are nearly dry.

#### **Northern goshawk**

1. Breeding season is March 1 through September 30.
2. No treatments may occur within occupied “nest stands.” FS biologist to determine occupancy.
3. Specified herbicides may be applied along road rights-of-way in goshawk PFAs during the breeding season (same as MSO).
4. Only specified herbicides may be applied within goshawk PFAs (same as MSO).
5. Specified herbicides may be applied from FS system trails during the breeding season commensurate with the designated trail use (nonmotorized, motorized, livestock).
6. Specified herbicides may be applied during the breeding season to the remainder of the goshawk PFA outside of the “nest stand” by nonmotorized methods.

**Migratory Birds Including Sensitive, MIS, and PIF Species**

1. Class 0 or 1 avian toxicity herbicides may be applied during nesting season (March through August).
2. Treatment and application methods would be commensurate with the designated uses within the treatment area.
3. Avoid using avian toxicity Class 2 or 3 (Dicamba) during the breeding season. For all habitats, these herbicides may be used September through February.

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Species	Herbicides					Chlorsulfuron
	2,4-D (acid formulations)	2,4-D (aquatic amine salt formulations)	2,4-D (nonaquatic amine salt formulations)	2,4-D (aquatic ester formulations)	2,4-D (nonaquatic ester formulations)	
Apache trout, Gila chub, Gila topminnow, Little Colorado spinedace (Flows <100cfs)	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 feet downstream: Liquid- 30-foot buffer from edge of water body or habitat.	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 feet downstream.  Liquid – 50-foot buffer				Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 feet downstream: Liquid – 30-foot buffer from edge of water body or habitat*
Arizona cliffrose	May not be used in habitat.			May not be used in or near habitat.		
Bald eagle	A half-mile buffer from currently occupied nests. May be applied along existing road ROW (paved or gravel-base roadways only) during breeding season.			Buffer applies for 1 mile up and downstream from nest's location when applied at edge of water of	Buffer applies for 1 mile up and downstream from nest's location when applied at edge of water of occupied nest. Spot - 10 ft.	A ½-mile buffer from currently occupied nests. May be applied along existing road ROW (paved or gravel-base roadways only) during breeding season.

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Species	Herbicides					Chlorsulfuron
	2,4-D (acid formulations)	2,4-D (aquatic amine salt formulations)	2,4-D (nonaquatic amine salt formulations)	2,4-D (aquatic ester formulations)	2,4-D (nonaquatic ester formulations)	
				occupied nest. Spot - 10 ft. from water edge. Mechanized - 80 ft. from water edge.  A ½-buffer from currently occupied nests.	from water edge. Mechanized - 80 ft. from water edge.  A ½-buffer from currently occupied nests.	
California condor	May be applied along road ROW. A ¼-mile buffer from nests, roosts, and release sites					
Chiricahua leopard frog, Northern leopard frog, Lowland leopard frog	Spot applications on land above high water line of species habitat, one-half mile upstream (including tributaries), 300 feet downstream.  Liquid – 30-foot buffer					May be applied on land below or above the high water line of species habitat.
Colorado pikeminnow, loach minnow, razorback sucker, spinedace and roundtail chub  (Flows >100cfs)	No buffer			Spot applications in the following areas: one-half mile upstream (including tributaries), all species habitat, and 300 feet downstream.  Liquid – 20-foot buffer		No buffer
Kanab ambersnail, Page springsnail, Verde Rim springsnail	Spot applications around habitat: Liquid – no buffer	Spot applications around habitat: Liquid – 10-foot buffer ULV – 150-foot buffer				Spot applications around habitat: Liquid – no buffer ULV – 80-foot buffer

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Species	Herbicides					
	2,4-D (acid formulations)	2,4-D (aquatic amine salt formulations)	2,4-D (nonaquatic amine salt formulations)	2,4-D (aquatic ester formulations)	2,4-D (nonaquatic ester formulations)	Chlorsulfuron
	ULV – 80-foot buffer					
Mexican gray wolf, black-footed ferret, brown pelican	No limitations					
Mexican spotted owl	May be sprayed along road ROW during breeding season. May be applied in rest of PAC outside the breeding season.		May be sprayed within the PAC outside of No Activity center during the breeding season.		May be sprayed along road ROW during BS. May be applied in rest of PAC outside the BS.	
Migratory birds including sensitive & PIF species	May be applied during the breeding season.					
Northern goshawk	May be sprayed along road ROW during the breeding season. May be applied in rest of PFA outside the breeding season.		May be sprayed within PFA outside of nest stand during the breeding season.		May be sprayed along road ROW during the BS. May be applied in rest of PFA outside the BS.	
Southwestern willow flycatcher	Spot – no buffer Mechanized – 30-foot buffer Breeding season timing restriction – April through August		No buffer. Breeding season timing restriction – April through August		Spot – no buffer Mechanized – 30-foot buffer BS TR – April-August	
Yellow-billed cuckoo	Spot – no buffer Mechanized – 30-foot buffer Breeding season timing restriction – May through August		No buffer Breeding season timing restriction – May through August		Spot – no buffer Mechanized – 30-foot buffer BS TR – May-August	

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Species	Herbicides					
	2,4-D (acid formulations)	2,4-D (aquatic amine salt formulations)	2,4-D (nonaquatic amine salt formulations)	2,4-D (aquatic ester formulations)	2,4-D (nonaquatic ester formulations)	Chlorsulfuron
Yuma clapper rail	Spot applications within species habitat, ½ mile upstream (including tributaries) and 300 feet downstream: Liquid – 10-foot buffer ULV – 150-foot buffer Breeding season timing restriction – March through July			No buffer. Breeding season timing restriction – March through July		Spot applications within species habitat, ½ mile upstream (including tributaries), and 300 feet downstream: Liquid – 10-foot buffer ULV – 150-foot buffer BS TR – March - July

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Federal Species	Herbicides						
	Clopyralid	Dicamba	Glyphosate (aquatic)	Glyphosate (nonaquatic)	Imazapic	Imazapyr (technical formulation)	Imazapyr (aquatic)
Apache trout, Gila chub, Gila topminnow, Little Colorado spinedace  (Flows <100cfs)	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 ft. downstream: Liquid – 30-foot buffer from edge of water body or habitat*		Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 ft. downstream: Liquid- No buffer w/spot applications per the conservation measures	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 ft. downstream: Liquid- 30-foot buffer from edge of water body or habitat*	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 ft. downstream: Liquid- No buffer w/spot applications per the conservation measures	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 feet downstream: Liquid- 30-foot buffer from edge of water body or habitat* *10-foot buffer if FWS approved & spot applied	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 ft. downstream: Liquid- No buffer w/spot applications per the conservation measures
Arizona cliffrose	Conduct test treatments of the herbicide on ex situ Arizona cliffrose with varying distances for buffers to determine appropriate buffer zones; treatments should be	May not be used in or near habitat.			Conduct test treatments of the herbicide on ex situ Arizona cliffrose with varying distances for buffers to determine appropriate buffer zones; treatments should be	May not be used in or near habitat	

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Federal Species	Herbicides						
	Clopyralid	Dicamba	Glyphosate (aquatic)	Glyphosate (nonaquatic)	Imazapic	Imazapyr (technical formulation)	Imazapyr (aquatic)
	done in fall.				done in fall		
Bald eagle	A ½-mile buffer from currently occupied nests. May be applied along existing road ROW (paved or gravel-base roadways only) during breeding season	Buffer applies for 1 mile up & down stream from nest's location when applied at edge of water of occupied nest. Spot-10 feet from water edge Mechanized-80 feet from water edge.  Half-mile buffer from currently occupied nests.	A ½-mile buffer from currently occupied nests. May be applied along existing road ROW (paved or gravel-base roadways only) during breeding season.				
California condor	May be applied along road ROW- a ¼-mile buffer from nests, roosts, and release sites	A ¼ mile from occupied nests, roosts, release sites	May be applied along road ROW. A ¼-mile buffer from nests, roosts, and release sites.				



**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Federal Species	Herbicides						
	Clopyralid	Dicamba	Glyphosate (aquatic)	Glyphosate (nonaquatic)	Imazapic	Imazapyr (technical formulation)	Imazapyr (aquatic)
Chiricahua leopard frog, Northern leopard frog, Lowland leopard frog	May be applied on land below or above the high water line of species habitat.	Spot applications on land above high water line of species habitat, ½ mile upstream (including tributaries), 300 feet downstream: Liquid – 30-foot buffer	May be applied on land below or above the high water line of species habitat.	Spot applications on land above high water line of species habitat, ½ mile upstream (including tributaries), 300 feet downstream  Liquid – 30-foot buffer	May be applied on land below or above the high water line of species habitat.		
Colorado pikeminnow, loach minnow, razorback sucker, spikedace and roundtail chub  (Flows >100cfs)	No buffer	Spot applications in the following areas: ½ mile upstream (including tributaries), all species habitat, and 300 ft downstream: Liquid – 10-foot buffer	No buffer	Spot applications in the following areas :½ mile upstream (including tributaries), all species habitat, and 300 feet downstream : Liquid – 10-ft. buffer	No buffer		
Kanab ambersnail, Page springsnail, Verde Rim springsnail	Spot applications around habitat: Liquid – no buffer ULV – 80-foot buffer						

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Federal Species	Herbicides						
	Clopyralid	Dicamba	Glyphosate (aquatic)	Glyphosate (nonaquatic)	Imazapic	Imazapyr (technical formulation)	Imazapyr (aquatic)
Mexican gray wolf, black-footed ferret, brown pelican	No limitations						
Mexican spotted owl	May be sprayed along road ROW during BS. May be applied in rest of PAC outside the BS.	May not be sprayed in MSO PACS Spot-300 ft outside PACs & unsurveyed habitat Mechanized-¼ mile outside PACs & unsurveyed habitat.	May be sprayed within PAC outside of No Activity center during the BS.	May be sprayed along road ROW during BS. May be applied in rest of PAC outside BS.	May be sprayed within PAC outside of No Activity center during the BS.	May be sprayed along road ROW during BS. May be applied in rest of PAC outside BS.	May be sprayed within PAC outside of No Activity center during the BS.
Migratory birds including sensitive & PIF species	May be applied during the BS.	May be applied Sept.- February	May be applied during the breeding season.				
Northern goshawk	May be sprayed along road ROW during BS. May be applied in rest of PFA outside BS.	May be sprayed within PFA outside of nest stand during the BS.	May be sprayed along road ROW during BS. May be applied in rest of PFA outside BS.	May be sprayed within PFA outside of nest stand during the BS.	May be sprayed along road ROW during BS. May be applied in rest of PFA outside BS.	May be sprayed within PFA outside of nest stand during the BS.	

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Federal Species	Herbicides						
	Clopyralid	Dicamba	Glyphosate (aquatic)	Glyphosate (nonaquatic)	Imazapic	Imazapyr (technical formulation)	Imazapyr (aquatic)
Southwestern willow flycatcher	Spot - no buffer Mechanized - 30 ft BS TR - April-August	Spot - 10 ft Mechanized - 60 ft BS TR - April-August	No buffer. BS TR - April-August	Spot - no buffer Mechanized - 30 ft BS TR - April-August	No buffer. BS TR - April-August	Spot - no buffer Mechanized - 30 ft BS TR - April-August	No buffer. BS TR - April-August
Yellow-billed cuckoo	Spot - no buffer Mechanized - 30 ft BS TR - May - August	Spot - 10 ft Mechanized - 60 ft BS TR - May - August	No buffer. BS TR - May-August	Spot - no buffer Mechanized - 30 ft. BS TR - May-August	No buffer. BS TR - May-August	Spot - no buffer Mechanized - 30 ft buffer BS TR - May-August	No buffer. BS TR - May-August
Yuma clapper rail	Spot applications within species habitat, ½ mile upstream (including tributaries), and 300 ft. downstream: Liquid - 10 ft buffer ULV - 150 ft buffer BS TR - March - July	Spot applications within species habitat, ½ mile upstream (including tributaries), and 300 ft. downstream: Liquid - 20 ft buffer ULV - 200 ft buffer BS TR - March - July	No buffer. BS TR - March - July	Spot applications within species habitat, ½ mile upstream (including tributaries), and 300 ft downstream: Liquid - 10 ft buffer ULV - 150 ft buffer BS TR - March - July	No buffer. breeding BS TR - March - July	Spot applications within species habitat, ½ mile upstream (including tributaries), and 300 ft downstream : Liquid - 10 ft buffer ULV - 150 ft buffer BS TR - March - July	No buffer. BS TR - March - July

**Table 26. Required protection measures for pesticide applications in identified species habitats.**

Federal Species	Herbicides					
	Imazapyr (nonaquatic)	Metsulfuron--Methyl (see note below)	Picloram (see note below)	Sulfometuron--Methyl	Triclopyr (amine salt formulations)	(ester formulations)
Apache trout, Gila chub, Gila topminnow, Little Colorado spinedace  (Flows <100cfs)	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 feet downstream: Liquid - No buffer w/spot applications per the conservation measures	Spot applications in the following areas: 1 mile upstream (including tributaries), all species habitat, and 300 ft downstream: Liquid – 30-foot buffer from edge of water body or habitat*			Spot applications in the following areas 1 mile upstream (including tributaries), all species habitat, and 300 feet downstream Liquid – 50-foot buffer	
Arizona cliffrose	May not be used in or near habitat					
Bald eagle	A ½-mile buffer from currently occupied nests. May be applied along existing road ROW (paved or gravel-base roadways only) during the breeding season.				Buffer applies for 1 mile up & downstream from nest's location when applied at edge of water of occupied nest. Spot - 10 ft. from water edge Mechanized-80 ft. from water edge ½ mile buffer from currently occupied nests.	

Appendix B - Design Features, Best Management Practices,  
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Federal Species	Herbicides					
	Imazapyr (nonaquatic)	Metsulfuron-- Methyl (see note below)	Picloram (see note below)	Sulfometuron-- Methyl	Triclopyr (amine salt formulations)	(ester formulations)
California condor	May be applied along road ROW 1/4 mile buffer from nests, roosts, and release sites.					
Chiricahua leopard frog, Northern leopard frog, Lowland leopard frog	May be applied on land below or above the high water line of species habitat.	Spot applications on land above high water line of species habitat, ½ mile upstream (including tributaries), 300 feet downstream: Liquid – 30-foot buffer		May be applied on land below or above the high water line of species habitat.	Spot applications on land above high water line of species habitat, ½ mile upstream (including tributaries), 300 feet downstream: Liquid – 50-foot buffer	
Colorado pikeminnow, loach minnow, razorback sucker, spikedace and roundtail chub  (Flows >100cfs)	No buffer	Spot applications in the following areas: ½ mile upstream (including tributaries), all species habitat, and 300 feet downstream: Liquid – 10-foot buffer		No buffer	Spot applications in the following areas: ½ mile upstream (including tributaries), all species habitat, and 300 feet downstream: Liquid - 20-foot buffer	
Kanab ambersnail, Page springsnail, Verde Rim springsnail	Spot applications around habitat: Liquid - no buffer; ULV – 80-foot buffer.					
Mexican gray wolf, black-footed ferret, brown pelican	No limitations					

Federal Species	Herbicides					
	Imazapyr (nonaquatic)	Metsulfuron--Methyl (see note below)	Picloram (see note below)	Sulfometuron--Methyl	Triclopyr (amine salt formulations)	(ester formulations)
Mexican spotted owl	May be sprayed within PAC outside of No Activity center during the BS.	May be sprayed along road ROW during breeding season. May be applied in rest of PAC outside the breeding season.		May be sprayed within PAC outside of No Activity center during the BS.	May be sprayed along road ROW during BS. May be applied in rest of PAC outside BS.	May be sprayed within PAC outside of No Activity center during the BS.
Migratory birds including sensitive & PIF species	May be applied during the breeding season.					
Northern goshawk	May be sprayed within PFA outside of nest stand during the BS.	May be sprayed along road ROW during the breeding season. May be applied in rest of PFA outside the breeding season.		May be sprayed within PFA outside of nest stand during the BS.	May be sprayed along road ROW during BS. May be applied in rest of PFA outside BS.	May be sprayed within PFA outside of nest stand during the breeding season.
Southwestern willow flycatcher	No buffer - BS TR - April-August	Spot - no buffer. Mechanized - 30 ft. BS TR - April-August	No buffer. BS TR - April-August	No buffer. BS TR - April-August	Spot - no buffer. Mechanized - 30 ft. BS TR - April-August	No buffer. BS TR - April-August
Yellow-billed cuckoo	No buffer - BS TR - May-August	Spot - no buffer. Mechanized - 30 ft. BS TR - May-August	No buffer. BS TR - May-August	No buffer. BS TR - May-August	Spot - no buffer. Mechanized - 30 ft. BS TR - May-August	No buffer. BS TR - May-August
Yuma clapper rail	No buffer. BS TR - March - July	Spot applications within species habitat, ½ mile upstream	No buffer. BS TR- March – July.		Spot applications within species habitat, ½ mile upstream	No buffer. BS TR - March - July

Federal Species	Herbicides					
	Imazapyr (nonaquatic)	Metsulfuron--Methyl (see note below)	Picloram (see note below)	Sulfometuron--Methyl	Triclopyr (amine salt formulations)	(ester formulations)
		(including tributaries), and 300 feet downstream: Liquid - 10 ft. buffer ULV - 150 ft. buffer BS TR - March - July			(including tributaries), and 300 feet downstream: Liquid - 10 ft. buffer ULV - 150 ft. buffer BS TR - March - July	

**Notes:**

**RPMPA** - Resource Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service. J. Allen White, U.S. Fish and Wildlife Service, 10711 Burnett Road, Suite No. 200, Austin, Texas 78758, July 2004. These RPMPAs are to be implemented in concert with the required protection measures detailed in Appendix B of the FEIS for the tri-forest noxious or invasive weed treatments.

**Metsulfuron** = metsulfuron is rated as Class 1 in toxicity groups for fish and amphibians due to reported mortality incidents not indicated by toxicity data.

**Picloram** = picloram is used mostly for broad-leaved plants but can harm some grasses and other monocots.

A **buffer zone** is the distance between the boundary of the area requiring protection and the closest point of the last spot application or application swath. Standard weather conditions for pesticide application (i.e., no temperature inversions, wind speeds between 3 and 10 miles per hour, and no rainfall for 24 hours) should be followed in implementing recommended buffer zones.

**Spot applications** include pesticide applications by hand-operated equipment or a spray gun that discharges pesticide in liquid streams from a spray tank.

**Low aerial applications** (nozzle or spreader height less than 12 feet) and high aerial applications (nozzle or spreader height greater than 12 feet) are relative to the plant canopy or a bare ground surface. In grassland or semi-open plant communities (shrubland, woodland, etc.) with more than 40 percent grass cover, the top of the grass canopy should be used to determine whether an aerial application is low or high. For forested lands or dense shrubland with less than 40 percent grass cover, the tops of trees or shrubs should be used in determining whether applications are low or high.

**Solid formulations** include baits, granules, pellets, and treated seed but do not include dusts.

**Liquid formulations** include any type of liquid-based formulation other than ULV formulations.

**ULV (ultra low volume)** refers to liquid formulations applied at a rate of 1/2 gallon or less per acre.

**Abbreviation Key:** BS - Breeding Season; ROW - Right of way; PAC - Protected Activity Center; PFA – Post-fledging family area; MSO - Mexican spotted owl; TR - Timing restriction.



**Table 27. Adjuvant summary table and required protection measures**

<b>Species</b>	<b>ACTIVATOR 90, SILWET L-77, CHOICE, LI 700, ACIDI pHACTANT, ALL CLEAR, Tank and Equipment Cleaner Mineral oil**</b>	<b>Methylated Seed Oil**, AMIGO**, Marker dye WSP, CHEM-TROL, NU FILM P, FIGHTER F, FOAM FIGHTER</b>
Apache trout, Gila chub, Gila topminnow, Little Colorado spinedace Colorado pikeminnow, loach minnow, razorback sucker, spikedace, roundtail chub, Chiricahua leopard frog, northern leopard frog, lowland leopard frog, southwestern willow flycatcher, yellow-billed cuckoo, Yuma clapper rail, bald eagle, brown pelican, Kanab ambersnail, Page springsnail, Verde Rim springsnail, riparian migratory birds	Shall not be used in riparian habitat*.	Approved for use in riparian habitat.
Arizona cliffrose, Mexican spotted owl, California condor, black-footed ferret, Mexican gray wolf, Northern goshawk, terrestrial migratory birds,	Approved for use in habitat.	Approved for use in habitat.

\***Riparian habitat** – Overstory trees include alders, conifers, cottonwood, maple, sycamore, and willows. Understory species include hackberry, New Mexico locust, and soapberry. Herbaceous plants include sedges, spikerush, bull rush, little bluestem, blue grama, Canadian wildrye, sand bluestem, squirreltail, smartweed, and curlydock (EIS vegetation affected environment).

\*\***Carriers** – Three types of oils used to ensure even distribution of small amounts of herbicides during application.

Appendix B - Design Features, Best Management Practices,  
Required Protection Measures and Mitigation Measures

## **APPENDIX D**

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- Appendix D.1 Site Characterization Report
- Appendix D.2 Wildlife and Botanical Report
- Appendix D.3 Avian and Bat Studies for the Grapevine Canyon Wind Energy Project

**APPENDIX D.1**

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**SITE CHARACTERIZATION REPORT**

Available online at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)

# Site Characterization Report

Grapevine Canyon Wind Resource Area  
Coconino County, Arizona

*Prepared for:*

Foresight Flying M, LLC  
c/o Foresight Wind Energy, Manager

*Prepared by:*

David Tidhar and Andrea Chatfield  
Western EcoSystems Technology, Inc.  
26 North Main St., Waterbury, VT 05676



May 6, 2010

## EXECUTIVE SUMMARY

At the request of Foresight Flying M, LLC, (Foresight), Western Ecosystems Technology, Inc. has prepared this Site Characterization Report. The purpose of the report is to characterize biological resources within the proposed Grapevine Canyon Wind Resource Area (GCWRA), as well as a two-mile buffer (Evaluation Area). Biological resources were evaluated through a search of existing data, as well as a site visit.

The proposed project is located in central Arizona, along the southern edge of the Arizona/New Mexico Plateau Ecoregion. Vegetation communities in the region are characteristic of Great Basin shrublands and grasslands, with areas of higher elevation supporting pinyon pine and juniper woodlands and ponderosa pine forests. Elevations within the GCWRA range from approximately 1,700 –2,080 meters (m; 5,580 – 6,820 feet [ft]) above sea level. The primary vegetation communities comprising the GCWRA are scrub-shrub, juniper savannah/woodlands and grassland. Wetlands are very limited within the area, comprising less than 0.1% of the total GCWRA. There are no perennial streams in the GCWRA; however, several ephemeral creeks and stock tanks and ponds are present throughout the area.

Seven federal threatened, endangered, or candidate plant species or species of concern are listed as occurring in Coconino County and 16 state sensitive (i.e., highly restricted or salvage restricted) plants are listed as occurring in the Canyon Diablo and/or Middle Little Colorado Watersheds. The majority of these plants have limited distributions and specific habitat requirements and are not expected to occur in the GCWRA .

Based on a review of the federal endangered threatened wildlife species database maintained by the US Fish and Wildlife Service, 13 threatened, endangered, or candidate species are listed as occurring in Coconino County (four birds, one mammal, one reptile, one amphibian, five fish, and one snail). The majority of federal listed and candidate species have no potential to occur in the GCWRA; however, a few species have at least minimal potential to occur at some point in the year: southwestern willow flycatcher, western yellow-billed cuckoo, northern Mexican gartersnake, and Chiricahua leopard frog. A preliminary review of species from lists maintained by the Arizona Game and Fish Department found 14 state species of special concern with known occurrence in the Canyon Diablo and/or Middle Little Colorado Watersheds (seven birds, one mammal, two reptiles, two amphibians, and two fish). None of the bird species are likely to nest within the GCWRA, but several may occur as occasional winter visitors or pass through the GCWRA during migration (peregrine falcon, bald eagle, belted kingfisher, ferruginous hawk, northern goshawk, and osprey). Several additional state-listed species have at least some potential to occur in the GCWRA (Navajo Mexican vole, northern Mexican gartersnake, Chiricahua leopard frog, northern leopard frog, and Little Colorado sucker). Potentially suitable wetland and waterbody features which could support the Chiricahua leopard frog (federal threatened and state species of concern), northern leopard frog (state species of concern) and the little Colorado sucker (state species of concern) include stock ponds/tanks found within the GCWRA. Of these three species, only the Colorado sucker has been previously documented within a five-mile radius of the Evaluation Area. All three species are considered to have low probability of occurrence within the GCWRA. These species are restricted to aquatic features

## Grapevine Canyon Wind Project Site Characterization Report

located in canyon bottom ephemeral streams and pools, and waterbodies and wetlands associated with stock tanks and ponds found throughout the GCWRA. Project planning which avoids impacts to water bodies and wetlands would negate potential direct impacts on sensitive wildlife and plant species which could potentially occur at aquatic features found within the GCWRA. A final Project layout has not been determined at this time.

The raptors most likely to occur within the GCWRA are golden eagle, prairie falcon, American kestrel, sharp-shinned hawk, Cooper's hawk, red-tailed hawk, great-horned owl, barn owl, burrowing owl, long-eared owl, and western screech-owl. Other raptor species which may occur in the area as winter residents, migrants, or as rare visitors from the surrounding region are: bald eagle, ferruginous hawk, northern goshawk, osprey, peregrine falcon, merlin, rough-legged hawk, common black hawk, Swainson's hawk, and zone-tailed hawk. Potential nesting habitat for raptors is located primarily along major drainages within the GCWRA: Canyon Diablo and Grapevine Canyon in the central portions of the GCWRA, Anderson and Yaeger Canyons in the northwest, and Jack's Canyon in the southeast. Stands of oak and cottonwood in the canyon bottoms, as well as canyon walls and rock outcroppings likely provide nest sites for raptors. Additionally, small areas of pinyon-juniper woodland, juniper savannah, and ponderosa pine forest may also provide nesting structures, particularly in the western-most Evaluation Area. Open, grassland habitat for ground-nesting species such as burrowing owls is present throughout the GCWRA, particularly within prairie-dog colonies which have been documented in Study Area "A".

The GCWRA lies within the Intermountain West region of the extensive American Pacific Flyway, one of five primary migratory routes for waterbirds, shorebirds, songbirds, and raptors. The seasonal migration of birds through Arizona generally occurs in a broad front throughout the state. The GCWRA contains a limited amount of stopover habitat for songbirds, waterfowl, and shorebirds in the forms of grassland, shrubland, pinyon-juniper woodland, and a few wetland/riparian areas, and it is likely that migrating birds utilize these areas during migration. The majority of the GCWRA is not likely to concentrate migrating birds; however, there is some potential for migrating birds that follow topography to concentrate along canyon rims, such as raptors that utilize updrafts and thermals created by topography. Additionally, the presence of prairie dog colonies and waterfowl/shorebirds concentrated at water sources, could concentrate resident and migrating raptors in portions of GCWRA.

At least 11 bat species have been recovered during carcass searches at wind-energy facilities throughout the U.S. and of these, five species are potential residents and/or migrants through the GCWRA: hoary bat, silver-haired bat, Mexican free-tailed bat, big brown bat, and western red bat. Of the 30 species of bat documented as occurring in Arizona, 20 species may occur within the GCWRA at some time during the year. Two bats with potential to occur in the GCWRA are listed as state species of special concern: spotted bat and western red bat. Seven species are documented within the Arizona Heritage Data Management System as occurring within the Canyon Diablo and/or Middle Little Colorado Watersheds: greater bonneted bat, Allen's big-eared bat, western small-footed bat, long-eared myotis, Arizona myotis, fringed myotis, and long-legged myotis. Potential roosting habitat for bats is located within caves, crevices, and rock outcrops along the canyon walls, riparian woodlands in canyon bottoms, and juniper



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savannah/woodlands primarily in the western-most portions of the GCWRA. Bats undoubtedly forage at the creeks, springs, ponds, and stock tanks throughout the GCWRA

The GCWRA falls within the range of the Anderson Mesa herd of pronghorn antelope which have declined as a result of habitat degradation and drought over the past decades, and a focus of research and management effort within the state. Additionally, elk and mule deer are also likely to utilize the GCWRA at points throughout the year. Due to the lack of data regarding the potential impacts of wind energy development on big game, it is difficult to predict the effects of the Project on antelope, mule deer and elk populations, though based on information received from AZGFD the following is anticipated: 1) potential impacts including potential displacement is moderate for wintering individuals utilizing Study Area A; 2) potential impacts during parturition is low for the GCWRA, and; 3) potential avoidance of portions of Study Area A, and to a lesser extent Study Area B, by migrating pronghorn is possible. While potential impact areas of Study Area A overlap habitat improvement areas during migration periods (and possibly over-winter), overall use of habitat improvement areas within the GCWRA is low to moderate.

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## 1.0 INTRODUCTION

When exploring prospective wind power sites, knowledge of wildlife and other biological resource issues helps the wind industry identify and avoid potential ecological problems early in the development process. At the request of Foresight Flying M, LLC (Foresight), Western EcoSystems Technology, Inc. (WEST) has prepared this Site Characterization Report for the proposed Grapevine Canyon Wind Resource Area (GCWRA) in Coconino County, Arizona. The purpose of this report is to characterize biological resources within the proposed GCWRA as well as the surrounding area. The GCWRA is comprised of three distinct areas, defined as Study Areas A, B, and C (Figure 1.1). The area evaluated in this report includes: 1) the three study areas of the proposed GCWRA, which is comprised of infrastructure including but not limited to turbines, underground electrical collection lines, roads, substations and facility buildings, as well as the immediate vicinity of development which includes existing residential developments, agricultural, natural and semi-natural habitats, and; 2) a two-mile buffer surrounding the GCWRA defined as the Evaluation Area (Figure 1.1). Roads included in the GCWRA include existing and proposed access roads (Figure 1.1). The two-mile size used for the Evaluation Area has been determined by WEST as appropriate for evaluating potential effects of a wind-energy project on wildlife. For instance, potential nesting habitat for raptors within one or two miles of the Project could potentially influence raptor use within the GCWRA. In addition, the two-mile buffer allows for comparison of the GCWRA with the surrounding landscape and provides some data for evaluating whether landcover, habitats or biological resources found within the GCWRA are unique to the region. A separate report evaluating biological and botanical resources for the proposed transmission line inter-connection for the GCWRA has been prepared (Tidhar and Chatfield 2010).

Biological resources within the GCWRA and the Evaluation Area were evaluated through a search of existing data, and a site visit. Several sources of available data were used to identify biological resources including published literature, field guides, and public data sets. The Arizona Game and Fish Department (AZGFD) and U.S. Fish & Wildlife Service (USFWS) were contacted concerning the presence of sensitive species and habitats within the GCWRA. Agency correspondence is included in Appendix A. The site visit was conducted on November 10 and 12, 2009 by Mr. David Tidhar of WEST Inc. to evaluate land cover and habitats, potential for avian migratory pathways, and to look for important biological features such as raptor nests, prey populations, and other biological resources. Numerous photographs were taken of the GCWRA and Evaluation Area (Appendix B).

Pre-construction wildlife surveys were completed at Study Area A of the Project in 2007 and 2008 by WEST (Young et al 2009). In addition, pre-construction avian use and bat activity monitoring surveys were completed at the nearby Sunshine Wind Park (WEST 2006 and Gruver et al 2009). The primary objective of Grapevine A and Sunshine surveys was to generate data on seasonal and annual use by birds and bats that would be useful in evaluating potential impacts from the proposed wind-energy facility, provide

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information that could be used in project planning to minimize impacts to birds and bats, and recommend further monitoring studies or potential mitigation measures, if warranted.

Wildlife surveys completed at Study Area A included: 1) year-round avian use surveys consisting of 20-minute diurnal surveys at fixed points; 2) seasonal bat surveys consisting of passive acoustic monitoring; 3) raptor nest surveys, and; 4) prairie dog colony mapping. The objective of this Site Characterization Report is to provide additional information on biological resources within the GCWRA and the Evaluation Area which may not have been directly addressed during pre-construction wildlife surveys completed at Study Area A in 2007 and 2008. For instance, while all sensitive wildlife species observed during pre-construction surveys were noted, some sensitive species may not have been detected due to the timing of surveys or potential restriction of rare habitats.

### 1.1 Environmental Setting

The proposed project is located in central Arizona along the southern edge of the Arizona/New Mexico Plateau Ecoregion, which covers much of northern Arizona and northwestern New Mexico (USEPA 2004). This Ecoregion is a transitional region between the semiarid, low relief tablelands in the east, the drier, shrubland/woodland covered, higher relief tablelands in the Colorado Plateau, and the lower, hotter, less-vegetated Mojave Basin and Range in the east and Chihuahuan Desert in the south. Higher, more forested, mountainous ecoregions border the Arizona/New Mexico Plateau to the northeast and southwest. Vegetation communities in the region are characteristic of Great Basin shrublands and grasslands. Higher elevations within the region support pinyon pine (*Pinus edulis*) and juniper (*Juniperus spp.*) forests. Historical grazing management has resulted in landscape changes throughout much of the region. Lack of regular fires and high grazing pressure may have led to conversion of some areas from native grassland to Great Basin desert scrub or conifer woodland (AZGFD 2006).

Immediately to the west of the GCWRA lies the Arizona/New Mexico Mountain Ecoregion, and portions of the western Evaluation Area extend into this region of higher elevations and more vegetation (USEPA 2004). Chaparral is common on the lower elevation slopes of the Arizona/New Mexico Mountain Ecoregion. Pinyon-juniper and oak (*Quercus spp.*) woodlands are found on lower and mid elevations, and open to dense ponderosa pine (*Pinus ponderosa*) forests occur at higher elevations. Forests of spruce (*Picea spp.*), fir (*Abies spp.*) and Douglas fir (*Pseudotsuga menziesii*) are found in only a few high-elevation parts of this ecoregion, and are absent from the GCWRA and Evaluation Areas.

The GCWRA is comprised of a combination of State Trust land managed by the Arizona State Land Department, and private lands owned by the Flying M Ranch and the Bar T Bar or Crater Ranch. State, federal, and private lands in the region are collectively managed as part of the Diablo Trust, a grassroots land management group comprised of ranchers, environmentalists, state and federal land managers and others working together to create research and educational programs, provide better habitat for wildlife and livestock, and protect open space in southern Coconino County. The GCWRA falls

within the Diablo Canyon Rural Planning Area, an amendment to the Coconino County Comprehensive Plan. The GCWRA is sparsely populated with very few houses, barns, or other structures. Topography within the GCWRA is generally very flat to gently sloping with the exception of a few low ridges and larger canyons with moderate to steep embankments or cliffs. The western-most portion of the Evaluation Area has greater topographic relief and is characterized by the edge of the Anderson Mesa, running in northwest to southeast orientation. While the vast majority of the GCWRA is characterized by Great Basin shrubland and grassland, the vegetation transitions into areas of juniper savannah, pinyon-juniper woodland, and ponderosa pine forest as the western portion of the Evaluation Area extends onto the Anderson Mesa (Figure 2.1). Elevations within the GCWRA range from approximately 1,700 –2,080 meters (m; 5,580 – 6,820 feet [ft]) above sea level, and elevations within the larger Evaluation Area range from approximately 1,650 – 2,100 m (5,410 – 6,890 ft; Figures 1.2 and 1.3). The western boundary of the GCWRA abuts the Coconino National Forest. The Raymond Wildlife Area, comprised of State Trust and Arizona Game and Fish Commission Lands, lies immediately to the north of the GCWRA. Jack’s Canyon runs along the southeast corner of the GCWRA, Canyon Diablo and Grapevine Canyon cut through the center of the GCWRA, and Yaeger Canyon run through the northwest corner of the GCWRA (Figures 1.2 and 1.3).

Physiographic differences between Study Areas A, B, and C are apparent. Study Area C contains lower elevation sections, particularly in the northern half of the area compared with Study Areas A and B (Figures 1.2 and 1.3). Study Areas A and B both contain slightly more relief than Study Area C, and the proportion of canyon found within Study Area A is greater than that found within Study Areas B and C (Figures 1.2 and 1.3). The majority of canyon found within the Study Areas is located along GCWRA boundaries. Land use is similar between all three Study Areas, with low-density cattle grazing occurring throughout the area.

## **2.0 LAND COVER**

The GCWRA encompasses approximately 94,950 acres in southern Coconino County. According to the National Landcover Dataset (NLCD 2001; Table 2.1; Figures 2.1 and 2.2), the dominant cover type is scrub-shrub which comprises 70,333.97 acres, or 74.1% of the GCWRA. The only other major land cover type is grassland, which comprises 23.7% (22,529.05 acres) of the GCWRA. The remaining 2.2% of the GCWRA consists of very small amounts of evergreen forest (1,587.92 acres; 1.7%), woody wetlands (375.11 acres; 0.4%), barren land (90.09 acres; 0.1%), cropland (13.10 acres; < 0.1%), pasture/hay fields (12.38 acres; <0.1%), and developed open space (9.60 acres; < 0.1%). According to NLCD maps, evergreen forest is primarily restricted to the northwest corner of Study Area A, and along the western and southern boundary of Study Area B (Figure 2.1). However, the NLCD database appears to be confounding desert scrub with juniper-savannah woodlands, which dominate extensive portions of the southern half of the GCWRA (based on site observations [Appendix B]), but are classified as desert scrub by the NLCD. Evergreen forests within the area consist mainly of juniper savannah,

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however, some small areas of pinyon-juniper woodland do exist within the GCWRA and very small patches of ponderosa pine forest are found in isolated pockets of high elevation portions of the Evaluation Area; principally south of Study Areas A and B (Figure 2.1).

The Evaluation Area, which includes a 2-mile buffer surrounding the GCWRA, encompasses approximately 178,360 acres, and has a composition that is generally similar to that of the GCWRA according to the NLCD database (Table 2.1; Figures 2.1 and 2.2). The Evaluation Area has a slightly lower percentage of both scrub-shrub (69.2%) and grassland (18.4%) than the GCWRA, but a higher percentage of evergreen forest (11.9%). This is primarily due to the presence of pinyon-juniper woodland and ponderosa pine forest within higher elevation habitats in the western-most portions of the Evaluation Area, to the south of Study Areas A and B (Figure 2.1). Canyon bottoms within the GCWRA and Evaluation Area also contain Gambel's oak (*Quercus gambelii*) and cottonwood (*Populus fremontii*) trees, as well as several shrub species, not present within the vast majority of the GCWRA.

Landcover does not significantly differ among the three Study Areas of the Project (Table 2.2). Study Area C is the largest of the three Study Areas; constituting approximately 49,470 acres or 52% of the GCWRA. Study Area C contains slightly more grassland than the other Study Areas according to NLCD data. Study Area A contains the largest amount of woody wetlands (69 acres), due to the greater proportion of canyon found within the GCWRA compared with Study Areas B or C (Table 2.2, Figure 1.1).

Non-native plant species are present within the GCWRA, including regionally common noxious weed species. Following turbine construction, site restoration activities should begin immediately to minimize the spread of noxious weeds. Temporary construction areas around turbines, access road corridors, any temporary crane paths, and other temporarily disturbed areas should be restored according to the construction plan and any applicable state or federal permits. In general, restoration activities should include subsoil de-compaction (as necessary), rock/gravel removal, re-establishing pre-construction contours, spreading of stockpiled topsoil, and re-vegetation by seeding and mulching.



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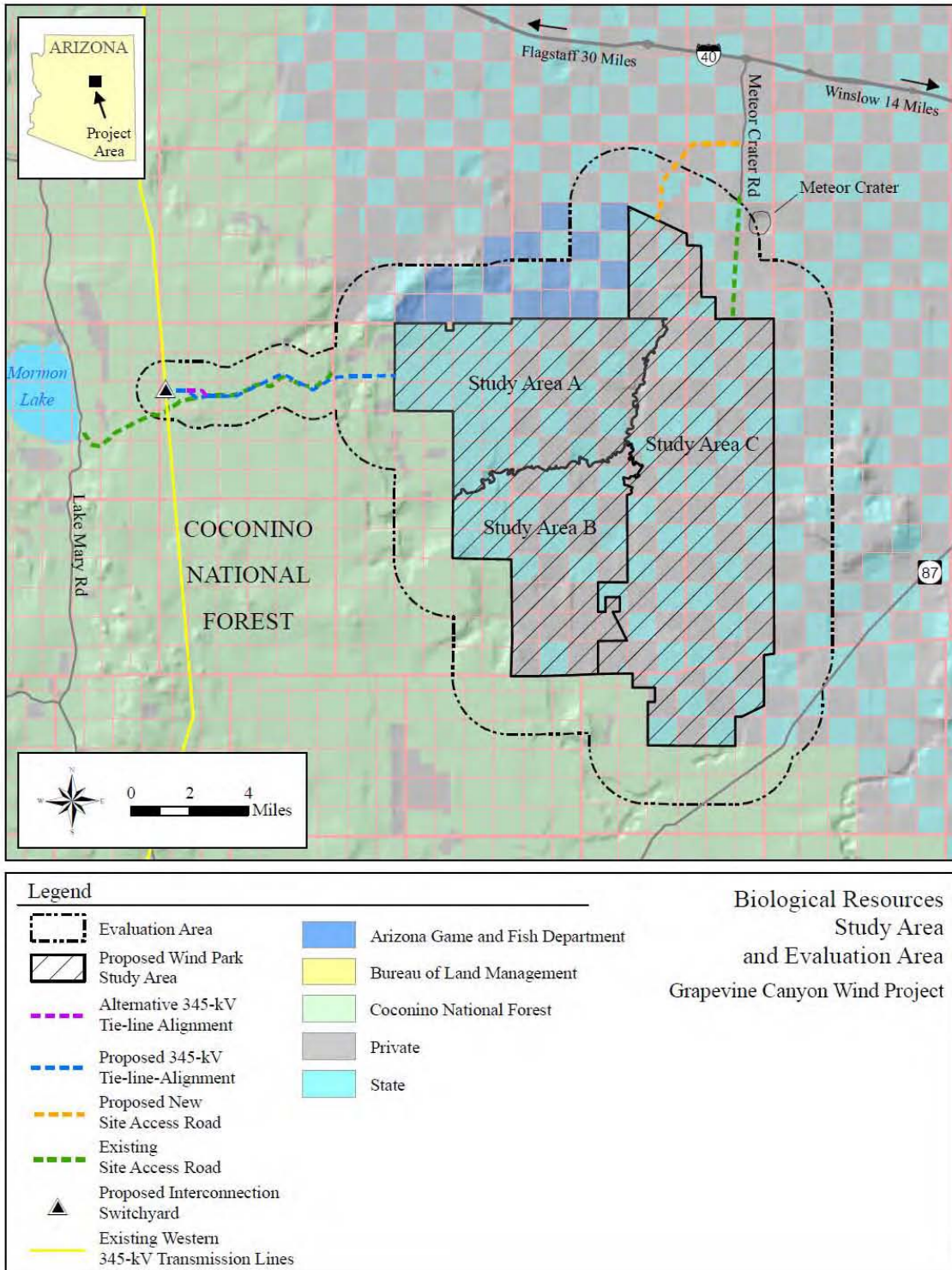


Figure 1.1 Location and composition of the Grapevine Canyon Wind Resource Area.



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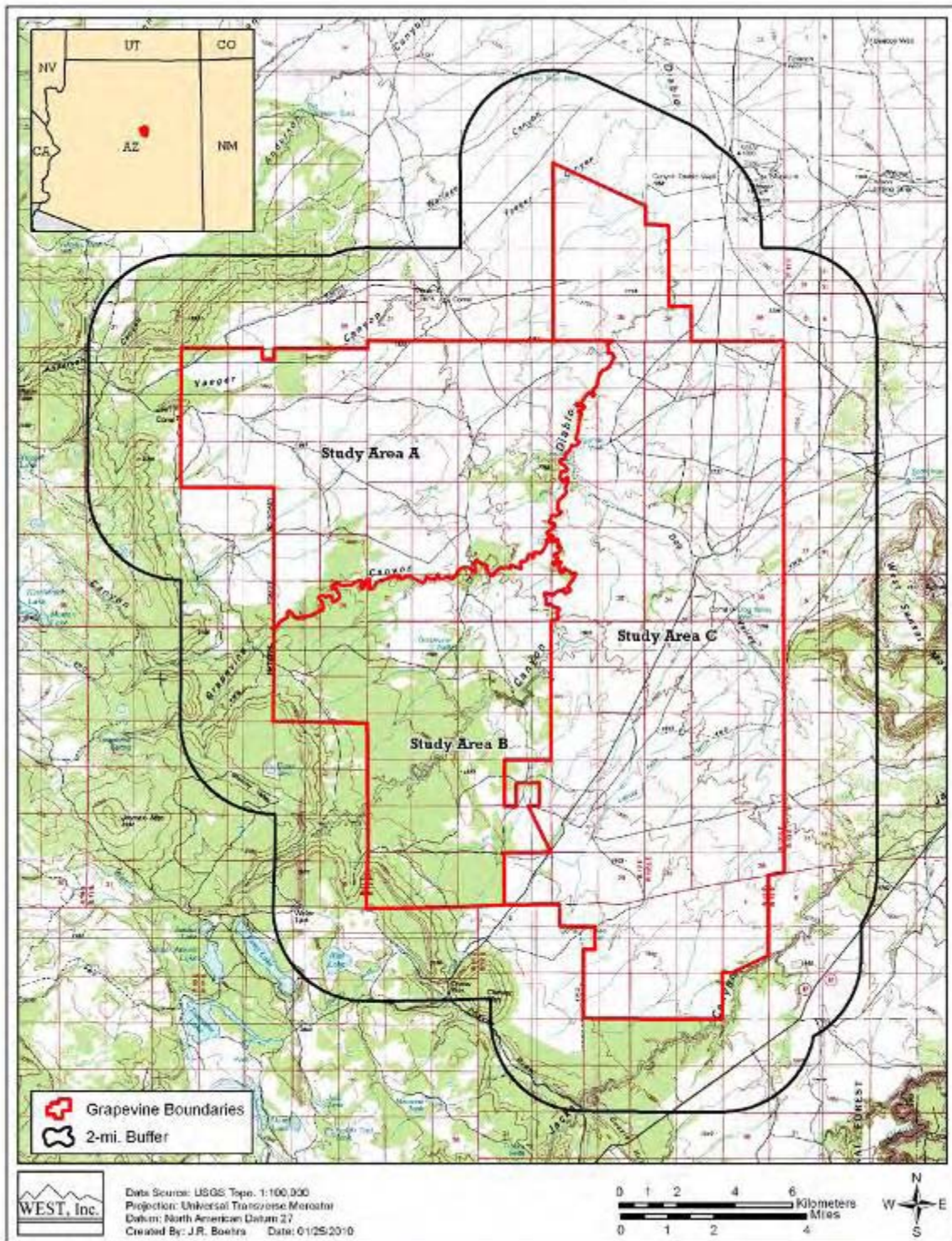


Figure 1.2 Topographic map of the Grapevine Canyon Wind Resource Area and Evaluation Area.

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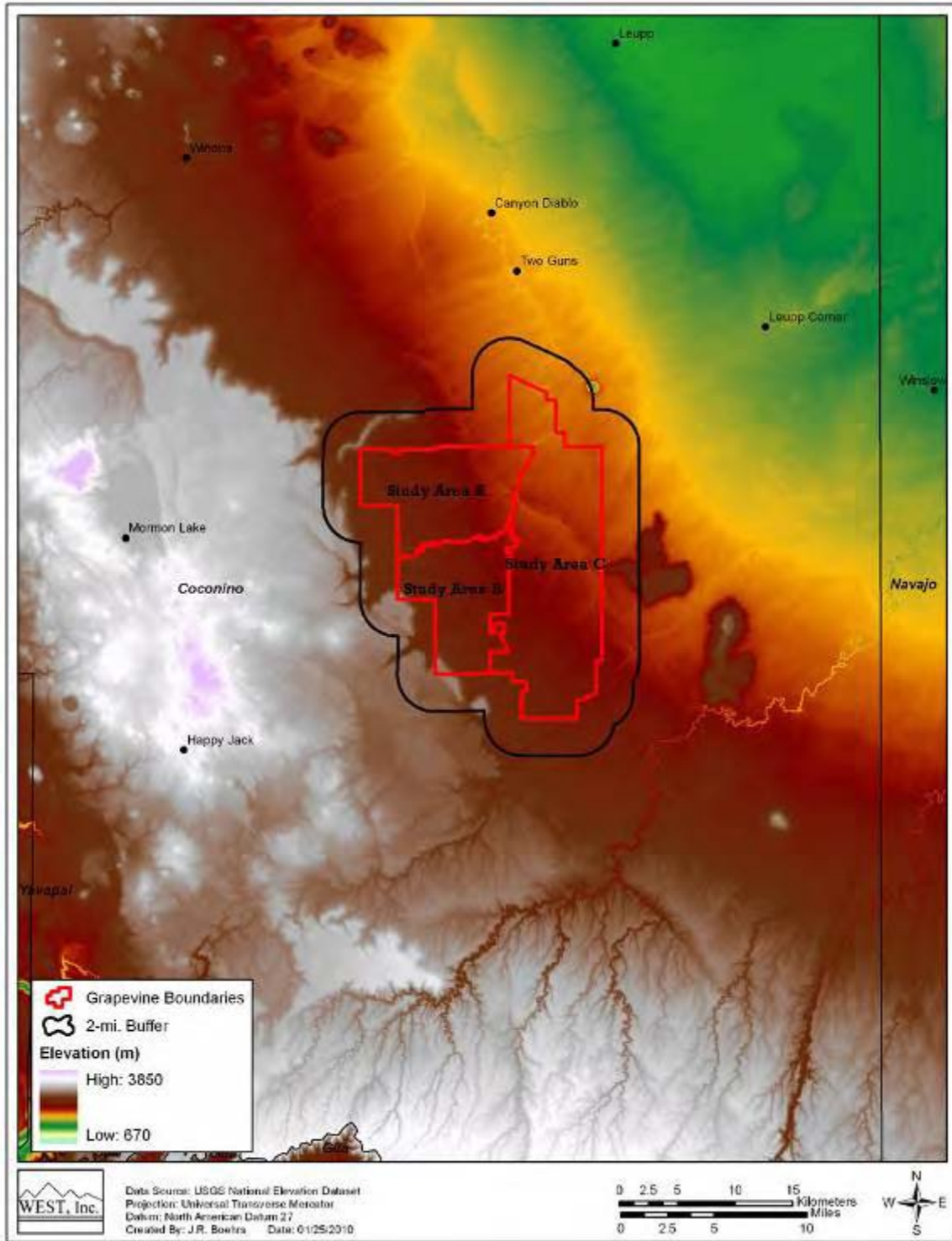
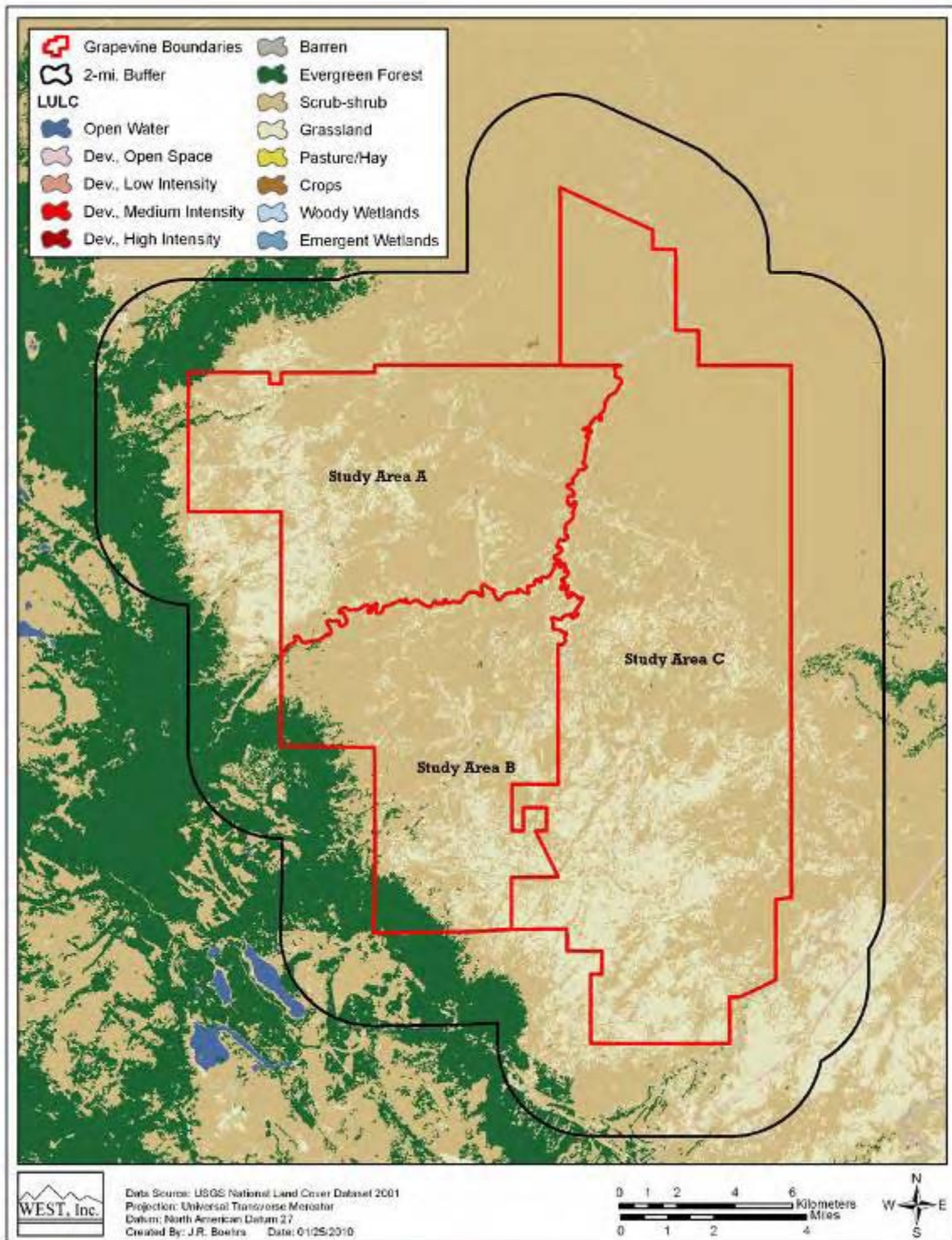


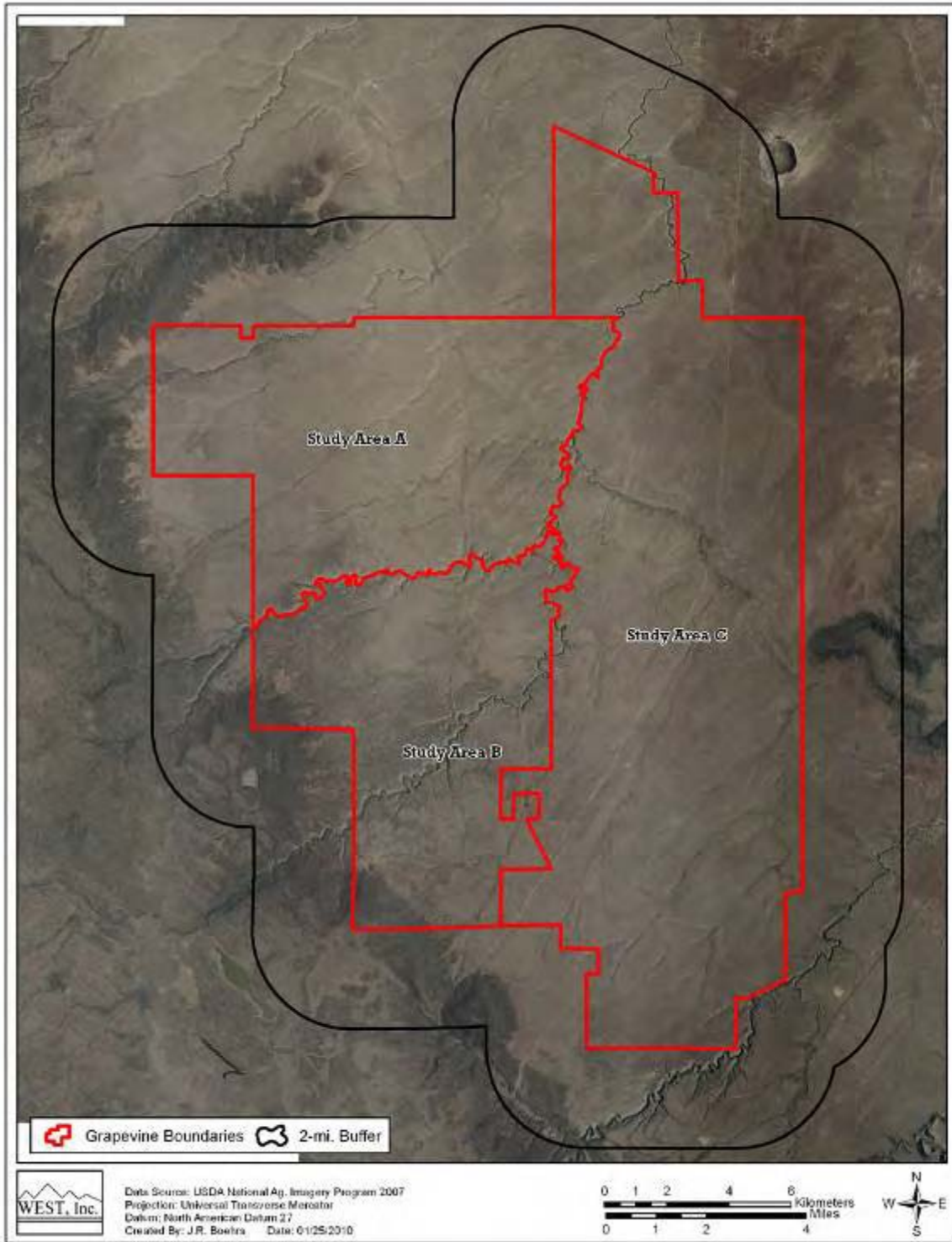
Figure 1.3 Digital elevation model of the Grapevine Canyon Wind Resource Area and Evaluation Area.



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**Figure 2.1 Land cover types within the Grapevine Canyon Wind Resource Area and Evaluation Area.**



**Figure 2.2 Aerial photograph of the Grapevine Canyon Wind Resource Area and Evaluation Area.**

**Table 2.1. Land use/habitat types present within the GCWRA and Evaluation Area. Data were obtained from USGS National Landcover Dataset compiled from satellite imagery (USGS 2001).**

Cover Type	GCWRA		Evaluation Area	
	Acreage	% Composition	Acreage	% Composition
Open Water	0	0	2.39	< 0.1
Developed, Open Space	9.60	< 0.1	166.08	0.1
Barren	90.09	0.1	114.16	0.1
Evergreen Forest	1,587.92	1.7	21274.10	11.9
Scrub-shrub	70,333.97	74.1	123355.55	69.2
Grassland	22,529.05	23.7	32842.24	18.4
Pasture/Hay	12.38	< 0.1	38.57	< 0.1
Crops	13.10	< 0.1	44.54	< 0.1
Woody Wetlands	375.11	0.4	524.00	0.3
<b>Total</b>	<b>94,951.21</b>	<b>100</b>	<b>178,361.61</b>	<b>100</b>

## 2.2 Wetlands and Riparian Areas

Broad-scale information concerning wetlands is based on data from the USFWS National Wetlands Inventory (USFWS 2004; Figure 2.3), land cover mapping (Table 2.1; Figure 2.1), aerial photography (Figure 2.2), and the site visit. Only a very small percentage of the GCWRA is classified as wetland; based on USFWS National Wetland Inventory (NWI) data, < 0.1% (30.86 acres) of the GCWRA is comprised of wetland habitat, all of which is classified as pond habitat. Similarly, only 0.1% (212.04 acres) of the Evaluation Area is comprised of wetland habitat, 123.53 acres of which is classified as lake habitat and 88.51 of which is pond habitat. A large proportion of the wetland habitat identified through NWI is natural wetlands, with the majority of wetlands identified via NWI consisting of cattle stock tanks and ponds (Appendix B). While some of the stock tanks and ponds have likely been constructed on top of pre-existing wetlands, many of the estimated 25 water tanks and ponds located throughout the GCWRA appear to be located in areas which do not appear capable of supporting natural wetlands. Formal wetland delineations have not been completed. Irrespective of their origin or characteristics, ephemeral and perennial waterbodies provide important wildlife habitat and focal areas within the arid region.

The GCWRA falls within the east-central portion of the Canyon Diablo Watershed, and the western-most portion of the Middle Little Colorado Watershed. Water drains the GCWRA in a general southwest to northeast direction. Larger waterways include Jack's Canyon in the southeast corner of the GCWRA (Study Area C), Canyon Diablo and Grapevine Canyon in the central portion of the GCWRA (Study Areas A-C), and Yaeger Canyon in the northwest corner of the GCWRA (Study Area A) (Figure 2.3). These canyons generally do not hold water year-round; however, during the site visit in November, water was present in some areas of the streams indicating the presence of ephemeral springs. Livestock drinkers and earthen stock ponds are also present

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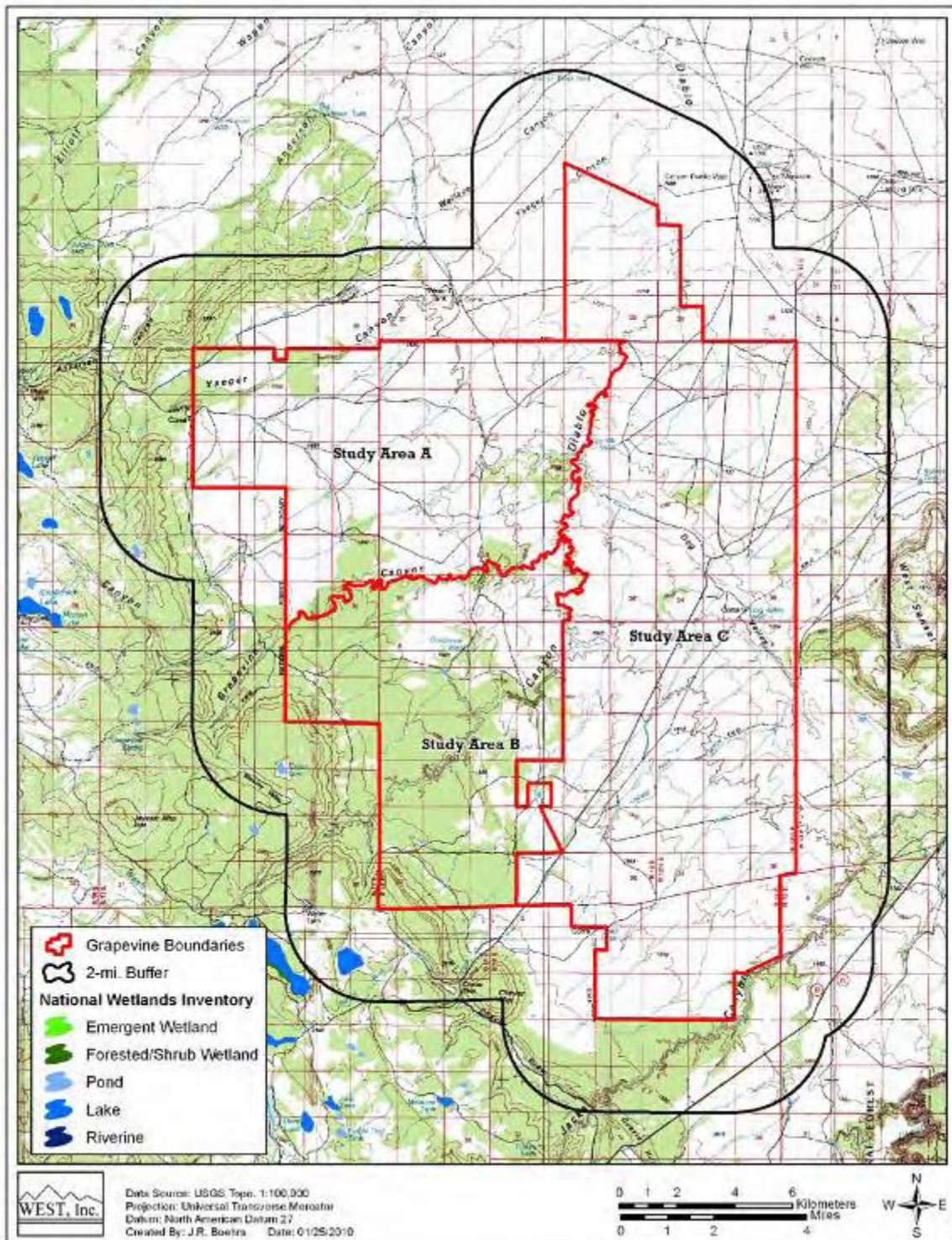
**Table 2.2. Land use/habitat types present within each Study Area of the GCWRA. Data were obtained from USGS National Landcover Dataset compiled from satellite imagery (USGS 2001).**

Study Area A			Study Area B			Study Area C		
Habitat	Acres	% Comp.	Habitat	Acres	% Comp.	Habitat	Acres	% Comp.
Barren	68.59	0.3%	Barren	8.99	0.0004	Barren	12.51	0.0003
Evergreen Forest	123.03	0.5%	Evergreen Forest	1463.59	0.0714	Evergreen Forest	1.30	0.0000
Scrub-shrub	19532.33	78.2%	Scrub-shrub	14606.09	0.7129	Scrub-shrub	36195.55	0.7317
Grassland	5178.25	20.7%	Grassland	4283.84	0.2091	Grassland	13066.95	0.2641
Pasture/Hay	5.21	0.0%	Pasture/Hay	1.06	0.0001	Pasture/Hay	6.11	0.0001
Crops	4.83	0.0%	Crops	3.70	0.0002	Crops	4.56	0.0001
Woody Wetlands	69.63	0.3%	Woody Wetlands	121.78	0.0059	Woody Wetlands	183.70	0.0037
						Dev., Open Space	9.60	0.0002
<b>Total</b>	<b>24981.88</b>	<b>100.0%</b>	<b>Total</b>	<b>20489.06</b>	<b>1.0000</b>	<b>Total</b>	<b>49470.68</b>	<b>1.0000</b>

throughout the GCWRA; however, little to no natural wetland vegetation is present in these areas. Several small seasonal lakes are present within the western-most portions of the Evaluation Area, the largest of which are Red Lake and Comer Lake, approximately one mile to the southwest and west of Study Area B, respectively (Figure 2.3). A number of larger seasonal lakes and wetlands are present along Anderson Mesa to the west of the Evaluation Area (Figure 2.3).



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**Figure 2.3 National Wetlands Inventory map of Grapevine Canyon Wind Resource Area and Evaluation Area.**

### 2.3 Sensitive Plant Species

Plant species can be directly affected by wind power facilities due to loss of individuals and populations from construction and habitat alteration. All federal- and state-listed species recorded for Coconino County and/or considered by the USFWS (2009) or AZGFD (2009a) to have the potential for occurrence within the county were evaluated. Species habitat and distribution information was reviewed and species were ranked for potential of occurrence within the GCWRA qualitatively from no potential for occurrence (“none”), to highest probability for occurrence (“high”) along the following scale:

Classification	Definition
None	No potential for occurrence. Known range and distribution do not overlap GCWRA. Potential habitat completely absent from GCWRA. No species accounts for GCWRA or surrounding area exist <sup>2</sup> .
Extremely Low	Extremely low probability of occurrence. Known range and distribution may not include GCWRA. Very limited potential habitat is available within GCWRA. No species accounts for GCWRA or surrounding area exist <sup>2</sup> .
Low	Low probability of occurrence. Known range and distribution include GCWRA. Potential habitat available patchily or in isolated areas within GCWRA. No species accounts for GCWRA or surrounding area exist <sup>2</sup> .
Moderate	Moderate probability of occurrence. Range and distribution include GCWRA. Habitat present within GCWRA. Species accounts for GCWRA or surrounding area may exist <sup>2</sup> .
High	Highest probability of occurrence. Range and distribution overlap GCWRA. Habitat abundant within GCRWA. Species accounts exist for GCWRA.

<sup>2</sup>= secondary qualifier for rank. Species accounts are not available equally across geographic regions and are influenced by survey effort, land ownership and access, financing of natural heritage programs and other factors. This information is useful for confirming that a given species was present in the GCWRA, but may not be sufficient information to confirm absence.

#### 2.3.1 Federal Listed Species

The USFWS (2009) lists seven plant species designated as endangered, threatened, or candidate species with known or potential occurrence in Coconino County, Arizona (Table 2.3). The AZGFD (2009a), which maintains lists of sensitive plant and wildlife species at the watershed level, lists a further six plants considered federal species of concern and one federal endangered species having documented presence within the

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Canyon Diablo and/or Middle Little Colorado Watersheds (Table 2.3). None of these plants have been documented as occurring within the GCWRA; however, it is likely that rare plant surveys have never been conducted in the area. Due to a very limited distribution and/or specific habitat requirements, six of the plants listed below are not likely to occur in the area (Table 2.3). Another three species have extremely low probability for potential to occur in the GCWRA or Evaluation Area based on species accounts and known distributions (AZGFD 2009b). A further four species have low probability for occurrence; while one species is ranked moderate, and zero are ranked as high. Based on information received from the AZGFD and USFWS (Appendix A), no federal threatened, endangered or sensitive plant species are known to occur within five miles of the GCWRA, and no critical habitat for federal listed species occurs within the GCWRA.

### 2.3.2 State Sensitive Species

The AZGFD (2009a) lists 16 state sensitive plant species with documented occurrence in the Canyon Diablo and/or Middle Little Colorado Watersheds (Table 2.4). These include three “Highly Restricted” species (i.e., no collection allowed) and 13 “Salvage Restricted” species (i.e., collection allowed only by permit). Of these, six species (blumer’s dock [*Rumex orthoneurus*], gladiator milk-vetch [*Astragalus xiphoides*], Mogollon thistle [*Cirsium parryi mogollonicum*], paper-spined cactus [*Pediocactus papyracanthus*], Peebles Navajo cactus [*Pediocactus peeblesianus* var. *peeblesianus*], and San Francisco Peaks groundsel [*Senecio franciscanus*]) are also listed as federal threatened or endangered species, or federal species of concern by the USFWS (see Table 2.3). Although the GCWRA contains relatively low diversity, there are areas of native shrub, grassland, juniper woodland, and wetland habitat that may support sensitive plant species. Of the state sensitive plant species with known occurrence in the Canyon Diablo and Middle Little Colorado Watersheds, seven species are not likely to occur due to their dependence on wetland, forest, or high-elevation habitats which are absent from the GCWRA and Evaluation Area. Three species have extremely low potential for occurrence; while five are ranked low, one is ranked moderate and zero are ranked high. Based on information received from the AZGFD (Appendix A), no state sensitive plant species are known to occur within five miles of the GCWRA, and there are no Critical Habitats documented within the GCWRA.

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**Table 2.3 Plant species listed as Federal endangered, threatened, candidate, or species of concern potentially occurring in the GCWRA. Results from USFWS (2009) and AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Habitat <sup>2</sup>	Potential for Occurrence
blumer's dock <i>Rumex orthoneurus</i>	FSC	Mid- to high-elevation wetlands; moist, organic soil; adjacent to perennial springs or streams in canyons or meadow situations.	<b>Low.</b> Not likely to occur in GCWRA due to preference for perennial wetland habitat; increased potential to occur in Evaluation Area to west of Study Areas A and B.
brady pincushion cactus <i>Pediocactus bradyi</i>	FE	Gravelly alluvium on gently sloping benches and terraces with sparse vegetation of scattered shrubs, grasses, and annuals; open, exposed, sunny situations.	<b>Extremely Low.</b> Known only in northern portion of County, but potential habitat present in the GCWRA (all three Study Areas).
cinder phacelia <i>Phacelia serrata</i>	FSC	Primarily in volcanic cinder areas associated with volcanic cones but also roadcuts and abandoned quarries in open, exposed, sunny locations.	<b>None.</b> Documented occurrence in Canyon Diablo watershed, north of Flagstaff; no potential to occur in the GCWRA (all three Study Areas). GCWRA and Evaluation Area dominated by basalt.
fickeisen plains cactus <i>Pediocactus peeblesianus fickeiseniae</i>	FC	Ridge-tops and benches with slight to moderate slope in gravelly limestone/gravelly loam soils; also in grasslands at foot of cliffs.	<b>Extremely Low.</b> Known only in northern and central Coconino County; potential to occur in GCWRA in isolated pockets of limestone which may be present, however, GCWRA and Evaluation Area dominated by basalt.
gladiator milk-vetch <i>Astragalus xiphoides</i>	FSC	Grasslands and alluvial plains from 5,000 to 6,000 ft.; generally associated with badlands of broken sandstone and clay bluffs in washes, floodplains, or complexes of small arroyos.	<b>Low.</b> Known in the Middle Little Colorado watershed to east of GCWRA; potential to occur in GCWRA (all three Study Areas).

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**Table 2.3 Plant species listed as Federal endangered, threatened, candidate, or species of concern potentially occurring in the GCWRA. Results from USFWS (2009) and AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Habitat <sup>2</sup>	Potential for Occurrence
Mogollon thistle <i>Cirsium parryi mogollonicum</i>	FSC	Moist to very moist soils in the shaded riparian understory of perennial streams found in coniferous forests; newly discovered in AZ and little known about species.	<b>Extremely Low.</b> Very limited distribution in very south of Coconino County (along Mogollon Rim); not likely to occur in GCWRA due to habitat preference.
Navajo sedge <i>Carex specuicola</i>	FT	Shady seep/springs and hanging gardens, on vertical pink-red Navajo Sandstone cliffs and alcoves; found in juniper-pinyon woodlands.	<b>None.</b> Known only in northwest corner of County; not likely to occur in GCWRA due to habitat requirements and distribution.
paper-spined cactus <i>Pediocactus papyracanthus</i>	FSC	Open flats in grasslands and pinyon-juniper woodlands; associated with grama grass; restricted to fine, sandy clay loams and red sandy soils.	<b>Low.</b> Found in the middle Little Colorado watershed, to east of the GCWRA; potential to occur in GCWRA (all three Study Areas).
Peebles Navajo cactus <i>Pediocactus peeblesianus</i> var. <i>peeblesianus</i>	FE	Exposed, sunny situations in weakly alkaline, gravelly soils of the Little Colorado Paleochannel; gently sloping hills to flat hilltops in desert scrub and grassland.	<b>Moderate.</b> Found in the middle Little Colorado watershed to east of GCWRA; potential to occur in GCWRA (all three Study Areas).
San Francisco Peaks groundsel <i>Senecio franciscanus</i>	FT	In cracks and crevices of talus slopes in alpine fellfields on San Francisco Peaks; primary succession species.	<b>None.</b> Known only from San Francisco Peaks north of Flagstaff; alpine species – no potential to occur in GCWRA based on habitat and distribution.
sentry milk-vetch <i>Astragalus cremnophylax</i> var. <i>cremnophylax</i>	FE	In uppermost layer of Kaibab limestone in open, pinyon-juniper-cliffrose plant communities above 4,000 ft.	<b>None.</b> Known only in central portion of County, near the Grand Canyon; not likely to occur in GCWRA due to habitat requirements and distribution.

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**Table 2.3 Plant species listed as Federal endangered, threatened, candidate, or species of concern potentially occurring in the GCWRA. Results from USFWS (2009) and AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Habitat <sup>2</sup>	Potential for Occurrence
siler pincushion cactus <i>Pediocactus sileri</i>	FT	Low red or gray gypsiferous badlands derived from the Moenkopi Formation; restricted to gypsum, selenium, and calcareous soils, high in soluble salts.	<b>None.</b> Found in very northeast of County; not likely to occur in GCWRA due to habitat requirements and distribution.
Welsh phacelia <i>Phacelia welshii</i>	FSC	Great Basin cold desert scrub communities, typically in the red shale outcrops of the Moenkopi Formation along roadsides and gravelly washes; also on black, sandy, volcanic ash.	<b>Low.</b> Found in the Little Colorado River drainage, north of the GCWRA; potential to occur in GCWRA (all three Study Areas).
Welsh's milkweek <i>Asclepias welshii</i>	FT	Open, sparsely vegetated semi-stabilized coral pink sand dunes in sagebrush, juniper, pine, and oak communities of Great Basin desert scrub.	<b>None.</b> Known only from north of County; not likely to occur in GCWRA due to habitat requirements.

<sup>1</sup>FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate for listing; FSC = Federal Species of Concern

<sup>2</sup>Habitat and species distribution information from AZGFD (2005)

## 2.4 Vegetation Summary and Conclusions

The primary vegetation communities within the GCWRA are scrub-shrub, juniper savannah and woodland, and grassland. Wetlands are very limited within the area, comprising less than 0.1% of the total GCWRA. Many waterbodies are comprised of artificial water tanks or ponds utilized for cattle. Seven federal listed plant species are listed as occurring in Coconino County and 16 state sensitive (highly restricted or salvage restricted) plants are listed as occurring in the Canyon Diablo and/or Middle Little Colorado Watersheds (AZGFD 2009a). The majority of these plants has limited distributions and specific habitat requirements and are not expected to occur in the GCWRA; however, the GCWRA does contain areas of native shrub, grassland, and woodland habitat, and a very small amount of wetland habitat that could potentially support some sensitive plant species. Upper-elevation portions of the Evaluation Area containing ponderosa pine forest may support some plant species not supportable within the GCWRA. Canyon bottoms containing riparian areas, deciduous woodlands, wetlands or waterbodies may support wetland and mesic plant species not found within the vast majority of the GCWRA. Canyon bottoms are not likely to be impacted by Project facilities or infrastructure. Based on information received from the AZGFD, no threatened, endangered, or sensitive plant species are known to occur within five miles of the GCWRA, and there are no Critical Habitats documented within the GCWRA (Appendix A). No sensitive plant species are considered to have high probability for occurrence within the GCWRA or Evaluation Area. Of federal- and state-listed plant species, only the Peebles Navajo cactus *Pediocactus peeblesianus* var. was ranked as having moderate potential to occur within the GCWRA, based on availability of habitat and known distribution within the vicinity of the Evaluation Area; though no records exist within five-miles of the Evaluation Area. The species occurs on gently sloping sunny aspects with desert scrub or grassland vegetation on in weakly alkaline, gravelly soils.

Study Area A may contain more potential sensitive plant species habitat than Study Area B or C, due largely to the greater proportion of canyon bottom wetland habitat found within Study Area C (Table 2.2; Figure 1.2). In addition, there appear to be a greater number of wetland and waterbodies located within Study Area A and B compared with Study Area C.



**Table 2.4 Plant species listed as state species of concern with known or potential occurrence the Canyon Diablo and Middle Little Colorado Watersheds, Coconino County, Arizona. Results from AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Watershed	Habitat <sup>2</sup>	Potential for Occurrence
blumer's dock <i>Rumex orthoneurus</i>	HS	MLC	Mid- to high-elevation wetlands; moist, organic soil; adjacent to perennial springs or streams in canyons or meadow situations.	<b>Low.</b> Not likely to occur in GCWRA due to preference for perennial wetland habitat; increased potential to occur in Evaluation Area to west of Study Areas A and B.
broadleaf twayblade <i>Listera convallarioides</i>	SR	MLC	Moist mixed deciduous/coniferous forests, growing in rich humus in open woods to boggy meadows; in Arizona grows along banks of perennial streams or seeps in mosses or damp soil.	<b>None.</b> Occurs in very south of County; not likely to occur in GCWRA due to habitat requirements; greater potential to occur in Evaluation Area, to west of Study Areas A and B.
Flagstaff pennyroyal <i>Hedeoma diffusum</i>	SR	CD	Open, ponderosa pine habitats; prefers weathered limestone solution pockets filled with 4-6 inches of soil, but also grows in vertical cracks and around edges of boulders.	<b>None.</b> Known west of GCWRA; not likely to occur in GCWRA due to habitat requirements. GCWRA and Evaluation Area dominated by basalt and very limited distribution of ponderosa pine in Evaluation Area.
gladiator milk-vetch <i>Astragalus xiphoides</i>	SR	MLC	Grasslands and alluvial plains from 5,000 to 6,000 ft.; generally associated with badlands of broken sandstone and clay bluffs in washes, floodplains, or complexes of small arroyos.	<b>Low.</b> Known in the Middle Little Colorado watershed to east of GCWRA; potential to occur in Study Areas A, B, C

**Table 2.4 Plant species listed as state species of concern with known or potential occurrence the Canyon Diablo and Middle Little Colorado Watersheds, Coconino County, Arizona. Results from AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Watershed	Habitat <sup>2</sup>	Potential for Occurrence
Grand Canyon cottontop cactus <i>Echinocactus polycephalus</i> <i>var. xeranthemoides</i>	SR	MLC	Rocky hills, slopes, and ledges of canyons in Great Basin and Mojave Desert scrub; found on rocky, mostly south-facing ledges or canyons or on rocky hillsides in Navajoan Desert or on edge of juniper-pinyon woodland.	<b>Low.</b> Known to occur north of GCWRA in Middle Little Colorado Watershed; habitat in canyons of Study Areas A, B, C. GCWRA may be suitable.
green death camus <i>Zigadenus virescens</i>	SR	CD	Montane coniferous forests; generally above 6,500 ft.	<b>Extremely Low.</b> Not likely to occur in GCWRA due to habitat and elevation range; some potential to occur in Evaluation Area, to west of Study Areas A and B.
mazatzal triteleia <i>Triteleia lemmoniae</i>	SR	MLC	Sparse pine woodlands; typically understory plant along streams, in boggy areas, near ponds and lakes, in open meadows or pastures, and on rocky hillsides.	<b>Extremely Low.</b> Known to west and south of GCWRA; not likely to occur in GCWRA due to preference for pine woodlands; increased potential to occur in Evaluation Area, to west of Study Areas A and B.
Mogollon columbine <i>Aquilegia desertorum</i>	SR	CD, MLC	In potholes and clefts of Kaibab limestone outcrops in ponderosa pine community; often shaded by pine overstory; moist to xeric sites.	<b>None.</b> Know to west and south of GCWRA; not likely to occur in GCWRA due to preference for ponderosa pine woodland; increased potential to occur in Evaluation Area, to west and south of Study Areas A and B.

**Table 2.4 Plant species listed as state species of concern with known or potential occurrence the Canyon Diablo and Middle Little Colorado Watersheds, Coconino County, Arizona. Results from AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Watershed	Habitat <sup>2</sup>	Potential for Occurrence
Mogollon thistle <i>Cirsium parryi mogollonicum</i>	SR	MLC	Moist to very moist soils in the shaded riparian understory of perennial streams found in coniferous forests; newly discovered in AZ and little known about species.	<b>Extremely Low.</b> Very limited distribution in very south of Coconino County (along Mogollon Rim); not likely to occur in GCWRA due to habitat preference.
paper-spined cactus <i>Pediocactus papyracanthus</i>	SR	MLC	Open flats in grasslands and pinyon-juniper woodlands; associated with grama grass; restricted to fine, sandy clay loams and red sandy soils.	<b>Low.</b> Found in the middle Little Colorado watershed, to east of the GCWRA; potential to occur in GCWRA (all three Study Areas).
Pebbles Navajo cactus <i>Pediocactus peeblesianus</i> <i>var. peeblesianus</i>	HS	MLC	Exposed, sunny situations in weakly alkaline, gravelly soils of the Little Colorado Paleochannel; gently sloping hills to flat hilltops in desert scrub and grassland.	<b>Moderate.</b> Found in the middle Little Colorado watershed to east of GCWRA; potential to occur in Study Areas A, B, C
purple adder's mouth <i>Malaxis porphyrea</i>	SR	MLC	Mixed conifer forest; near slightly damp, mossy, or grassy places in slightly open forests; generally above 7,000 ft.	<b>None.</b> Known to south of GCWRA; no potential to occur in GCWRA or Evaluation Area due to habitat requirements.
Rocky Mountain bristlecone pine <i>Pinus aristata</i>	SR	CD	Dry, rocky slopes and ridges near timberline in montane and subalpine areas; generally above 7,500 ft.	<b>None.</b> No potential to occur in GCWRA or Evaluation Area due to habitat and elevation range.

**Table 2.4 Plant species listed as state species of concern with known or potential occurrence the Canyon Diablo and Middle Little Colorado Watersheds, Coconino County, Arizona. Results from AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Watershed	Habitat <sup>2</sup>	Potential for Occurrence
roundleaf errazurizia <i>Errazurizia rotundata</i>	SR	MLC	Exposed areas within Great Basin desert scrub habitats; found in sandy soils in sandstone, gravelly soils in calcareous outcrops, and deep alluvial cinders in sandstone breaks.	<b>Low.</b> Known to north and east of GCWRA; potential to occur in Study Areas A, B, C
San Francisco Peaks groundsel <i>Senecio franciscanus</i>	HS	CD	In cracks and crevices of talus slopes in alpine fellfields on San Francisco Peaks; primary succession species.	<b>None.</b> Known only from San Francisco Peaks north of Flagstaff; alpine species – no potential to occur in GCWRA based on habitat and distribution.
sunset crater beardtongue <i>Penstemon clutei</i>	SR	CD	Cinder fields devoid of soil covering and where other herbaceous vegetation is sparse; generally above 6,100 ft.	<b>None.</b> Found to northwest of GCWRA; not likely to occur in GCWRA due to absence of cinder fields in basalt dominated region

<sup>1</sup>HS = Highly Safeguarded – no collection allowed; SR = Salvage Restricted – collection only with permit

<sup>2</sup>Habitat and species distribution information from AZGFD (2005)

### 3.0 WILDLIFE

Wildlife can be directly affected by wind power facilities due to loss of individuals and populations from construction and habitat alteration (NWCC 2007, Young et al 2009). Wildlife may also be indirectly affected by construction or operation of wind-energy facilities (for more information please see NWCC 2007). All wildlife species observed within the GCWRA or Evaluation Area during the site visit conducted on November 10 and 12, 2009 were recorded (Table 3.1). None of the birds observed during the site visit were new to the GCWRA, as all bird species had previously been recorded during Study Area A preconstruction wildlife surveys (Young et al 2009). Black bear (*Ursus americanu*), deermouse (*Peromyscus maniculatus*), woodrat (*Neotoma* spp.) and mountain lion (*Puma concolor*) sign were observed during the site visit within a remote canyon bottom; these species were not previously observed by WEST.

**Table 3.1. Wildlife observed during the GCWRA site visit.**

Common name	Scientific name
<b>Birds</b>	
Golden eagle	<i>Aquila chrysaetos</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Common raven	<i>Corvus corax</i>
Western meadowlark	<i>Sturnella neglecta</i>
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>
Mountain bluebird	<i>Sialia currucoides</i>
Horned lark	<i>Eremophila alpestris</i>
<b>Mammals</b>	
Deermouse	<i>Peromyscus maniculatus</i>
Unidentified woodrat	<i>Neotoma spp.</i>
Gunnison’s prairie dog	<i>Cynomys gunnisoni</i>
Pronghorn antelope	<i>Antilocapra Americana</i>
Mule deer	<i>Odocoileus hemionus</i>
Elk	<i>Cervus elaphus</i>
Black bear	<i>Ursus americanu</i>
Mountain lion	<i>Puma concolor</i>

The potential for wildlife species to occur within the GCWRA or Evaluation Area and information regarding potential for relative abundance or distribution was evaluated. Species habitat and distribution information available from published reports and publically available data sets was reviewed. Species were ranked for potential of occurrence within the GCWRA qualitatively from no potential for occurrence (“none”), to highest probability for occurrence (“high”) along the following scale:

Classification	Definition
None	No potential for occurrence. Known range and distribution do not overlap GCWRA. Potential habitat completely absent from GCWRA. No species accounts for GCWRA or surrounding area exist <sup>2</sup> .
Rare	Extremely low probability of occurrence. Known range and distribution may not include GCWRA. Very limited potential habitat is available within GCWRA. Species may transient or disperse over/through GCWRA, however breeding habitat absent. No species accounts for GCWRA or surrounding area exist <sup>2</sup> .
Low	Low probability of occurrence. Known range and distribution include GCWRA. Potential habitat available patchily or in isolated areas within GCWRA. No species accounts for GCWRA or surrounding area exist <sup>2</sup> .
Moderate	Moderate probability of occurrence. Range and distribution include GCWRA. Habitat present within GCWRA. Species accounts for GCWRA or surrounding area may exist <sup>2</sup> .
High	Highest probability of occurrence. Range and distribution overlap GCWRA. Habitat abundant within GCWRA. Species accounts exist for GCWRA.

<sup>2</sup>= secondary qualifier for rank. Species accounts are not available equally across geographic regions and are influenced by survey effort, land ownership and access, financing of natural heritage programs and other factors. This information is useful for confirming that a given species was present in the GCWRA, but may not be sufficient information to confirm absence.

### 3.1 Sensitive Wildlife Species

All federal- and state-listed species recorded for Coconino County and/or considered by the USFWS (2009) or AZGFD (2009) to have the potential for occurrence within the county were evaluated.

#### 3.1.1 Federal Listed Species

A list of federal threatened, endangered, and candidate wildlife species potentially occurring within the GCWRA was compiled using online databases maintained by the USFWS (2009) and AZGFD (2009), as well as correspondence from the USFWS and AZGFD (Appendix A). Thirteen wildlife species listed as endangered, threatened candidate, or non-essential experimental special status species by the federal Endangered Species Act (ESA) occur within Coconino County, Arizona; including four birds, one mammal, one reptile, one amphibian, five fish, and one snail (Table 3.2). The species are discussed further below. Based on information received from the AZGFD and the

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USFWS, no federal threatened, endangered, candidate or non-essential experimental wildlife species are known to occur within five miles of the GCWRA, and no critical habitat for listed species occurs within the GCWRA (Appendix A).

California Condor

The California condor (*Gymnogyps californianus*) inhabits high desert canyons and plateaus. In Arizona, condors roost and nest in steep terrain with rock outcroppings, cliffs, and caves. High perches are necessary to create strong updrafts required for flight, and open grasslands or savannahs are essential for searching for food. In the late 1970s the California condor was reduced to a population of less than 25 birds. At that point, all remaining condors were taken from the wild and a captive breeding program was initiated. In 1992 the Recovery Program began releasing birds back into the wild in California in 1992, and in northern Arizona in 1996. Successful breeding was first documented in Arizona in 2003. The current wild population in Arizona is 75 birds, located primarily near the Vermillion Cliffs and the Grand Canyon (AZGFD 2009c). While the California condor is currently listed as a federal endangered species throughout its range, the northern Arizona population is considered an experimental, nonessential population (USFWS 2009). An experimental/nonessential area has been designated for much of northern Arizona and southern Utah. In Arizona, this area is defined by a polygon formed by Highway 191 in the east, Interstate 40 in the south, and Highway 93 in the west. The GCWRA lies approximately 10 miles to the south of this polygon. Given their current limited distribution in north-central Arizona, California condors have an extremely low potential to occur in the GCWRA as transient birds or during foraging forays.



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**Table 3.2. Federal listed and candidate species with known or potential occurrence in Coconino County, Arizona. Results from USFWS (2009) and AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Habitat	Potential for Occurrence
<b>Birds</b>			
California condor <i>Gymnogyps californianus</i>	FE/ NE	High desert canyons and plateaus; in Arizona nest and roost in steep terrain with rock outcroppings, in cliffs and caves; high perches necessary to create strong updraft required for flight; open grasslands or savannahs essential for searching for food.	<b>Extremely Low.</b> Non-essential, experimental population occurs in northern AZ where population numbers 75 individuals; primarily occur near Vermillion Cliffs and Grand Canyon. May transient over project.
Mexican spotted owl <i>Strix occidentalis lucida</i>	FT	Nest in canyons and dense mixed-conifer forests with multi-layered foliage structure.	<b>None.</b> Known to occur in forested areas to south of Evaluation Area; habitat not suitable within GCWRA; some potential to occur in scattered pockets of ponderosa pine forests of Evaluation Area.
southwestern willow flycatcher <i>Empidonax traillii extimus</i>	FE	Cottonwood/willow and tamarisk vegetation communities along rivers and streams; prefers dense shrub canopy cover and surface water during the breeding season.	<b>Extremely Low.</b> Not known to occur in GCWRA; suitable riparian habitat appears to be absent; low potential to transient during migration.
western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	FC	Streamside cottonwood, willow, tamarisk and mesquite riparian habitats required for nesting and migrating.	<b>Extremely Low.</b> Not known to occur in GCWRA; suitable riparian habitat appears to be absent; low potential to transient during migration.
<b>Mammals</b>			
black-footed ferret <i>Mustela nigripes</i>	FE/NE	Grasslands; arid plains; generally associated with prairie dogs.	<b>None.</b> Two non-essential experimental populations located >100 miles from GCWRA. Suitable habitat and prey available in low proportions within GCWRA.
<b>Reptiles</b>			
northern Mexican gartersnake <i>Thamnophis eques</i>	FC	Densely vegetated habitats surrounding cienegas, stock tanks, large-river riparian woodlands and forests; strongly associated with presence of a native	<b>Low.</b> Known in central Arizona (Verde River drainage) to southwest of GCWRA; wetland habitat very limited in GCWRA and

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<i>megalops</i>		prey base including leopard frogs and native fish	Evaluation Area.
<b>Amphibians</b>			
Chiricahua leopard frog <i>Rana chiricahuensis</i>	FT	Streams, rivers, backwaters, ponds, and stock tanks that are mostly free from introduced fish, crayfish, and bullfrogs; require permanent or nearly permanent water source.	<b>Low.</b> Known to south of GCWRA along the Mogollon Rim; aquatic habitat very limited in GCWRA.
<b>Fishes</b>			
Apache trout <i>Oncorhynchus apache</i>	FT	Cool, clear, streams and rivers generally above 6,000 ft. with adequate stream flow and shading; substrate composed of boulders, rocks, gravel and some sand and silt.	<b>None.</b> Currently restricted to drainages in the White Mountains of eastern Arizona; stream habitat not suitable.
humpback chub <i>Gila cypha</i>	FE	Large, warm turbid rivers especially canyon areas with deep fast water; typically below 4,000 ft.	<b>None.</b> In Arizona known in Colorado and Little Colorado Rivers in the Grand Canyon to north of GCWRA; stream habitat in GCWRA not suitable.
Little Colorado spinedace <i>Lepidomeda vittata</i>	FT	Moderate to small streams; found in pools and riffles with water flowing over fine gravel and silt substrate.	<b>None.</b> Known to occur in mainstem of Little Colorado, Nutrioso Creek, Clear Creek and Chevelon Creek; stream habitat in GCWRA not suitable.
Razorback sucker <i>Xyrauchen texanus</i>	FE	Riverine and lacustrine areas, generally not in fast moving water and may use backwaters; in impoundments prefer water depths of meter or more over sand, mud, or gravel substrate.	<b>None.</b> Currently known only in Lake Mohave, Lake Mead, and Lake Havasu; stream habitat in GCWRA not suitable.
roundtail chub <i>Gila robusta</i>	FC	Cool to warm waters of mid-elevation rivers and streams; adults often occupy the deepest pools and eddies of large streams.	<b>None.</b> Known to occur in Little Colorado and to east of GCWRA; stream habitat in GCWRA not suitable.
<b>Snails</b>			
kanab ambersnail <i>Oxyloma haydeni kanabensis</i>	FE	Travertine seeps and springs in Grand Canyon National Park; associated with watercress, monkey flower, and other wetland vegetation.	<b>None.</b> Extremely geographically isolated – known only in one location in Arizona (Grand Canyon).

<sup>1</sup>FE=Federal Endangered; FT = Federal Threatened; FC=Federal Candidate for listing; NE = non-essential experimental population

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Mexican Spotted Owl

In Arizona, Mexican spotted owls (*Strix occidentalis lucida*) are distributed patchily throughout forested mountains statewide, but also in steep canyons of the Colorado Plateau including the Grand Canyon (AZGFD 2009b). They generally nest and roost in dense, old-growth mixed-conifer forest with multi-layered foliage structure located on steep slopes, especially deep, shady ravines. In Arizona, they occur primarily in mixed-conifer and pine-oak forests, but may also occur in ponderosa pine forests and rocky canyonlands. Mexican spotted owls are known to occur in the forested mountains and canyons to the west and south of the GCWRA (AZGFD 2009b; Henry Provencio USFS, personal communications); however, suitable forest habitat is not present within the GCWRA itself, and there is no potential for the species to occur. A limited amount of nesting and foraging habitat is available in the ponderosa pine forests at the higher elevations of the Evaluation Area, to the south of Study Areas A and B, and there is some potential for the species to occur in these areas.

Southwestern Willow Flycatcher

The southwestern willow flycatcher (*Empidonax traillii extimus*) is a riparian-obligate, migratory species. The flycatcher arrives at its breeding territory in Arizona in late April through early May, and migrates southward again in August and September. Their preferred nesting habitat is mature cottonwood and willow (*Salix* spp.) woodland along still or slow-moving watercourses, but they are also found in tamarisk (*Tamarix pentandra*) thickets and pure willow stands (AZGFD 2009b). The willow flycatcher's breeding range in Arizona includes sites along the Colorado River in Grand Canyon near the mouth of the Little Colorado River; at the Little Colorado River headwaters near Greer and Eagar; very locally along the middle Gila, Salt, and Verde Rivers; the middle to lower San Pedro River; and the upper San Francisco River near Alpine (AZGFD 2009b). Riparian habitat is very limited within the GCWRA, and the southwestern willow flycatcher is not known to occur within the vicinity (AZGFD 2009b). While the species is not likely to nest within the GCWRA, there is low potential for transient occurrence during spring and fall migration periods.

Yellow-billed Cuckoo

The yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a neotropical migrant, arriving on its breeding territories in Arizona in May and June, and departing for its Mexican wintering grounds in August and September. In the arid southwest, the species is primarily restricted to densely wooded rivers and streams and damp thickets. Yellow-billed cuckoo nests are found along lowland drainages within stands of multi-structured native riparian vegetation, mainly mature cottonwood/willow woodland and sometime large mesquite (*Prosopis* spp.) bosques (AZGFD 2009b; Corman and Wise-Gervais 2005). Suitable nesting habitat within the GCWRA is not present. There is extremely low potential for yellow-billed cuckoos to use the few riparian habitats found within canyon bottoms as stopover areas during migration periods.

Black-footed Ferret

In Arizona, the historic range of the black-footed ferret (*Mustela nigripes*) is characterized as plains and Great Basin grassland communities (AZGFD 2009b). Black-

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footed ferrets are closely associated with prairie dogs which comprise more than 90% of their diet. An estimated 40-60 ha of prairie dog colony is necessary to support a single ferret (AZGFD 2009b). In the late 1900s a national effort to eradicate prairie dogs resulted in a drastic decline in black-footed ferret populations due to the ferrets' extreme dependence on prairie dogs. After an approximate 60 year absence in Arizona, the AZGFD reintroduced 35 captive-breed ferrets in Aubrey Valley, located approximately 100 miles west of the GCWRA in west-central Coconino County (AZGFD 2009d). In addition, AZGFD recently initiated a second reintroduction site northwest of Williams, Arizona, approximately 120 miles from the GCWRA. These populations are listed as non-essential experimental populations under the federal Endangered Species Act (ESA). While a single active Gunnison's prairie dog colony was documented in the GCWRA (Young et al 2009), black-footed ferrets do not currently occur within approximately 120 miles of the GCWRA, and less than 40-60 ha of prairie dog colony are believed to exist within the GCWRA (at this time prairie dog town mapping has only been completed within Study Area A (Young et al 2009). No prairie dog towns were observed within the GCWRA or Evaluation Area during the site visit aside from those already mapped by WEST during 2007-2008 surveys.

### Northern Mexican Gartersnake

The northern Mexican gartersnake (*Thamnophis eques megalops*) is most abundant in densely vegetated habitat surrounding cienegas, cienega-streams, and stock tanks and in or near water along streams in valley floors and generally open areas (AZGFD 2009b). They are strongly associated with the presence of a native prey base including native fish and leopard frogs (USFWS 2009). In Arizona, the species is known to occur in the central portion of the state (in the mid and upper Verde River drainage; AZGFD 2009b), but not in the vicinity of the GCWRA. Wetland habitat is very limited within the GCWRA; however, there is some potential for the species to occur in perennial pools found within canyon bottoms or near water tanks surrounded by suitable vegetation. There is low potential for the species to occur at suitable habitats within the GCWRA and Evaluation Area, however, no observations of the species have been recorded within 5-miles of the Evaluation Area (Appendix A).

### Chiricahua Leopard Frog

The Chiricahua leopard frog (*Rana chiricahuensis*) is a highly aquatic habitat generalist. They require a permanent or nearly permanent water source that is mostly free from introduced fish, crayfish, and bullfrogs. These can range from natural aquatic systems (streams, rivers, backwaters, and ponds) to man-made systems (earthen stock ponds, livestock drinkers, irrigation sloughs and abandoned swimming pools). Their primary habitat type is oak, mixed-oak, and pine woodlands; however, other habitat types include chaparral, grassland, and even desert (AZGFD 2009b). In Arizona, there are two distinct populations: the northern population which extends from montane central Arizona along the Mogollon Rim into New Mexico, and another population in the southeast corner of the state. Aquatic habitats are very limited within the GCWRA and largely restricted to water tanks and impoundments, and ephemeral streams. There is low potential for the species to occur at suitable habitats within the GCWRA and Evaluation Area, however,

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no observations of the species have been recorded within 5-miles of the Evaluation Area (Appendix A).

Apache Trout

The Apache trout (*Oncorhynchus apache*) inhabits cool, clear, high elevation rivers and streams, generally above 6,000 feet elevation (AZGFD 2009b). In Arizona, Apache trout are currently restricted to drainages in the White Mountain in the east-central portion of the state (USFWS 2009). Due to the restricted range of the species, and a lack of suitable stream habitat within the GCWRA, there is no potential for the Apache trout to occur.

Humpback Chub

The humpback chub (*Gila cypha*) inhabits large, warm turbid rivers especially canyon areas with deep fast water. In Arizona, the species is found in the Colorado and Little Colorado Rivers in the Marble and Grand Canyons (USFWS 2009). Stream habitat within the GCWRA is not suitable for the humpback chub and there is no potential for the species to occur.

Little Colorado Spinedace

The Little Colorado spinedace (*Lepidomeda vittata*) inhabits moderate to small streams where they prefer pools and riffles with water flowing over fine gravel and silt substrate (USFWS 2009). The fish is found in water ranging from 0.5-4.3 feet in depth, but most abundant in depths of around 1.9 feet (AZGFD 2009b). They are most common in slow to moderate water currents, over fine gravel bottoms, preferring unshaded pools with rocks or undercut banks for cover. Four populations presently exist in Arizona: the mainstem of the Little Colorado, Nutrioso Creek, Chevelon Creek, and Clear Creek, all of which are located to the east and southeast of the GCWRA (AZGFD 2009b). Stream habitat within the GCWRA is not suitable for the Little Colorado spinedace and there is no potential for the species to occur.

Razorback Sucker

The razorback sucker (*Xyrauchen texanus*) is a large fish, reaching sizes of up to three feet in length. The species inhabits riverine and lacustrine areas, generally not in fast moving water, and may use backwaters (USFWS 2009). In impoundments they prefer depths of a meter or more over sand, mud or gravel substrates. In Arizona, the historical range of the razorback suckers included the Colorado, Gila, Salt, Verde, and San Pedro rivers. Presently, natural adult populations exist only in Lake Mohave, Lake Mead, and Lake Havasu (AZGFD 2009b). Stream habitat within the GCWRA is not suitable for the razorback suckers, and there is no potential for the species to occur.

Roundtail Chub

The roundtail chub (*Gila robusta*) inhabits cool to warm waters of rivers and streams, often occupying the deepest pools and eddies of large streams (USFWS 2009). Cover is usually present and consists of large boulders, tree roots, submerged large trees and branches, undercut cliff walls, or deep water. Smaller chubs generally occupy shallower, low-velocity water adjacent to overhead bank cover (AZGFD 2009b). The historical range of the roundtail chub included both the upper and lower Colorado River Basins. In 2009, the lower Colorado population (Arizona and New Mexico) was determined to be a

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distinct vertebrate population segment (DPS), and is considered a candidate for federal listing (USFWS 2009). In Arizona, the species is currently limited to two tributaries of the Little Colorado (Chevelon and East Clear Creek) to the southeast of the GCWRA, as well as the Bill Williams and Gila River basins in the south of the state (USFWS 2009; AZGFD 2009b). Suitable perennial stream habitat is not present in the GCWRA, and the species has no potential to occur.

### Kanab Ambersnail

The Kanab ambersnail (*Oxyloma haydeni kanabensis*) inhabits marshes fed by springs and seeps at the base of sandstone cliffs or limestone (AZGFD 2009b). The snail is associated with a perennial wet surface or shallow standing water, not under logs or other microhabitats commonly frequented by other land snails. The presence of cattails (*Typha domingensis*), or at least the permanently wet ground around cattails, is believed to be an important component of the species' habitat (AZGFD 2009b). The Kanab ambersnail is extremely geographically isolated. There are three historical populations, and only two remain; one in Utah and the other in Grand Canyon National Park (USFWS 2009). Due to its very limited distribution and habitat requirements, the species has no potential to occur in the GCWRA.

### *3.1.2 State Sensitive Species*

The AZGFD (2009a) lists 14 wildlife species as state species of special concern with documented presence within the Canyon Diablo and/or Middle Little Colorado Watersheds; including seven birds, one mammal, two reptiles, two amphibians, and two fish (Table 3.3). Four of the species of special concern (Mexican spotted owl, northern Mexican gartersnake, Chiricahua leopard frog, and Little Colorado spinedace) also have federal endangered, threatened, or candidate status under the ESA, and are addressed in the preceding section (Section 3.1.1). The remaining state sensitive species are further addressed below. Based on correspondence received from the AZGFD (Appendix A), two state wildlife species of special concern have been documented within five miles of the GCWRA: bald eagle (wintering individuals [*Haliaeetus leucocephalus*]) and Little Colorado sucker (*Catostomus* spp.).

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**Table 3.3 State-designated wildlife of special concern with known or potential occurrence within Canyon Diablo and/or Middle Little Colorado Watersheds, Coconino County, Arizona. Results from AZGFD (2009a); accessed November 12, 2009.**

Species	Status <sup>1</sup>	Watershed <sup>2</sup>	Habitat	Potential for Occurrence
<b>Birds</b>				
American peregrine falcon <i>Falco peregrinus anatum</i>	WSC	CD, MLC	Found where sufficient prey is present near tall cliffs; optimum habitat considered steep, sheer cliffs overlooking woodlands, riparian areas, or other habitats supporting avian prey species in abundance.	<b>Extremely Low.</b> In Arizona most nesting occurs in cliff areas of Mogollon Rim, Grand Canyon, and Colorado Plateau; not likely to nest in GCWRA, but may occur as migrant.
bald eagle <i>Haliaeetus leucocephalus</i>	WSC	CD, MLC	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; roost communally especially in winter	<b>Low.</b> Historically nested on the Anderson Mesa including at Mormon Lake; not likely to nest in GCWRA, but may occur as occasional winter visitor/transient.
belted kingfisher <i>Megaceryle alcyon</i>	WSC	MLC	Rivers, ponds, lakes, brooks, swamps, and estuaries with nearby branches, snags, or power lines for perching; typically nest in a burrow in a bank near water.	<b>Extremely Low.</b> Known to nest along smaller streams in White Mountain and along Mogollon Rim; not likely to occur within GCWRA due to scarcity of water; some potential to occur in suitable habitats found in canyon bottoms.
ferruginous hawk <i>Buteo regalis</i>	WSC	MLC	Inhabits open country, primarily prairies, plains, and badlands; nests in tall trees along streams or on steep slopes, cliff ledges, hillsides, or power line towers	<b>Extremely Low.</b> Currently nest in northern and southeastern Arizona; not likely to nest in GCWRA; more likely to occur as rare winter resident or migrant.
Mexican spotted owl <i>Strix occidentalis lucida</i>	WSC	CD, MLC	Nest in canyons and dense mixed-conifer forests with multi-layered foliage structure.	<b>None.</b> Known to occur in forested areas to south of Evaluation Area; habitat not suitable within GCWRA some potential to occur in scattered pockets of ponderosa pine forests of Evaluation Area.
northern goshawk <i>Accipiter gentilis</i>	WSC	CD, MLC	Nest is variety of forest types including deciduous, conifer, and mixed forests;	<b>Low.</b> Nest along Mogollon Rim to southwest of GCWRA; no potential to nest



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			typically nest in large tracts of mature or old-growth forest.	in GCWRA but may occur as rare winter visitor or migrant; limited nesting habitat available in ponderosa pine forests in Evaluation Area.
osprey <i>Pandion haliaetus</i>	WSC	CD, MLC	Nest in coniferous trees alongside or near rivers and lakes.	<b>Extremely Low.</b> In Arizona primarily nest in White Mountains and across the Mogollon Plateau; not likely to nest in GCWRA but may occur as rare transient/migrant.
<b>Mammals</b>				
Navajo Mexican vole <i>Microtus mexicanus navaho</i>	WSC	CD	Prostrate shrub thickets that provide dense cover; also dry, grassy areas usually adjacent to pine forests but sometime juniper woodland or sagebrush.	<b>Low.</b> Known from Flagstaff area to northwest of GCWRA; low potential to occur in GCWRA.
<b>Reptiles</b>				
narrow-headed gartersnake <i>Thamnophis rufipunctatus</i>	WSC	MLC	Pinyon-juniper and pin-oak woodland into ponderosa pine forest; in permanently flowing streams.	<b>None.</b> Known along Mogollon Rim south and southeast of GCWRA; habitat for species does not occur in GCWRA or Evaluation Area.
northern Mexican gartersnake <i>Thamnophis eques megalops</i>	WSC	MLC	Densely vegetated habitats surrounding cienegas, stock tanks, large-river riparian woodlands and forests; strongly associated with presence of a native prey base including leopard frogs and native fish	<b>Low.</b> Known in central Arizona (Verde River drainage) to southwest of GCWRA; wetland habitat very limited in GCWRA and Evaluation Area.
<b>Amphibians</b>				
Chiricahua leopard frog <i>Rana chiricahuensis</i>	WSC	MLC	Aquatic systems (both natural and man-made) in a variety of habitat types from oak and pine woodlands to chaparral, grassland, and desert.	<b>Low.</b> Known to south of GCWRA along the Mogollon Rim; aquatic habitat very limited in GCWRA.
northern leopard frog <i>Lithobates pipiens</i>	WSC	CD, MLC	Variety of habitats including grassland, shrubland, woodlands, and forests;	<b>Low.</b> Occurs in northern and central Arizona; aquatic habitat very limited in

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			typically in permanent water with rooted aquatic vegetation.	GCWRA.
<b>Fishes</b>				
Little Colorado spinedace <i>Lepidomeda vittata</i>	WSC	CD, MLC	Moderate to small streams; found in pools and riffles with water flowing over fine gravel and silt substrate.	<b>None.</b> Known to occur in mainstem of Little Colorado, Nutrioso Creek, Clear Creek and Chevelon Creek; stream habitat in GCWRA not suitable.
Little Colorado sucker <i>Catostomus sp. 3</i>	WSC	MLC	Creeks, small to med. Rivers, and impoundments; usually in pools with abundant cover; also found in riffles.	<b>Low.</b> Endemic to upper portion of Little Colorado River and many of its north-flowing tributaries; moderate probability to occur in GCWRA in suitable aquatic habitat.

<sup>1</sup>WSC = Wildlife of Special Concern

<sup>2</sup>CD = Canyon Diablo; MLC = Middle Little Colorado

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American Peregrine Falcon

The American peregrine falcon (*Falco peregrinus anatum*) is generally found in open country with tall cliffs for roosting or nesting and with open water, woodland, or riparian areas nearby that support abundant avian prey species. In Arizona, the majority of peregrine falcon nesting occurs in the tall cliffs of the Mogollon Rim, the Grand Canyon, and the Colorado Plateau (AGFD 2009b). The species is unlikely to nest within the GCWRA or Evaluation Area due to the scarcity of suitable cliffs for nesting; however, there is potential for peregrine falcons to occur as a rare winter visitor or migrant through the GCWRA. During one year of avian use surveys conducted at Study Area A no peregrine falcons were observed, and none were observed incidentally by WEST biologists (Young et al 2009). No records exist with the AZGFD natural heritage database within five miles of the Evaluation Area (Appendix A).

Bald eagle

Delisted from the federal endangered species act in 2007, the bald eagle (*Haliaeetus leucocephalus*) remains protected under the federal Bald and Golden Eagle Protection Act, and is a state species of special concern in Arizona. In 2008, the USFWS determined the Sonoran Desert population of bald eagles occurring in central Arizona and northwestern Mexico to be a distinct population segment (DPS); however, on February 25, 2010 the USFWS released a finding stating that neither this population nor its habitat warrants protection under the federal Endangered Species Act. The Sonoran Desert DPS occurs to the south and west of Coconino County. Breeding bald eagles are found near large lakes, reservoirs, or perennial streams throughout central Arizona, where they perch in large riparian trees, pines, or on cliffs (Corman and Wise-Gervais 2005). Bald eagles generally construct nests in the tallest trees in an area near water; however, in Arizona, they frequently nest on cliff faces, ledges, or pinnacles. Within the State's 56 known bald eagle breeding areas, all but two nests are located within one mile of water (McCarty and Jacobson 2008). Historically, bald eagles nested along the Mogollon Rim including at Mormon Lake and Lake Mary, approximately ten miles to the west and 12 miles to the northwest of the GCWRA, respectively (AZGFD 2009b). While eagles are no longer known to nest in these areas, the lakes do support wintering populations. There is no suitable nesting habitat within the GCWRA, and the nearest known bald eagle breeding area is greater than 10 miles away (McCarty and Jacobson 2008). There is some potential for wintering or transient eagles to occur in the GCWRA. Bald eagles have been observed at the Raymond Wildlife Area immediately to the north of the GCWRA (AZGFD 2009e), and seven observations were recorded during the 2007/2008 baseline avian studies conducted at Study Area A of the proposed project (Young et al. 2008).

Belted Kingfisher

The belted kingfisher (*Megaceryle alcyon*) inhabits a variety of wetland habitats including rivers, brooks, ponds, lakes, streams, tidal creeks, mangroves, swamps and estuaries with nearby branches, snags, or power lines for perching. The kingfisher prefers clear, still water for fishing. The nest is typically a burrow within a bank, usually near freshwater. Wetland habitat is limited within the GCWRA, and the species is not likely to nest or overwinter in the area; however, there is extremely low potential for the species to use riparian areas at stopover habitat during migration. During one year of avian use

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surveys conducted at Study Area A none were observed, and none were observed incidentally by WEST biologists (Young et al 2009). No records exist with the AZGFD natural heritage database within five miles of the Evaluation Area (Appendix A).

### Ferruginous hawk

Ferruginous hawks (*Buteo regalis*) are found in various open habitats such as grasslands, shrublands, and deserts where rodent and lagomorphs prey species are available. In Arizona, ferruginous hawks generally breed in open scrublands, woodlands, grasslands, and semi-desert grasslands in the northern Colorado Plateau and southeastern portion of the state (AZGFD 2009b). Nests in Arizona are primarily constructed in isolated juniper trees (Corman and Wise-Gervais 2005). In winter, ferruginous hawks can be found statewide in these same habitats along with agricultural areas. Hunting typically occurs in open grasslands and agricultural fields; preferably with low hills or short trees which serve as perches. While potential nesting habitat is present within the GCWRA, the species is not currently known to nest within this region of the state (Corman and Wise-Gervais 2005; AZGFD 2009a). They are more likely to occur as occasional winter visitors or migrants through the GCWRA. Ferruginous hawks have been observed at the Raymond Wildlife Area immediately to the north of the GCWRA (AZGFD 2009e), though no records exist within five miles of the Evaluation Area (Appendix A), none were observed during one year of avian use surveys conducted at Study Area A, and none were observed incidentally by WEST biologists (Young et al 2009).

### Northern Goshawk

Northern goshawks (*Accipiter gentilis*) inhabit a wide range of forest types including deciduous, coniferous, and mixed forests. They typically nest in large tracts of mature or old-growth forests. In Arizona, goshawks nest in high, forested mountains and plateaus, and are most abundant in ponderosa pine forests along the Mogollon Rim, on the Kaibab Plateau, and in the southeastern mountains (AZGFD 2009b). Suitable forested nesting habitat for northern goshawks is not present within the GCWRA and they are not likely to occur during summer months. While goshawks in Arizona are primarily resident, some may move to lower elevations in the winter when food resources become scarce (Corman and Wise-Gervais 2005), and there is some potential for the species to occur in the GCWRA as a rare winter visitor. A limited amount of nesting habitat is available within ponderosa pine forests found in patches at the higher elevations of the Evaluation Area and there is some potential for goshawk to occur in these areas. No recorded observations have been made within five miles of the Evaluation Area (Appendix A) and none were observed during one year of avian use surveys conducted at Study Area A, and none were observed incidentally by WEST biologists (Young et al 2009).

### Osprey

Ospreys (*Pandion haliaetus*) nest primarily in coniferous trees alongside or near rivers and lakes, feeding almost exclusively on fish. In Arizona, ospreys breed in the White Mountain and along the Mogollon Plateau. There is also some nesting at lower elevations along the Salt and Gila Rivers in the southeast of the state; however, no desert nest sites have been documented (AZGFD 2009b). Suitable nesting and foraging habitat is not present within the GCWRA, and ospreys are not likely to occur as residents; however,

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there is extremely low potential for the species to occur as a very rare transient or during migration. No recorded observations have been made within five miles of the Evaluation Area (Appendix A) and none were observed during one year of avian use surveys conducted at Study Area A, and none were observed incidentally by WEST biologists (Young et al 2009).

### Navajo Mexican Vole

The Navajo Mexican vole (*Microtis mexicanus navaho*) is found in a wide range of vegetation communities from Great Basin desert scrub and Great Basin woodland to Rocky Mountain montane and subalpine forests. They generally inhabit prostrate thickets of various shrub species that provide a dense cover; however, they may also occur in dry, grassy areas usually adjacent to ponderosa pine forest, but also juniper or sagebrush at lower elevations (AZGFD 2009b). In Coconino County, the species is known to occur on the south rim of the Grand Canyon and approximately 20 miles west of the GCWRA in Walnut Canyon National Monument (AZGFD 2009b, USGS unpublished data). Shrub, grassland, and juniper woodland habitats are present within the GCWRA, and there is potential for the Navajo Mexican vole to occur.

### Narrow-headed Gartersnake

The narrow-headed gartersnake (*Thamnophis rufipunctatus*) inhabits pinyon-juniper woodlands, oak-pine forests, and ponderosa pine forests where they are found in or beside clear, rocky streams. The species is almost strictly aquatic, foraging under water, seeking shelter under rocks and boulders in the streambed, and basking on rocks and vegetation along stream banks. Hibernation takes place in rocky outcropping in late fall and winter. In Arizona, narrow-headed gartersnakes are found primarily in upland drainages in the White Mountains and along the Mogollon Rim. Suitable woodland and stream habitat is not present within the GCWRA, and there is no potential for the species to occur. The species has not been recorded within five miles of the Evaluation Area (Appendix A).

### Northern Leopard Frog

Northern leopard frogs (*Lithobates pipiens*) inhabit a variety of habitats throughout northern and central Arizona including grassland, shrubland, woodland, and forest ranging high into the mountains (AZGFD 2009b). They are typically found in permanent water with rooted aquatic vegetation, ranging from springs, ponds, and marshes to irrigation ditches, small streams, and rivers. Wetland habitat is limited throughout the GCWRA; however, there is low potential for the northern leopard frog to occur in these areas. Northern leopard frogs have been documented in the Raymond Wildlife Area immediately to the north of the GCWRA (AZGFD 2009e), but have not been recorded within five miles of the Evaluation Area (Appendix A).

### Little Colorado Sucker

The Little Colorado sucker (*Catostomus sp. 3*) occurs in creeks, small to medium rivers, and impoundments, primarily in pools with abundant cover. The species is endemic to the upper portion of the Little Colorado River and many of its north-flowing tributaries (AZGFD 2009b). According to Heritage Data Management System (AZGFD 2009a), the

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species has been documented in drainages within five miles to the south and southeast of the GCWRA (Appendix A). There is some potential for the Little Colorado sucker to occur in several of the larger drainages or springs within the Evaluation Area, particularly within Canyon Diablo, Grapevine Canyon, or Jack's Canyon.

### *3.1.3 Sensitive Species Summary and Conclusions*

In general, probability for federal or state-listed wildlife species to occur within the GCWRA or Evaluation Area is low. Sensitive wildlife species with relatively greater likelihood of potential to occur were primarily species dependent on wetland or aquatic habitats. Of the federally-listed wildlife species known to occur within Coconino County, none have high or moderate potential for occurrence within the GCWRA or Evaluation Area. Only five have extremely low or low probability of occurrence within the GCWRA or the Evaluation Area (Table 3.2). Of the seven state listed bird species, one is considered to have no potential for occurrence, while four are considered extremely low and two considered low (Table 3.3). No state-listed bird species were considered to have moderate or high probability of occurrence within the GCWRA. The single state-listed mammal was ranked low. Of the two reptiles, one was ranked with no potential and one considered low. Both amphibians were ranked low, while one fish was ranked low and one ranked as having no potential for occurrence. No federally-listed birds, mammals or fish have the potential to occur, with the exception of the southwestern willow flycatcher and the western yellow-billed cuckoo, which may rarely stopover within suitable riparian areas isolated to canyon bottoms during spring and fall migration seasons. The northern Mexican garter snake (federal candidate) and Chiricahua leopard frog (federal-threatened) have low probability to occur within the GCWRA at suitable aquatic features or immediately adjacent to those features. Suitable habitats include water tanks and ponds, or perennial pools or streams, which have natural or semi-natural vegetation present, as well as potential to support fish, including native species. No records exist for these species within five-miles of the Evaluation Area, however, the presence of suitable habitat and records from other location within the region suggest some possibility that the species could be found at suitable habitats within the GCWRA. The same conclusion has been made for potential for the northern leopard frog and Little Colorado sucker, state species of concern. Wintering bald eagles (state species of concern) may occasionally transient the GCWRA, and results from pre-construction avian use surveys conducted at Study Area A (Young et al 2009) suggest only extremely low use of that portion of the GCWRA.

Study Areas A and B may contain more potential sensitive wildlife habitat compared with Study Area C, due largely to the greater proportion of canyon bottom wetland habitat found within those Study Areas, which could provide potential stopover habitat for western yell-billed cuckoo and southwestern willow-flycatcher. In addition, there appear to be a greater number of wetland and waterbodies located within Study Areas A and B compared with Study Area C, which have the potential to support sensitive amphibians or the Colorado sucker. Having said that, overall landcover and potential wildlife habitats do not generally differ between the Study Areas, when evaluated separately (Table 2.2) or compared with the GCWRA or Evaluation Area (Table 2.1).

## 3.2 Raptors

### 3.2.1 Species likely to occur in the area

Raptor information was collected from the Arizona Breeding Bird Atlas (Corman and Wise-Gervais 2005) and Sibley (2001). Seventeen diurnal raptor species have the potential to occur as residents and/or migrants in the GCWRA at some point during the year. In addition, one species of vulture, and five species of owls occur in the region.

Of the 17 diurnal raptors with the potential to occur in the GCWRA, six species have the potential to nest or reside year-round within the GCWRA: sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), American kestrel (*Falco sparverius*), prairie falcon (*Falcon mexicanus*), and peregrine falcon (*Falco peregrinus*). A further three species may occur as winter residents and/or migrants in the GCWRA: northern harrier (*Circus cyaneus*), ferruginous hawk (*Buteo regalis*), and rough-legged hawk (*Buteo lagopus*). Eight species are not likely to reside in the area due to specific habitat requirements, but may pass through the GCWRA as migrants and/or occasional visitors from the surrounding region: zone-tailed hawk (*Buteo albonotatus*), Swainson's hawk (*Buteo swainsonii*), northern goshawk (*Accipiter gentilis*), common black hawk (*Buteogallus anthracinus*), bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), peregrine falcon (*Falco peregrinus*), and merlin (*Falco columbarius*). Additionally, turkey vultures (*Cathartes aura*) are likely summer residents of the GCWRA. Of the diurnal raptors and vultures potentially occurring within the GCWRA, six species are considered wildlife of special of concern by the AZGFD (2009a): northern goshawk, common black hawk, ferruginous hawk, bald eagle, osprey, and peregrine falcon. The Evaluation Area has low potential to support nesting northern goshawk due to the presence of potential breeding and foraging habitat in the form of ponderosa pine forest located patchily at higher elevations. Bald eagle, ferruginous hawk, and sharp-shinned hawk have been documented within the Raymond Wildlife Area immediately to the north of the GCWRA (AZGFD 2009e), though state natural heritage records from within five miles of the Evaluation Area include only the bald eagle (Appendix A).

Five owl species have the potential to nest or reside year-round within the GCWRA: barn owl (*Tyto alba*), long-eared owl (*Asio otus*), burrowing owl (*Athene cunicularia*), great-horned owl (*Bubo virginianus*) and western screech-owl (*Megascops kennicottii*). Of the owl species potentially occurring within the GCWRA, burrowing owls are considered a species of concern by the USFWS, and have been observed at the Raymond Wildlife Area (AZGFD 2009e). The western-most portions of the Evaluation Area have some potential to support nesting northern saw-whet owl (*Aegolius acadicus*), northern pygmy owl (*Glaucidium gnoma*), and flammulated owl (*Otus flammeolus*) due to the presence of potential breeding and foraging habitat in the form of ponderosa pine forest at higher elevations of the Evaluation Area. Additionally, while nesting habitat for Mexican spotted owl (*Strix occidentalis lucida*), a federal threatened and state species of special concern, is not likely present within the Evaluation Area, there may be some suitable



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foraging habitat within forested areas. No records exist for Mexican spotted owl within state natural heritage records from within five miles of the Evaluation Area.

During baseline wildlife studies conducted by WEST at Study Area A of the project in 2007 and 2008 (Young et al. 2008), ten raptor species were observed using the GCWRA either as residents or during migration: Cooper's hawk, sharp-shinned hawk, red-tailed hawk, northern harrier, bald eagle, golden eagle, American kestrel, merlin, prairie falcon, and burrowing owl. Raptor species richness may be less in portions of Study Areas B and C, which contain greater proportions of grassland and desert scrub. This difference is suggested by avian survey results conducted at the Sunshine Wind Park, where fewer species (six) were sighted (WEST 2006). Similarly, abundance of raptors is likely to be less in open grassland or desert scrub areas where nesting and roost structures are less abundant (see Section 3.2.3) and prey density is lower (see Section 3.2.4). Avian use surveys conducted at Sunshine indicate lower abundance of raptors, particularly for golden eagle, relative to surveys conducted at Grapevine A (WEST 2006 and Young et al 2009).

Young et al. (2009) compared annual mean raptor use at Study Area A with 36 other proposed or existing wind-energy facilities that implemented similar protocols and had data for three or four seasons. The annual mean raptor use at these facilities ranged from 0.09 birds/20-min survey to 2.34 birds/20-min survey. Mean raptor use at Study Area A was 0.67 birds/20-min survey which is in the mid-range of all the sites studied. Raptor use at the nearby Sunshine Wind Park was lower than that observed at Grapevine A in 2007-2008, with a peak seasonal use of 0.58 observed during the Fall, while winter use was only 0.08 raptors observed per 30-minute fixed point survey (WEST 2006). A regression analysis of raptor use and mortality for 12 new-generation wind-energy facilities, where similar methods were used to estimate raptor use and mortality, found that there was a significant correlation between use and mortality ( $R^2 = 71.7\%$ ; see Young et al. 2008). Using this regression to predict raptor collision mortality at the Study Area A, based on an adjusted mean raptor use of 0.67 birds/20-min survey, yields an estimated fatality rate of 0.10 raptors/MW/year, or 10 raptor fatalities per year for a 100-MW wind-energy facility. A 90% prediction interval around this estimate is zero to 0.35 raptors/MW/year for Study Area A of the Grapevine Wind Resource Area.

### *3.2.2 Potential for raptor migration in the area*

The GCWRA lies within the Intermountain West region of the extensive American Pacific Flyway, one of five primary migratory routes for waterbirds, shorebirds, songbirds, and raptors. Several factors influence the migratory pathways of raptors; the most significant of which is geography. Two geographical features primarily used by raptors during migration are ridgelines and the shorelines of large bodies of water. Updrafts formed as the wind hits the ridges, and thermals created over land (and not water) make for energy-efficient travel over long distances (Liguori 2005). It is for this reason that raptors tend to follow corridors or pathways, for example along prominent ridges with defined edges or shorelines, during migration.

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While it is certain that raptors migrate through the GCWRA, the majority of the GCWRA is characterized by a flat upland plain that would generally not be expected to concentrate or funnel raptors during migration. However, there are several larger canyons in the area (particularly the Canyon Diablo and Grapevine Canyon through the central portions of the GCWRA, Yaeger and Anderson Canyons in the northwest corner of the GCWRA, and Jack's Canyon in the southeast) which may serve as important stopover areas for some raptor species during migration. The potential exists for migrating birds that follow topography to concentrate along these canyon rims, such as raptors that utilize updrafts and thermals created by topography. Additionally, the presence of prairie dog (*Cynomys gunnisoni*) colonies and waterfowl/shorebirds concentrated at water sources, could attract resident and migrating raptors. The western-most portions of the Evaluation Area, to the west of Study Areas A and B, have greater topographic relief, as well as a greater number of seasonal ponds and lakes and therefore, may be more likely to attract migrating raptors. Avian use studies conducted at Study Area A (Young et al 2009) indicate fall raptor use was relatively high (1.68 raptors/plot/20-minute survey) compared with other seasons (winter: 0.13; spring: 0.24; summer 0.51 raptors/plot/20-minute survey). 2007 fall raptor use resulted primarily from increased observations of red-tailed hawk, but also included greater species diversity relative to other seasons (Young et al 2009). Raptor observations also peaked during the fall migration period at Sunshine (WEST 2006); however, with less overall activity than observed at Grapevine A. These observations suggest the area is used by migrating raptors but in low abundance.

### *3.2.3 Potential raptor nesting habitat*

Potential nesting habitat for raptors is located primarily along the major drainages within the GCWRA: Canyon Diablo, Grapevine Canyon, Yaeger Canyon, and Jack's Canyon. Stands of oak and cottonwood in the canyon bottoms, as well as canyon walls and rock outcroppings likely provide nest sites for raptors such as golden eagles, red-tailed hawks, American kestrels, prairie falcons, barn owls, and great-horned owls. Additionally, small areas of pinyon-juniper woodland, juniper savannah, and ponderosa pine forest, particularly in western portions of Study Areas A and B, may also provide nest structures for raptors. Open, grassland habitat for ground-nesting species such as burrowing owls is present throughout the GCWRA, especially within prairie-dog colonies which have been documented in the GCWRA (Young et al. 2008). More extensive stands of ponderosa pine and pinyon-juniper forests are present within the western Evaluation Area, and there is some potential for forest-dwelling raptors such as northern goshawk, Cooper's hawk, sharp-shinned hawk, western screech-owl, northern saw-whet owl, northern pygmy owl, and flammulated owl to occur in these areas. During raptor nest surveys conducted by WEST in Study Area A of the project in 2008, one active red-tailed hawk nest was observed in Yaeger Canyon, and two inactive golden eagle nests were observed within Grapevine Canyon (Young et al. 2008; Figure 3.1). Canyon edges and mature ponderosa pine trees represent the best available nesting structures for golden eagles in the Evaluation Area. Open grasslands, desert scrublands and pinyon-juniper woodlands have low potential for nesting golden eagles. Consequently, there is low potential for the species to nest within large portions of Study Areas B and C. Although formal raptor nest surveys were not conducted at the Sunshine Windpark, extremely low numbers of

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golden eagles were observed (one) during pre-construction avian use surveys (WEST 2006).

*3.2.4 Areas of potentially high prey density*

Studies indicate that raptor mortality at wind-energy facilities (for example, Altamont Pass WRA, California [APWRA]) may be in part due to behavioral differences between species, increasing the susceptibility of some for collision with turbines. Orloff and Flannery (1992, 1996) suggested that high golden eagle mortality at APWRA was in part due to the apparently high densities of ground squirrels (*Spermophilus beecheyi*) in the area (Thelander and Smallwood 2007). Continued research at the site revealed that the degree of aggregation of pocket gopher (*Thomomys bottae*) burrows around the turbines was positively correlated to red-tailed hawk fatality rates (Smallwood et al. 2001, Thelander et al. 2003, Thelander and Smallwood 2007). In addition, features providing cover for cottontails (*Sylvilagus auduboni*) appeared to be associated with areas where golden eagles were killed.

Two active and one inactive Gunnison's prairie dog colonies were mapped during baseline wildlife studies conducted in Study Area A (WEST 2008; Figure 3.2). Prairie dog colonies are important foraging grounds for several raptor species likely to occur at the GCWRA including golden eagle, red-tailed hawk, northern harrier, and ferruginous hawk. Colonies may serve to concentrate raptors in the GCWRA throughout the year; WEST (Young et al 2009) found significantly higher raptor use at observation points located near active prairie dog colonies (Figure 3.2). Baseline surveys for prairie dog towns have not been completed at this time in Study Areas B and C. There is potential for prairie-dog colonies to occur in suitable habitats in grassland, cleared or disturbed areas throughout the GCWRA. The AZGFD indicated in correspondence received April May 4, 2010 that 2007 surveys conducted by AZGFD indicated presence of colonies in Study Areas A and C (see Appendix A). Additionally, waterfowl and shorebirds using the few wetlands and ponds present in the GCWRA may also serve to concentrate raptor species. Other types of prey likely to be present throughout the GCWRA are rodent and shrew species associated with semi-arid to arid grassland, shrub, and juniper woodland areas. Lagomorphs that may occur in the area include desert cottontail (*Sylvilagus audubonii*), and black-tailed jackrabbit (*Lepus californicus*).

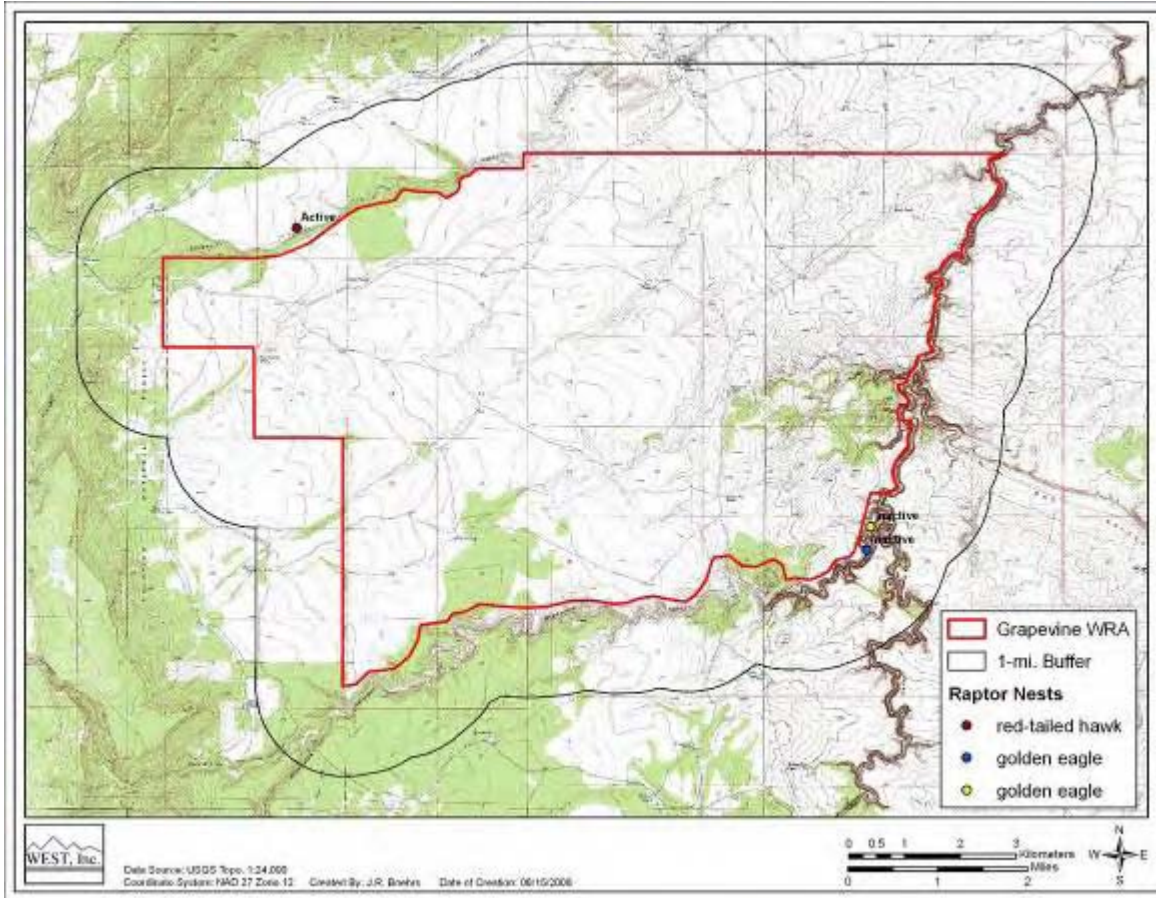


Figure 3.1 Raptor nests within Study Area A (Young et al. 2008).

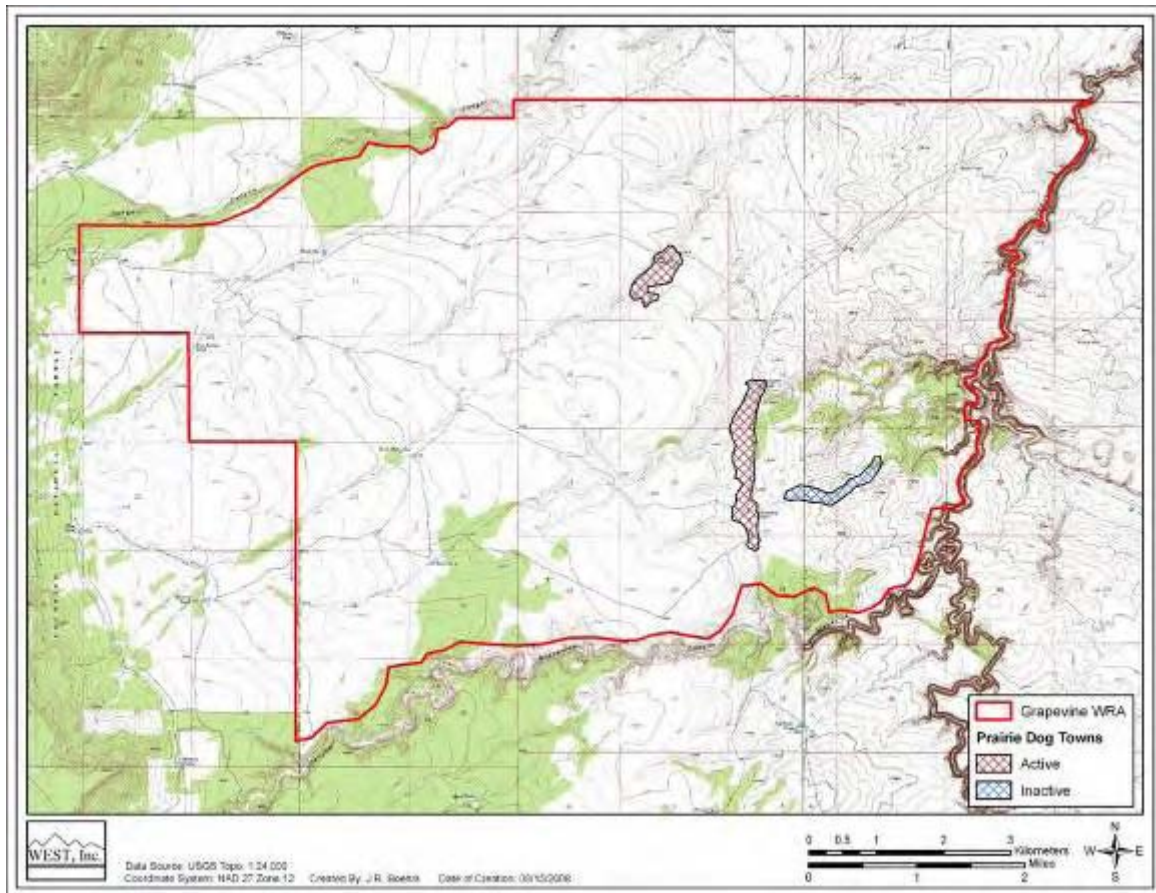


Figure 3.2 Location of prairie dog colonies within Study Area A (Young et al. 2008).

### 3.3 Avian Migration

The average overall bird fatality rate at wind power projects in the U.S. is 2.3 bird fatalities per turbine per year or 3.1 bird fatalities per MW per year (NWCC 2004). Most species of birds are protected by the Migratory Bird Treaty Act. Many species of songbirds migrate at night and may collide with tall man-made structures, though no large mortality events on the same scale as those seen at communication towers have been documented at wind-energy facilities in North America (NWCC 2004). It is generally assumed that nocturnal migrating passerines move in broad fronts rather than along specific topographical features (Gauthreaux et al. 2003, NRC 2007). Large numbers of songbirds have collided with lighted communication towers and buildings when foggy conditions and spring or fall migration coincide. Birds appear to become confused by the lights during foggy or low ceiling conditions, flying circles around lighted structures until they become exhausted or collide with the structure (Erickson et al. 2001). Most collisions at communication towers are attributed to the guy wires on these structures, which wind turbines do not have. Additionally, the large mortality events observed at communication towers occurred at structures greater than 150 m in

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height (Erickson et al. 2001), likely because most birds migrate at elevations of 270 m or higher (Young et al. 2004, Young and Erickson 2006). Modern wind turbines are below 270 m in height.

The seasonal migration of birds through Arizona generally occurs in a broad front throughout the state. The GCWRA contains a limited amount of stopover habitat for songbirds, waterfowl, and shorebirds in the forms of grassland, shrubland, pinyon-juniper woodland, and a few wetland/riparian areas, and it is likely that migrating birds utilize these areas during migration.

Wind plants with year-round waterfowl use have shown the highest waterfowl mortality, although levels of waterfowl/waterbird mortality appear insignificant compared to use of the sites by these groups. The recently constructed Top of Iowa Wind farm is located in cropland between three Wildlife Management Areas (WMAs) with historically high use by migrant and resident waterfowl. During a recent study, approximately one million total goose-use days and 120,000 total duck-use days were recorded in the WMAs during the fall and early winter, and no waterfowl fatalities were documented during concurrent and standardized wind project fatality studies (Koford et al. 2005). Similar findings were observed at the Buffalo Ridge Wind Project in southwestern Minnesota, which is located in an area with relatively high waterfowl use. Snow geese (*Chen caerulescens*), Canada geese (*Branta Canadensis*), and mallards (*Anas platyrhynchos*) were the most common waterfowl observed. Only three of the 55 fatalities observed during the fatality studies were waterfowl, including two mallards and one blue-winged teal (*Anas discors*; Johnson et al. 2002).

During avian baseline surveys conducted by WEST in 2007 and 2008, use by resident and migrating waterfowl and shorebirds was found to be low, comprising less than 3% of overall bird use (Young et al. 2008). While the GCWRA itself has very little wetland habitat, the wetland complex along the Anderson Mesa along the western boundary of the Evaluation Area has been documented as one of two major waterfowl use areas in Arizona during migration, particularly by dabbling ducks during spring migration (National Audubon Society 2009; see discussion of Important Bird Areas below).

### **3.4 Breeding Birds**

#### *3.4.1 Important Bird Areas*

Songbirds (order Passeriformes) are by far the most abundant bird group in most terrestrial ecosystems and are the most often reported fatalities at wind-energy facilities (NRC 2007). The Audubon Society lists Important Bird Areas (IBAs) that are sites providing essential habitat for one or more species of bird (National Audubon Society 2009). These include sites for breeding, wintering and/or migrating birds and can range from a few, to thousands of acres in size. The proposed GCWRA lies immediately to the east of the Anderson Mesa Important Bird Area, located within the Coconino National Forest. Anderson Mesa begins about nine miles southeast of Flagstaff, and continues as a gently sloping tableland for approximately 25 miles to the southeast. The GCWRA lies



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along the northeastern edge of the Anderson Mesa with portions of the Evaluation Area extending up onto the Mesa.

Along the length of the Anderson Mesa are a complex of lakes, including permanent, semi-permanent, and ephemeral lakes and wetlands, grasslands, pinyon-juniper woodland, and conifer forests. The largest of the lakes, Mormon Lake, lies approximately 10 miles to the west of the GCWRA. The wetland complex within the Anderson Mesa IBA has been documented as one of two major waterfowl use areas in Arizona during migration, particularly by dabbling ducks during spring migration (National Audubon Society 2009). A variety of land birds also use the IBA for breeding and as a migration stopover site. The extensive pinyon pine and juniper woodlands in the area support populations of pinyon jay (*Gymnorhinus cyanocephalus*), a species of global conservation concern because of the limited distribution of pinyon pine on which the species depends (National Audubon Society 2009).

### 3.4.2 USFWS Birds of Conservation Concern

The GCWRA lies near the southwestern boundary of the Southern Rockies/Colorado Plateau Bird Conservation Region. Twenty-seven species are listed by the USFWS as birds of conservation concern within this region (USFWS 2008; Table 3.4). These species do not receive special protection unless they are also listed by the USFWS under the Endangered Species Act or by the AZGFD; but have been identified as vulnerable to population declines in the area by the USFWS (2008). Of these, four species have been documented by Arizona's Natural Heritage Program as occurring within the Canyon Diablo and/or Middle Little Colorado Watersheds: bald eagle, ferruginous hawk, peregrine falcon, and burrowing owl (AZGFD 2009).

During WEST's 2007/2008 baseline avian surveys at Study Area A, seven USFWS species of conservation concern were observed in the Study Area A of the Project: bald eagle, ferruginous hawk, prairie falcon, burrowing owl, gray vireo (*Vireo vicinior*), pinyon jay, and Cassin's finch (*Carpodacus cassinii*; Young et al. 2008). USFWS correspondence received for this study (Appendix A) identifies the gray vireo, loggerhead shrike (*Lanius ludovicianus*) and olive-sided flycatchers (*Contopus cooperi*) as species potentially affected by Project development. A total of three gray vireos, 32 loggerhead shrikes and zero olive-sided flycatchers were identified during Study Area A surveys (Young et al 2009). During avian surveys conducted at the Sunshine Wind Park, 13 loggerhead shrikes, zero gray vireos or olive-sided flycatchers were observed (WEST 2006). The potential for gray vireo and olive-sided flycatcher is greatest in open woodlands and associated areas primarily located west of the GCWRA atop Anderson Mesa. The potential for these species to occur declines from the Evaluation Area through Study Areas A, B and C. Data from the Sunshine Windpark studies indicate low breeding or occurrence probability for these species in open grasslands associated with large portions of the GCWRA. Loggerhead shrike habitat is available within the GCWRA and within the wider region; the species is not listed as a USFWS Bird of Conservation Concern (Table 3.4).



### 3.4.3 USGS Breeding Bird Survey

The USGS Breeding Bird Survey (BBS) is a large-scale survey of North American breeding birds. Each June over 3,500 designated routes in the continental U.S. and southern Canada are surveyed by experienced birders. Each BBS route is 24.5 miles long and consists of 50, three-minute point counts along the length of the route. Information gathered from these surveys allows some indication of species that may utilize the region either transiently or for breeding habitat during the summer. The BBS routes closest to the GCWRA are the Happy Jack and Forest Lakes routes (Figure 3.3); however, these routes are located in the higher-elevation, forested region to the west and south of the GCWRA, and generally do not contain habitat types representative of the GCWRA. Alternatively, the Castle Buttes route located approximately 40 miles to the northeast (Figure 3.4) is characterized by Great Basin shrub and grassland habitats more likely to support bird species found within the GCWRA. The Castle Buttes route has been monitored for seven years, between 1992 and 2007. A total of 38 species have been observed along this route, including four raptor species and one vulture species (red-tailed hawk, golden eagle, American kestrel, prairie falcon, and turkey vulture; Sauer et al. 2008). The most common species observed along this route were: horned lark (*Eremophila alpestris*), common raven (*Corvus corax*), western meadowlark (*Sturnella neglecta*), mourning dove (*Zenaidura macroura*), Cassin's kingbird (*Tyrannus vociferans*), and lark sparrow (*Chondestes grammacus*), with an average of >10 individuals sighted per year. This is generally similar to the most common species observed during the avian use surveys conducted by WEST during the summer of 2007 at Study Area A of the Project which included: lark sparrow, horned lark, and northern mockingbird (Young et al. 2008). No federal threatened or endangered species or state species of special concern have been observed along the Castle Buttes route, but two federal species of conservation concern have been observed: prairie falcon and pinyon jay (USFWS 2008; Table 3.4).

Additional raptors observed on the nearby Happy Jack and Forest Lakes routes include bald eagle, northern goshawk, sharp-shinned hawk, peregrine falcon, and great-horned owl. Of these, bald eagle, northern goshawk, and peregrine falcon are considered state species of special concern by the AZGFD (2009a).

### 3.4.4 Indirect Displacement Effects

The presence of wind turbines may alter the landscape so that wildlife habitat use patterns are altered, thereby displacing wildlife away from site facilities. For wind power projects, one of the greatest concerns related to displacement impacts are for wind energy projects placed in grasslands and other native habitats. Recently, research has been initiated to assess the potential displacement of grassland songbirds at wind power facilities, although uncertainty still exists over the actual effects. In Minnesota, researchers have found that breeding songbird density on Conservation Reserve Program (CRP) grasslands was reduced in the immediate vicinity of turbines (Leddy et al. 1999), but changes in density at broader scales were not detectable (Johnson et al. 2000). Erickson et al. (2003) documented a decrease in density of some native grassland songbirds such as grasshopper sparrows (*Ammodramus savannarum*) near turbines in Washington; however, they could not determine if a decrease in post-construction density was the result of behavioral disturbance or a loss of habitat. Piorkowski (2006) conducted a displacement study at a

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wind power project in Kansas. Of the grassland species present on the facility in Kansas (horned lark, killdeer [*Charadrius vociferus*], dickcissel [*Spiza americana*], Cassin's sparrow [*Aimophila cassinii*], grasshopper sparrow, bobolink [*Dolichonyx oryzivorus*], scissor-tailed flycatcher [*Tyrannus forficatus*], and western meadowlark), only the western meadowlark showed significantly lower densities near turbines. Piorkowski (2006) suggested that habitat characteristics were more important to determining songbird breeding densities than the presence of wind turbines. Shaffer and Douglas (2009) of the USGS examined displacement effects of wind turbines in North Dakota and South Dakota, and found that three out of the five grassland species examined did not appear to avoid turbines.

**Table 3.4. Species of Conservation Concern within the Southern Rockies/Colorado Plateau Bird Conservation Region (USFWS 2008)**

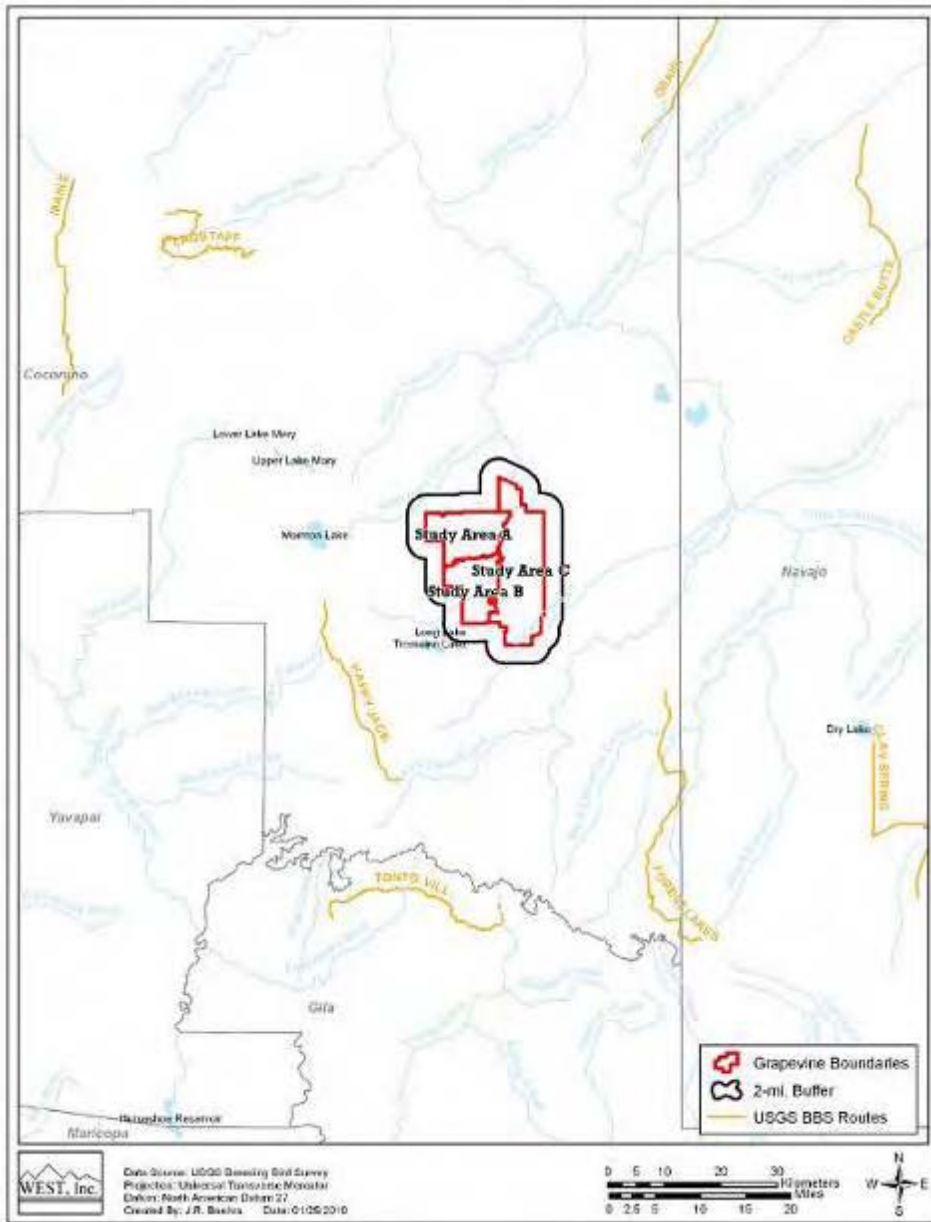
Species	Scientific Name
Gunnison sage-grouse	<i>Centrocercus minimus</i>
American bittern	<i>Botaurus lentiginosus</i>
bald eagle (b)	<i>Haliaeetus leucocephalus</i>
ferruginous hawk	<i>Buteo regalis</i>
peregrine falcon (b)	<i>Falco peregrinus</i>
prairie falcon	<i>Falco mexicanus</i>
snowy plover (c)	<i>Charadrius alexandrinus</i>
mountain plover	<i>Charadrius montanus</i>
long-billed curlew	<i>Numenius americanus</i>
yellow-billed cuckoo (a)	<i>Coccyzus americanus</i>
flamulated owl	<i>Otus flammeolus</i>
burrowing owl	<i>Athene cunicularia</i>
Lewis's woodpecker	<i>Melanerpes lewis</i>
willow flycatcher (c)	<i>Empidonax traillii</i>
gray vireo	<i>Vireo vicinior</i>
pinyon jay	<i>Gymnorhinus cyanocephalus</i>
juniper titmouse	<i>Baeolophus ridgwayi</i>
Veery	<i>Catharus fuscescens</i>
Bendire's thrasher	<i>Toxostoma bendirei</i>
Grace's warbler	<i>Dendroica graciae</i>
brewer's sparrow	<i>Spizella breweri</i>
grasshopper sparrow	<i>Ammodramus savannarum</i>
chestnut-collared longspur	<i>Calcarius ornatus</i>
black rosy-finch	<i>Leucosticte atrata</i>
brown-capped rosy-finch	<i>Leucosticte australis</i>
Cassin's finch	<i>Carpodacus cassinii</i>

(a) ESA candidate; (b) ESA delisted; (c) non-listed subspecies or population of Threatened or Endangered species

The GCWRA and Evaluation Areas contain substantial amounts of grassland habitat (~24% and 18% of total land cover, respectively based on NLCD data – see Section 2.0), and some species of sensitive grassland songbirds may reside in, or migrate through, the

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GCWRA. As more research is published, the potential impacts of wind turbines on breeding songbirds can be better defined.



**Figure 3.3 USGS Breeding Bird Survey routes closest to the GCWRA.**

## 3.5 Bats

### 3.5.1 Species likely to occur in the area

Bat fatalities at wind-energy facilities were first noted during avian surveys in the early 1990s (Orloff & Flannery 1992); however it was not until reports estimated high numbers of bat fatalities in sites in West Virginia (Kerns & Kerlinger 2004) and Tennessee

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(Fiedler 2004) that concern was elevated and alliances such as the Bats and Wind Energy Cooperative were established to determine the extent of bat mortality at wind power facilities and to develop solutions to the problem (Arnett 2007). The National Research Council recently published the findings of the Committee on Environmental Impacts of Wind Energy Projects whose task was to provide a comprehensive review of scientific literature pertaining to the effects of wind power facilities on the local environment (NRC 2007). Bat casualties have been reported from most wind power facilities where post-construction fatality data are publicly available. Reported estimates of bat mortality at wind power facilities have ranged from 0.02 – 53.3 per MW per year (Arnett et al. 2008). Though some wind power facilities have extremely high numbers of bat fatalities these figures are likely underestimations due to high levels of scavenger removal (70% of killed bats scavenged within 24 hrs) and low searcher efficiency, especially where vegetation is high (Arnett 2005). The small body size of bats also adds to lower detection ability, compared for example with detection rates for raptor carcasses.

Most of the bat casualties at wind power facilities to date are migratory species which conduct long fall migrations between summer roosts and winter areas (Gruver 2002, Johnson et al. 2003). The reason for disproportionate mortalities during fall are unknown; however it may be that tree bats fly at lower altitudes during spring migration than during fall migration. For example, hoary bats (*Lasiurus cinereus*) fly 1-5 m (3-16 ft) from the ground while migrating through New Mexico in the spring, but apparently not in the fall (Cryan & Veilleux, 2007). In contrast, a hoary bat collided with an aircraft above Oklahoma at an altitude of 2,438 m (7,999 ft) in October (Peurach 2003). At least eleven bat species have been recovered during carcass searches at wind-energy facilities throughout the U.S. (Johnson 2005, Kunz et al. 2007, NRC 2007, Arnett et al. 2008) and of these, five species are potential residents and/or migrants in the GCWRA (Table 3.4).

**Table 3.4. Species composition of bat fatalities from wind-energy facilities in the U.S. (Adapted from NRC, 2007 p. 65)**

Common name	Scientific name	Total (number & percentage)	
Hoary bat*	<i>Lasiurus cinereus</i>	1,023	41
Eastern red bat	<i>Lasiurus borealis</i>	580	23
Tri-colored bat (formally eastern pipistrelle)	<i>Perimyotis subflavus</i>	261	11
Silver-haired bat*	<i>Lasionycteris noctivagans</i>	209	8.4
Little brown myotis	<i>Myotis lucifugus</i>	145	5.8
Brazilian (or Mexican) free-tailed bat*	<i>Tadarida brasiliensis</i>	143	5.7
Big brown bat*	<i>Eptesicus fuscus</i>	59	2.4
Northern long-eared myotis	<i>Myotis septentrionalis</i>	8	0.4
Western red bat*	<i>Lasiurus blossevilli</i>	4	0.2
Seminole bat	<i>Lasiurus seminolus</i>	1	0.1
Unknown	-	53	2.1
Total	-	2,486	100

\*Potential resident and/or migrant in the GCWRA

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Due to the current lack of understanding of bat populations in North America, the species and relative abundance of bats occurring within the GCWRA are difficult to determine. Based on range maps and species accounts from Bat Conservation International (BCI 2009) and Harvey et al. (1999), 30 species of bat are known to occur in Arizona, with 20 species having an approximate range that includes the GCWRA or surrounding region (Table 3.5). Of these 20 species, 11 have the potential to roost or forage within the GCWRA; pallid bat (*Antrozous pallidus*), pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*), big brown bat (*Eptesicus fuscus*), spotted bat (*Euderma maculatum*), California myotis (*Myotis californicus*), western small-footed myotis (*Myotis ciliolabrum*), Arizona myotis (*Myotis occultus*), fringed myotis (*Myotis thysanodes*), big free-tailed bat (*Nyctinomops macrotis*), canyon bat (*Parastrellus hesperus*), and Mexican free-tailed bat (*Tadarida brasiliensis*). An additional three species are likely seasonal migrants through the GCWRA; silver-haired bat (*Lasionycteris noctivagans*), western red bat (*Lasiurus blossevillii*), and hoary bat. Based on known distributions and habitat preferences, a further six species are possible, though unlikely, residents of the GCWRA; Allen's big-eared bat (*Idionycteris phyllotis*), greater bonneted bat (*Eumops perotis*), southwestern myotis (*Myotis auriculus*), long-eared myotis (*Myotis evotis*), long-legged myotis (*Myotis volans*), and Yuma myotis (*Myotis yumanensis*). Of the bats with potential to occur within the GCWRA, 11 species are listed as federal species of concern by Arizona's Natural Heritage Program (AZGFD 2009): pale Townsend's big-eared bat, spotted bat, greater bonneted bat, Allen's big eared bat, western small-footed myotis, long-eared myotis, Arizona myotis, fringed myotis, long-legged myotis, Yuma myotis, and big free-tailed bat. In addition, two bats are designated as state species of special concern by the AZGFD (2009): spotted bat and western red bat. Of the bats with potential to occur within the GCWRA, seven species have been documented as occurring within the larger Canyon Diablo and/or Middle Little Colorado Watersheds: greater bonneted bat, Allen's big-eared bat, western small-footed bat, long-eared myotis, Arizona myotis, fringed myotis, and long-legged myotis (AZGFD 2009). Based on information provided by the AZGFD (Appendix A), fringed myotis and hoary bat have been documented within five miles of the GCWRA.

The highest numbers of bat fatalities found at wind-energy projects to date have occurred in eastern North America on ridge tops dominated by deciduous forest (NWCC 2004). However, Barclay et al. (2007) and Koford et al. (2005) have reported relatively high fatality rates from projects in Canada and Iowa located in grassland and agricultural habitats. The most likely roosting habitat for bats within the GCWRA is along the canyons in the southeastern, central, and northwestern portions of the GCWRA. Caves, crevices, and rock outcrops along the canyon walls likely provide habitat for roosting and hibernating bats. Juniper savannah/woodlands throughout the GCWRA and riparian woodlands in canyon bottoms may also provide roosting habitat for tree-roosting species. Bats undoubtedly forage at the creeks, springs, ponds, and stock tanks throughout the GCWRA and these areas are likely to concentrate both resident and migrant species. Free-tailed bats are known to occur in the region and can form colonies in caves and abandoned mines that contain hundreds of thousands of bats. Studies conducted at other wind-energy projects have documented use of areas within and around wind projects by

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resident or breeding bats during the summer; however, these species are rarely found as casualties at turbines (Johnson 2005).

During acoustic bat monitoring conducted by WEST at Study Area A of the proposed project in 2007 and 2008, bat activity (mean = 9.11 bat passes per detector-night) was relatively high compared to that observed at facilities in Minnesota and Wyoming, where bat collision mortality was low, but it was much lower than activity recorded at sites in West Virginia and Tennessee, where bat mortality rates were high (Table 3.6). Bat activity at the nearby Sunshine Wind Park was considerably lower, with a mean of 2.48 bat passes per detector night (Gruver et al 2009), suggesting decreased bat activity may occur in grassland and desert scrub areas associated with large portions of Study Areas B and C compared with observed detections in Study Area A. Based on the presumed relationship between pre-construction bat activity and post-construction fatalities, it is expected that bat mortality at the proposed project would be greater than the 2.2 bat fatalities/turbine/year reported at Buffalo Ridge, Minnesota, but much lower than the 20.8 fatalities/turbine/year reported at Buffalo Mountain, Tennessee. While there are no known published studies of bat mortality at wind projects in the desert southwest, other western projects including those in California have generally shown lower impacts. The recently published Dillon California fatality project showed a bat fatality rate of 2.17 fatalities per turbine per year (2.17 fatalities per MW per year; Chatfield et al 2009). Due to the overall lack of understanding regarding bat and wind turbine interactions in Arizona, it is difficult to predict if the proposed project may potentially result in a high fatality rate for bats. No known bat hibernaculum or roosts of significance have been noted within the vicinity of the GCWRA by the AZGFD or the USFWS (Appendix A).

**Table 3.5. Bat species determined from range-maps (Harvey et al. 1999; BCI website) with potential to occur within the GCWRA or Evaluation Area.**

Species	Status	Habitat	Potential for Occurrence
pallid bat ( <i>Antrozous pallidus</i> )		Inhabit rocky, outcrop areas of arid regions where they commonly roost in crevices, caves, and mines. May also roost in barns, hollow trees, or buildings.	<b>High.</b> Possible year-round resident.
pale Townsend's big-eared bat ( <i>Corynorhinus townsendii pallascens</i> )	FSC,	Distribution correlated with rocky situations where caves or abandoned mine tunnels are available. In west, most typical habitat is arid western desert scrub and pine forest regions. In spring and summer form maternity roosts in mines, caves or buildings. Hibernates in caves or abandoned mines. Extremely sensitive to disturbance.	<b>Moderate.</b> Possible year-round resident if cave/mine roosting habitat available.
big brown bat † ( <i>Eptesicus fuscus</i> )		Form maternity colonies beneath loose bark in forests and other trees, or in buildings and under bridges. Uses a variety of habitats including oak woodlands and areas with dense tree canopy. May forage over cleared meadows and trees in pastures or along streams. Hibernates in caves, mines, houses, hollow trees etc.	<b>Moderate.</b> Possible year-round resident.

**Table 3.5. Bat species determined from range-maps (Harvey et al. 1999; BCI website) with potential to occur within the GCWRA or Evaluation Area.**

Species	Status	Habitat	Potential for Occurrence
spotted bat ( <i>Euderma maculatum</i> )	FSC	Inhabit a range of habitats: from high-elevation pine forests, pinyon -juniper woodland, and open scrub associations in desert areas. In summer roost in crevices in cliff walls and canyons. Little known about winter habits. Distribution not known to include portion of county.	<b>Low.</b> Possible year-round habitat present but range extant is great from nearest known location.
California myotis ( <i>Myotis californicus</i> )		One of the most abundant bats in desert scrub habitat. Inhabit wooded canyons, open deciduous and coniferous forests, and brushy hillsides. Roost beneath loose bark, crevices of old snags and tree cavities. May also form small maternity colonies in cliff crevices, buildings, and bridges.	<b>High.</b> Possible year-round resident.
western small-footed myotis ( <i>Myotis ciliolabrum</i> )	FSC	Inhabit deserts, semi-deserts, and desert mountains. Day roost in crevices and cracks in canyon walls, tunnels, loose bark and buildings. Can be found hibernating in caves and mines in winter. Little else known about the species.	<b>High.</b> Possible year-round resident.
Arizona myotis ( <i>Myotis occultus</i> )	FSC	most commonly found in conifer forests in the 6,000 - 9,000 foot elevation range, although nursery colonies known from lower elevations, where affiliation with water common.	<b>High.</b> Possible year-round resident.
fringed myotis ( <i>Myotis thysanodes</i> )	FSC	Roost in caves, mine tunnels, rock crevices, and old buildings. Hibernate in caves and buildings but little is known about wintering locations. Habitat ranges from mountainous pine, oak, and pinyon-juniper to desert scrub and grassland.	<b>High.</b> Possible year-round resident; documented within five miles of GCWRA.
big free-tailed bat ( <i>Nyctinomops macrotis</i> )	FSC	Typically inhabit desert and arid grasslands, roosting in rock out-crops, canyons, and cliffs.	<b>Moderate.</b> Possible year-round resident
canyon bat ( <i>Parastrellus hesperus</i> )		Common to deserts, woodlands, and shrublands where they are typically associated with rocky situations along watercourses. Roosts among boulders or in cracks and crevices in canyon walls or cliffs. Probably hibernate in mines and caves in winter.	<b>High.</b> Possible year-round resident.
Mexican free-tailed bat† ( <i>Tadarida brasiliensis</i> )		Occupies a variety of habitats from desert communities to pinyon-juniper woodland and pine-oak forests. These are primarily cave-dwelling bats though some smaller maternity colonies are in hollow trees.	<b>Moderate.</b> Possible year-round resident – if suitable large caves/mines present.



**Table 3.5. Bat species determined from range-maps (Harvey et al. 1999; BCI website) with potential to occur within the GCWRA or Evaluation Area.**

Species	Status	Habitat	Potential for Occurrence
silver-haired bat† ( <i>Lasionycteris noctivagans</i> )		Long-distant migrant and solitary tree-roosting bat. Forms maternity colonies in tree cavities and small hollows. Roosts and hibernates beneath loose bark, in snags and in manmade structures. Inhabit forested areas near streams and lakes.	<b>High.</b> Likely migrant through GCWRA
western red bat† ( <i>Lasiurus blossevillii</i> )	FSC, WSC	Long-distant migrant and solitary tree-roosting bat. Prefer riparian areas dominated by cottonwoods, oaks, sycamore, and walnut in otherwise arid regions; though also found in desert scrub. Roosts in tree foliage.	<b>Moderate.</b> Possible summer resident, though suitable forested and riparian roosting habitat is limited; possible migrant.
hoary bat† ( <i>Lasiurus cinereus</i> )		Long-distant migrant and solitary tree bat. Roosts in trees along forest borders and edges of forest clearings. Forages above water and forest openings such as grassy meadows.	<b>High.</b> Likely migrant through GCWRA; documented within five miles of the GCWRA.
Allen's big-eared bat ( <i>Idionycteris phyllotis</i> )	FSC	Typically inhabit ponderosa pine, pinyon-juniper, and riparian habitats; roost in mines, boulder piles, and beneath loose bark of pine snags; most often found in rocky situations near riparian or woodland areas.	<b>Low.</b> Some potential to occur in wooded areas of Study Areas A and B; greater potential to occur in western Evaluation Area.
greater bonneted bat ( <i>Eumops perotis</i> )	FSC	Roost in cliff-face crevices high above ground; severely limited by available drinking water – due to long, narrow wings, require ponds at least 100feet long.	<b>Low.</b> Possible year-round resident, though water limited in GCWRA; greater potential to occur in Evaluation Area.
southwestern myotis ( <i>Myotis arculus</i> )		Inhabit ponderosa pine forests, oak woodlands, and mesquite, chaparral, and pinyon-juniper scrub habitats; generally occur near rocky cliffs and water; roost in tree cavities or beneath loose bark; may hibernate in cliff-face crevices.	<b>Low.</b> Woodland habitat and water is limited in GCWRA; greater potential to occur in Evaluation Area.
long-eared myotis ( <i>Myotis evotis</i> )	FSC	Found predominately in coniferous forest. Roost in tree cavities and beneath exfoliating bark. Hibernation sites poorly known.	<b>Low.</b> Possible year-round resident, though forested roosting habitat is limited; greater potential to occur in Evaluation Area.
long-legged myotis ( <i>Myotis volans</i> )	FSC	Forest inhabitants, preferring high, open woods and mountainous terrain. Roost in buildings, cliff crevices, and hollow trees. Maternity roosts have been found beneath bark and in other cavities.	<b>Low.</b> Possible year-round resident, though suitable roosting habitat may be limited.
Yuma myotis	FSC	Inhabit range of habitats from humid forests	<b>Moderate.</b> Possible

**Table 3.5. Bat species determined from range-maps (Harvey et al. 1999; BCI website) with potential to occur within the GCWRA or Evaluation Area.**

Species	Status	Habitat	Potential for Occurrence
<i>(Myotis yumanensis)</i>		to deserts, always near water. Most often roost in buildings and bridges, but may also use rock crevices, caves, and mines. Thought to hibernate in caves or mines in winter. Primarily forage over open water.	year-round resident, though foraging habitat (water) is very limited; greater potential to occur in Evaluation Area.

†Found as fatalities at wind-energy facilities (NRC 2007); FSC = Federal Species of Concern, WSC = State Wildlife Species of Special Concern. Range, habitat and use data from Bat Conservation International (2009).

**Table 3.6. Wind-energy facilities in the U.S. with both pre-construction AnaBat sampling data and post-construction mortality data for bat species (adapted from Kunz et al. 2007b).**

Wind-Energy Facility	Activity (#/detector night)	Mortality (bats/turbine/year)	Reference
Grapevine, AZ	9.11	-	Young et al. 2008
Foote Creek Rim, WY	2.2	1.3	Gruver 2002
Buffalo Ridge, MN	2.1	2.2	Johnson et al. 2005
Buffalo Mountain, TN	23.7	20.8	Fiedler 2004
Top of Iowa, IA	34.9	10.2	Koford et al. 2005
Mountaineer, WV	38.3	38.0	Arnett et al. 2005

### 3.6 Big Game

The GCWRA provides habitat for several species of big game including pronghorn antelope (*Antilocapra americana americana*), elk (*Cervus elaphus*), and mule deer (*Odocoileus hemonius*). In 2007, Arizona’s pronghorn population was estimated to be approximately 11,000 individuals, occurring mainly in north-central Arizona and scattered herds in the southeast (AZGFD 2007). Most pronghorn occur between 3,000 and 7,000 feet elevation and inhabit a variety of habitat types from desert grassland to forest and mountain meadows; however, they generally prefer flat, open grassland areas (AZGFD 2007). The GCWRA falls within the range of the Anderson Mesa herd of pronghorn antelope. This population declined throughout recent decades as a result of habitat degradation and drought. This herd has been a focus of research and management effort within the state (AZGFD 2007). On February 2, 2010, AZGFD provided information on the distribution of the Anderson Mesa herd requested for this report. AZGFD conducted a telemetry study on pronghorn between 2003-2006. In addition, AZGFD has implemented a number of habitat treatments projects for pronghorn within and adjacent to the GCWRA, though many of these treatments were implemented after the telemetry study was completed and therefore analysis of pronghorn use of treatment areas is not possible to complete with existing data (Figure 3.4).

## Anderson Mesa Grassland Restoration Treatments 2009

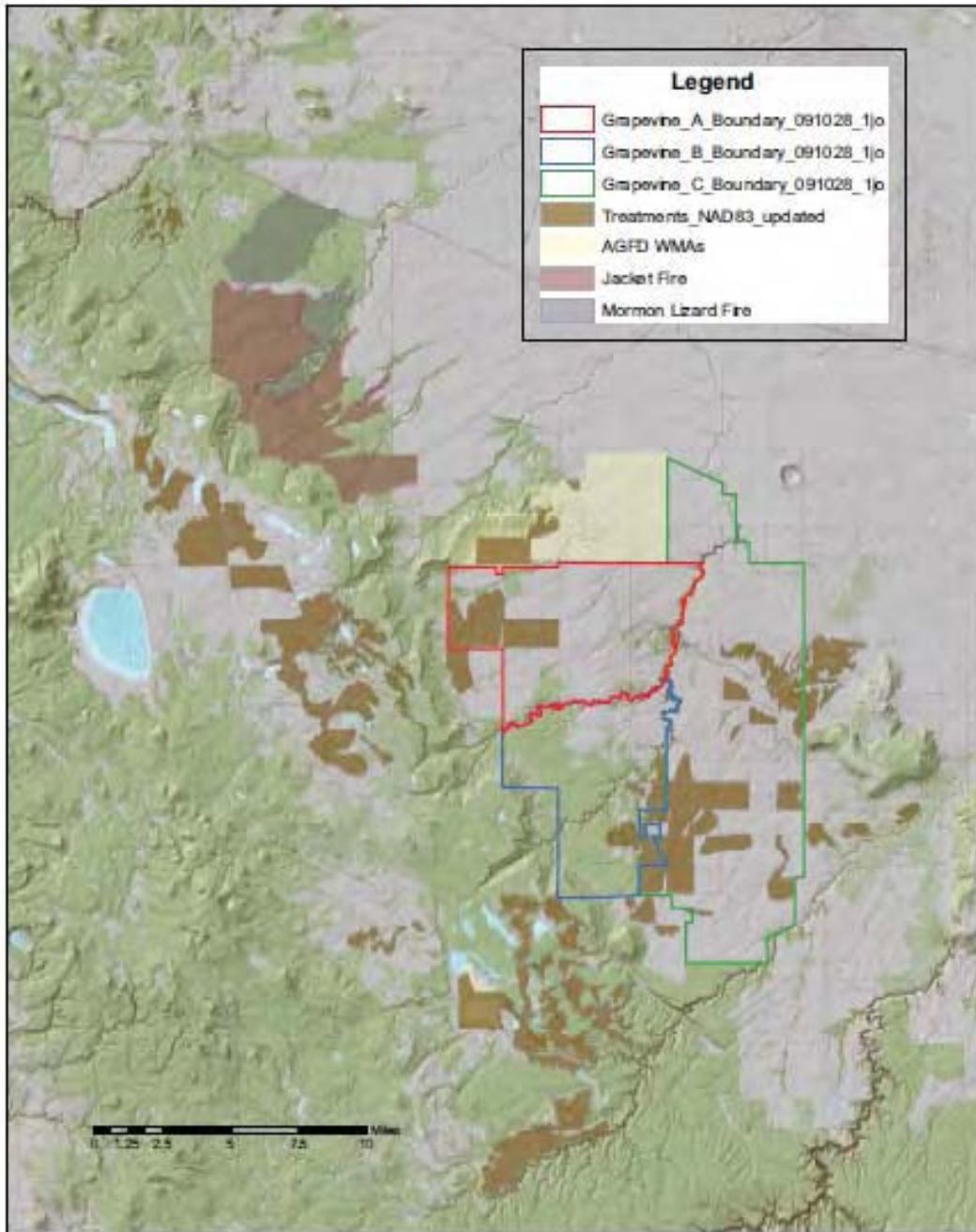


Figure 3.4 Pronghorn antelope habitat treatment areas in the vicinity of the GCWRA (AZGFD 2010).

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The pronghorn in this area are functionally split into two groups; one group spends the winter at lower elevation lands and spends the rest of the year on Anderson Mesa, the second group lives year-round in the lower elevation habitat (Figures 3.5 and 3.6). The AZGFD study involved capture and radio-collaring of individuals atop Anderson Mesa, west of the GCWRA. Data from this study is informative of dispersal and/or migration of individuals captured atop Anderson Mesa. Overall use of habitat treatment areas by those pronghorn observed within the GCWRA was low (Figure 3.5). During the summer, individuals were primarily located atop the Anderson Mesa, with few telemetry locations recorded within Study Area A of the GCWRA (Figure 3.7).

The majority of winter locations of radio collared individuals were in the same grasslands and shrublands, primarily on State and private lands, including those which comprise the GCWRA (Figure 3.8). Winter locations compiled by AZGFD (Figure 3.8) comprised the majority of the total number of telemetered locations recorded within the GCWRA; however, the seasonal dates (October 1 – March 14) used in the data compilation include likely periods of fall and spring migration. Migration movement through the GCWRA is described in Figure 3.6 and shows moderate use occurring within a central corridor of Study Area A, with lesser use of a portion of Study Area B.

The primary management issue for the Anderson Mesa pronghorn herd is low fawn recruitment (AZGFD 2007). Location data among individuals during the parturition period included in the 2003-2006 AZGFD study (Figure 3.9) is sparse within Study Area B and absent within Study Area C, however, a portion of Study Area A overlapping pronghorn habitat treatment areas was used by collared individuals (Figure 3.4). Overall use of the GCWRA during parturition by radio collared individuals was low.

No scientific studies directly measuring the effects of wind-energy development on big game have been published at this time. There are a few published studies of big game habitat use that may be relevant to the development of wind turbines and wintering game (Sawyer et al. 2009, Sawyer et al. 2009; Johnson et al. 2000; Van Dyke and Klein 1996; Rost and Bailey 1979). At the Foote Creek Rim wind project in Wyoming, pronghorn observed during raptor use surveys were recorded year round (Johnson et al. 2000). The mean number of pronghorn observed at the six survey points was 1.07 prior to construction of the wind-energy facility and 1.59 and 1.14/survey the two years immediately following construction, indicating no reduction in use of the immediate area. Mule deer and elk also occurred at Foote Creek Rim, but their numbers were so low that meaningful data on wind plant avoidance could not be collected. By comparison, during 2007-2008 surveys at Study Area A (Young et al 2009) a use estimate of 0.3 all big game species (pronghorn, elk and mule deer) was calculated based on the number of big game species observed during fixed-point avian use surveys.

Sawyer et al. (2009 and 2006) examined the effects natural gas development on mule deer distribution and habitat selection in western Wyoming. Mule deer were less likely to occupy areas in close proximity to well pads than those far away (Sawyer et al. 2006). Furthermore, in an examination of how three different well pads with varying levels of vehicle traffic influenced winter habitat use of mule deer, Sawyer et al. (2009) found that

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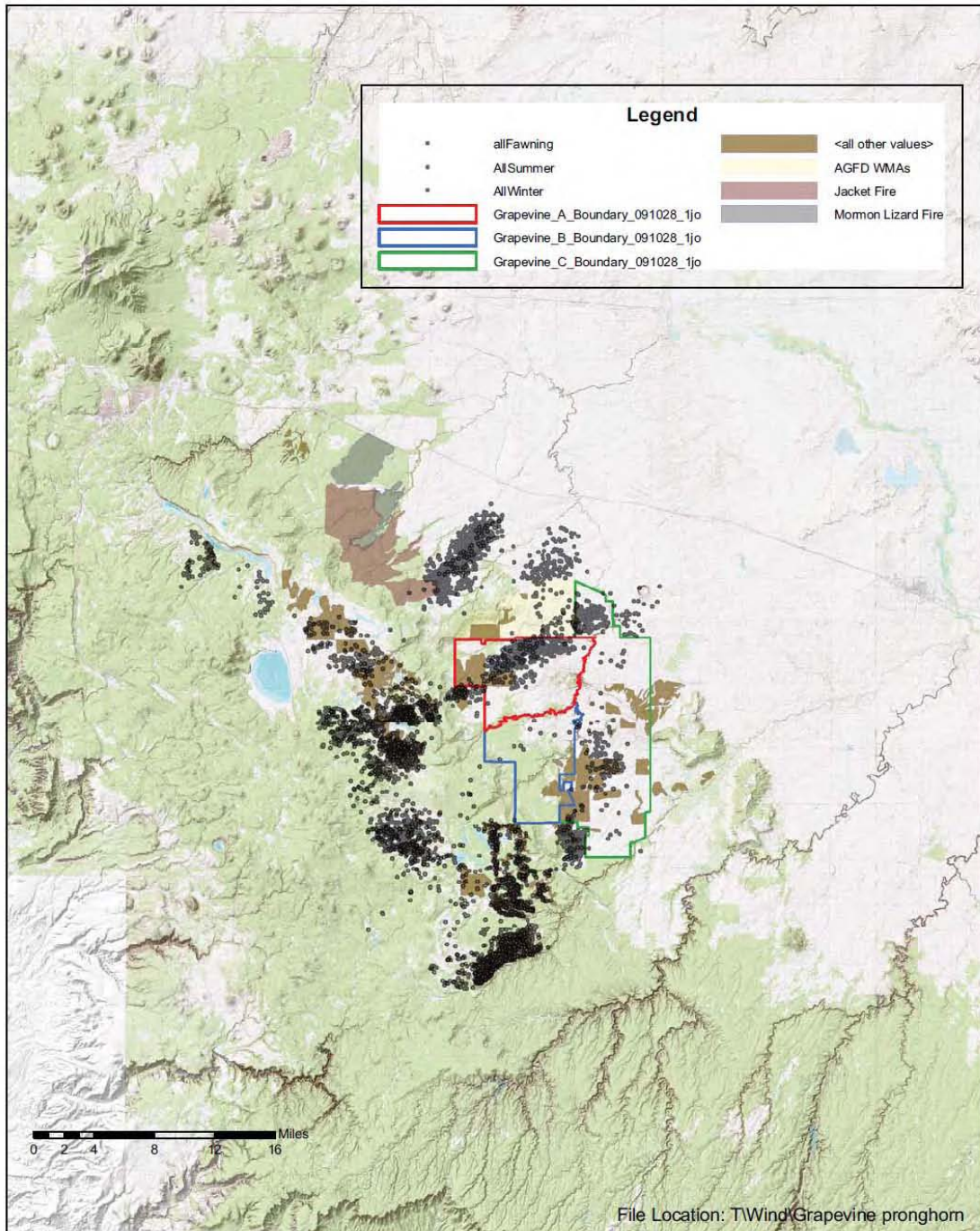
mule deer avoided all types of well pads, selecting areas further from well pads with high levels of traffic. Van Dyke and Klein (1996) documented elk movements through the use of radio telemetry before, during and after the installation of a single oil well within an area used year round by elk. Elk showed no shifts in home range between the pre- and post-drilling periods, however, elk shifted core use areas out of view from the drill pad during the drilling and post-drilling periods. The authors concluded that if drilling activities occupy a relatively small amount of elk home ranges, that elk are able to compensate by shifting areas of use within home ranges.

Studies have been conducted at the Starkey Research Unit, a large fenced experimental study area near La Grande, Oregon using radio-collared elk and deer. Results of spring studies (April – early June) suggest that elk habitat selection may be negatively related to traffic and other human disturbance (Johnson et al. 2000). Elk also tended to increase movement distances as a function of increased use by humans, including ATV use, hiking, and horseback riding (Wisdom et al. 2002). Alternatively, traffic and roads did not appear to be an important factor in spring distribution of mule deer. A study by Rost and Bailey (1979) found that wintering mule deer and elk avoided areas within 656 ft (200 m) of roads in eastern portions of their Colorado study area, where presumably greater amounts of winter habitat were present. The authors concluded that impacts of roads depended on the availability of suitable winter range away from roads, as well as the amount of traffic associated with roads. Availability of suitable big game winter range in the inter-mountain west is generally much less than that observed in north-central Arizona.

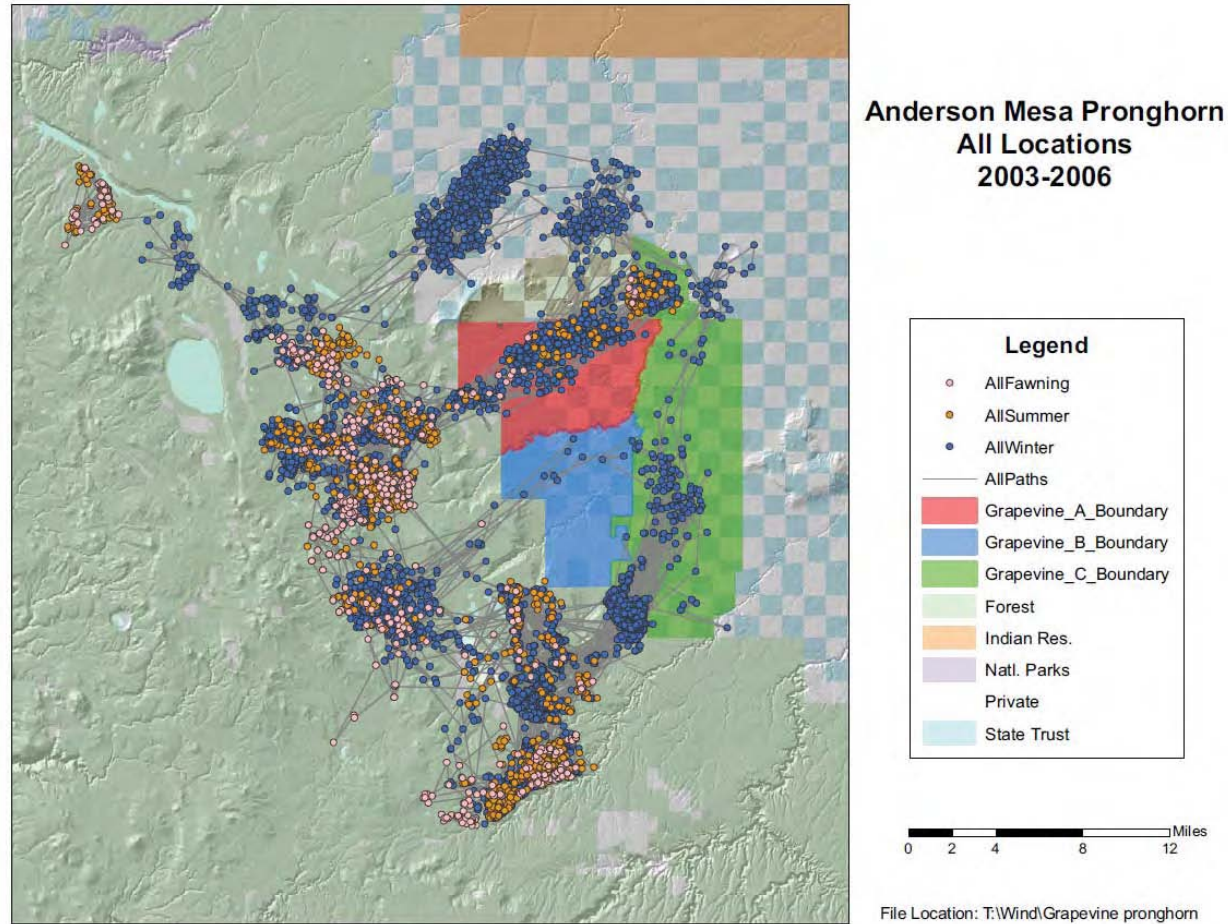
Due to the lack of data regarding the potential impacts of wind energy development on big game, it is difficult to predict the effects of the Project on antelope, mule deer and elk populations. Information received from the AZGFD telemetry study suggests: 1) potential impacts including potential displacement is moderate for wintering individuals utilizing Study Area A; 2) potential impacts during parturition is low for the GCWRA, and; 3) potential avoidance of portions of Study Area A, and to a lesser extent Study Area B, by migrating pronghorn is possible. However, this effects analysis is based on telemetry data from individuals collared outside the GCWRA and it is possible that individuals trapped and collared within the GCWRA may exhibit different spatial use patterns.



## Anderson Mesa Grassland Restoration Treatments 2009

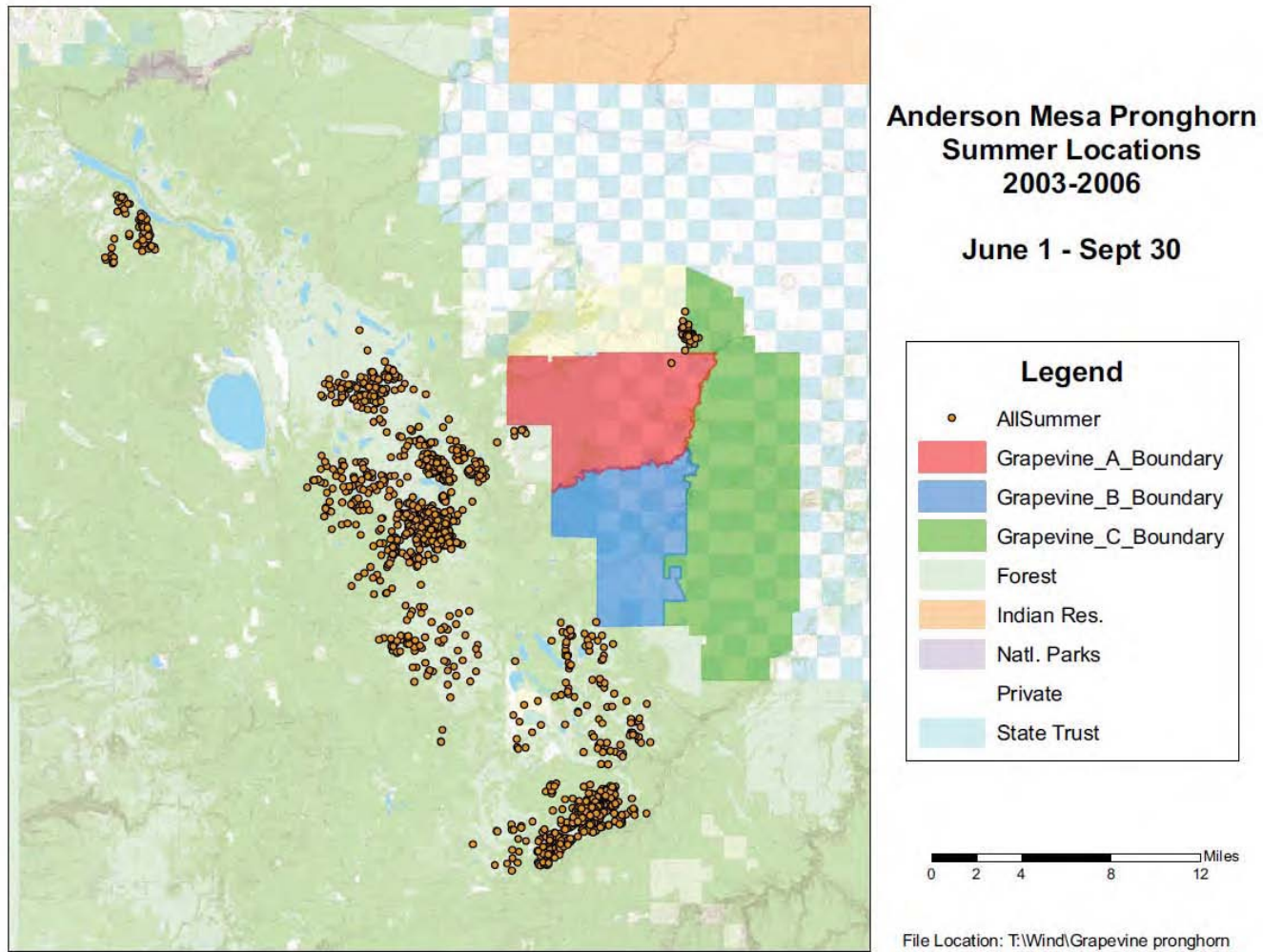


**Figure 3.5 Pronghorn antelope telemetered locations for all season all years during the AZGFD 2003-2006 study in the vicinity of the GCWRA (AZGFD 2010).**

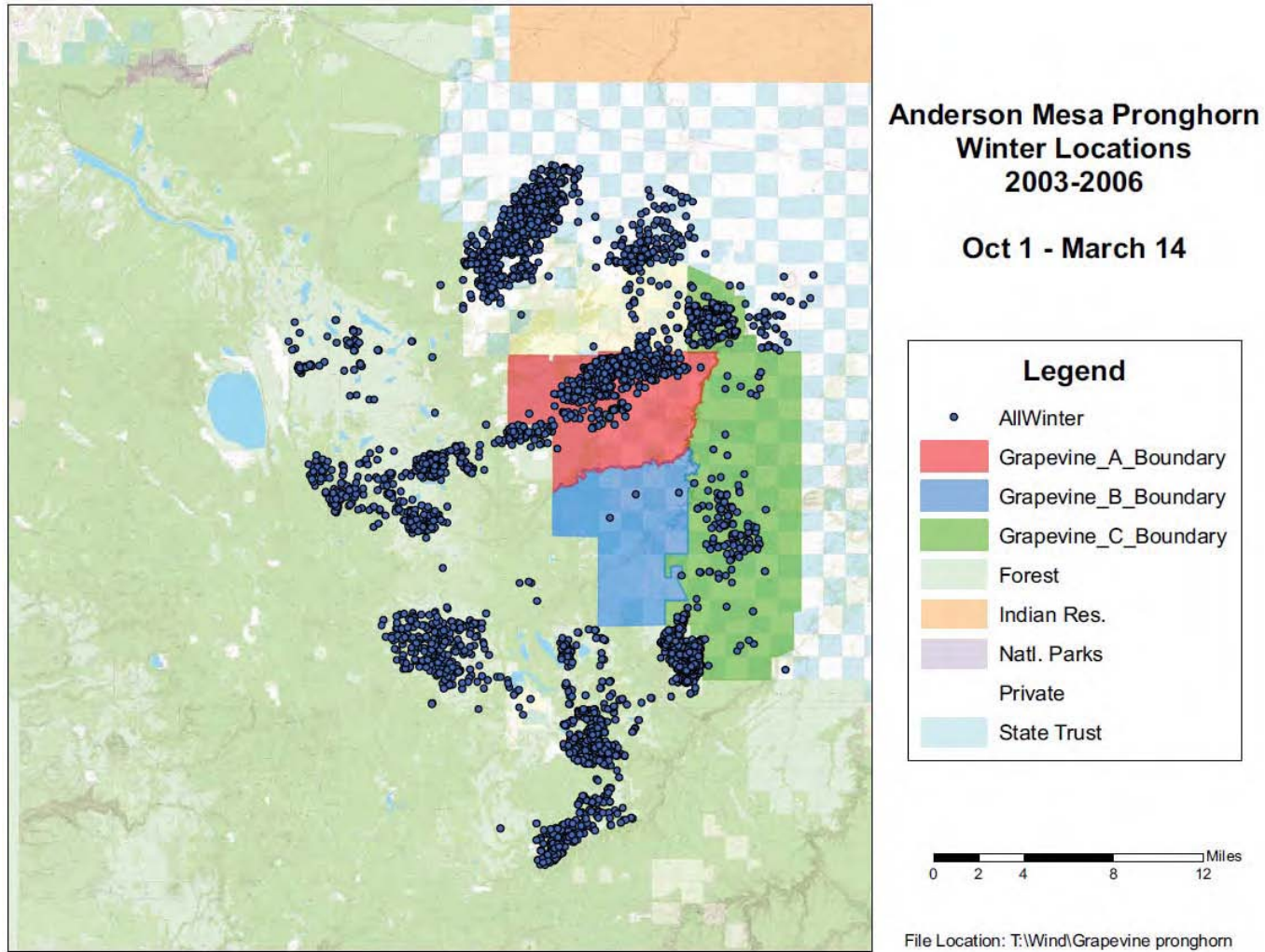


**Figure 3.6. Pronghorn antelope telemetered locations for all season all years during the AZGFD 2003-2006 study in the vicinity of the GCWRA (AZGFD 2010).**



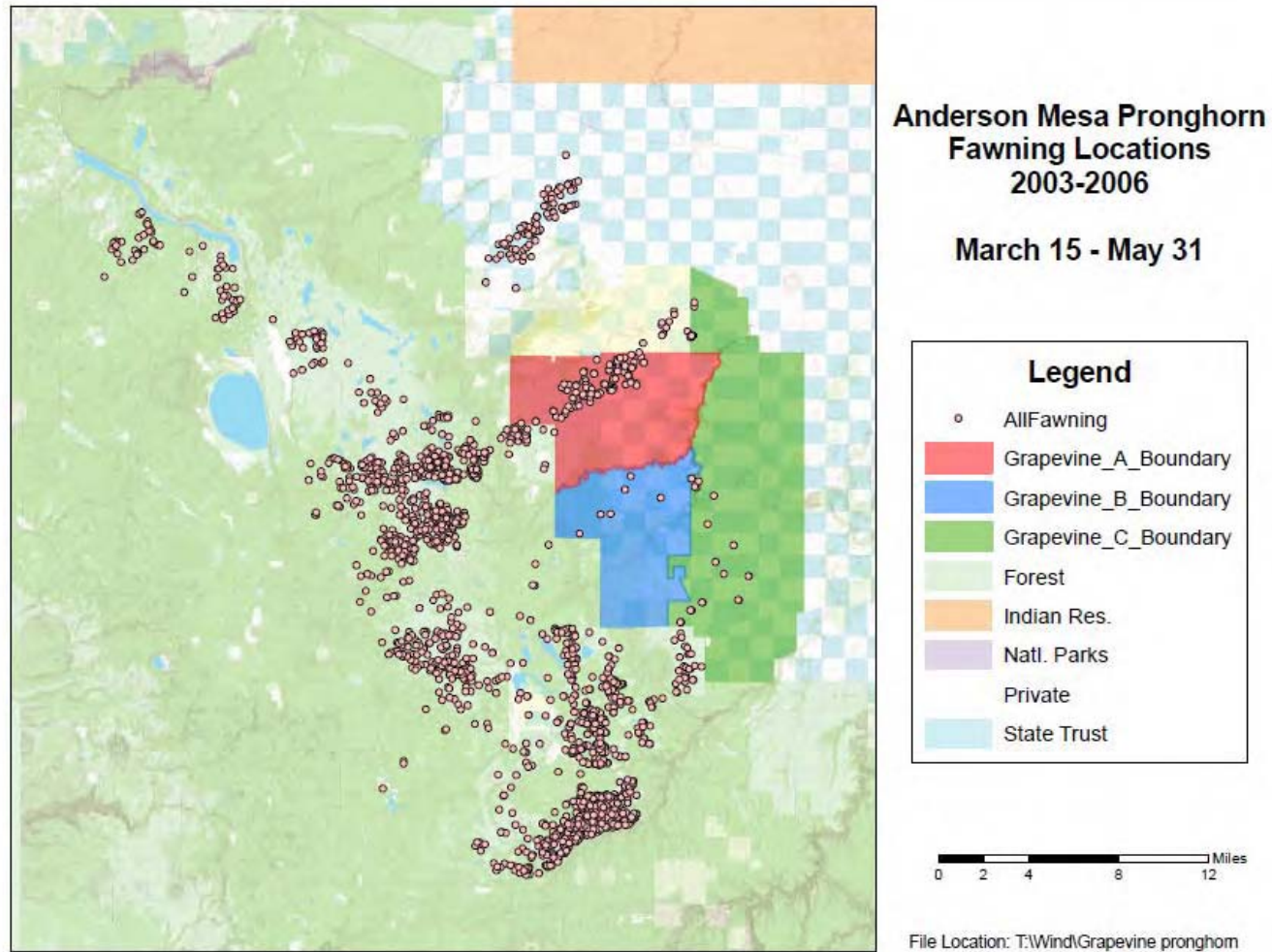


**Figure 3.7 Pronghorn antelope summer locations in the vicinity of the GCWRA as determined through telemetry locations (summer 2003-2006; AZGFD 2010).**



**Figure 3.8 Pronghorn antelope winter locations in the vicinity of the GCWRA as determined through winter telemetry locations (winters 2003-2006; AZGFD 2010).**

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**Figure 3.9 Pronghorn antelope telemetry locations recorded during parturition periods 2003-2006 in the vicinity of the GCWRA (AZGFD 2010).**



## 4.0 SUMMARY

Potential impacts to biological resources evaluated herein are summarized in Table 4.1. Assessment of potential impacts were assessed using standards of significance for impacts to biological resources which are consistent with standards applied for other components of the Grapevine Wind EIS (Grapevine EIS 2010) where appropriate. Definitions and criteria for the effects analysis are provided below.

### 4.1 Standards of Significance

The Proposed Action would have a significant and adverse effect on biological resources if they:

- Adversely affect a listed endangered, threatened, or proposed plant or animal species or designated critical habitat.
- The Proposed Action resulted in a long-term loss of vegetation resulting in the listing or jeopardizing the continued existence of a plant or animal species.
- The Proposed Action would affect the biological viability of a local, regional, or national population of a listed wildlife species or one of concern/interest leading to a downgrading in its listing.
- The Proposed Action would violate the Endangered Species Act (ESA) or the Bald and Golden Eagle Protection Act.
- Substantially interfere with the movement of any native resident or migratory fish or wildlife species for more than one reproductive season.
- Reduce the value of habitat for fish, wildlife, or plants to an unusable level.
- Cause a native fish or wildlife population to drop below self-sustaining levels.
- Adversely and substantially affect important riparian areas, wetlands, or other wildlife habitats.

*Short-term impacts* are those that last through the construction phase of a project, or one or two reproductive cycles, whichever is longer.

*Long-term impacts* are those that last more than two reproductive periods, or as long as the life of the wind park.

*Direct impacts* are those that occur as a result of construction or operation of the wind park.

*Indirect impacts* are those that occur as a result of the wind park's presence. These are usually associated with increased human accessibility to a previously inaccessible area.

The extent of impacts to some resources resulting from construction and operation of the GCWRA is currently unknown. Additional bird and bat data collection should occur for portions of the project not already surveyed. For these areas, additional pre-construction

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surveys prior to siting turbines associated with each of the subsequent phases of the GCWRA is recommended. These surveys may include:

- point count avian surveys during the spring;
- aerial surveys to identify raptor nests; and
- aerial and ground surveys for caves and/or ground fissures to identify potential bat roosting habitat within the wind park study area boundary as well as other potential roost sites in the general vicinity of the Project;.
- acoustic surveys for bats; and
- sensitive species surveys or habitat mapping.

### *4.1 Evaluation of Biological Resources*

Overall, the three Study Areas do not differ significantly in terms of landcover or physiographic features, though some differences do exist. The presence of a greater proportion of canyons and associated wetland/waterbody and riparian features increases the potential for occurrence of some sensitive plant and wildlife species in Study Area A and Study Area B, relative to Study Area C. However, differences are not great enough to warrant increased probability of occurrence of sensitive species within Study Areas A or B compared with the overall evaluation made for the GCWRA. All Study Areas contain similar landcover and physio-graphic features. The most notable difference between the Study Areas in terms of a potential habitat feature is the greater proportion of wetland or waterbodies (principally stock tanks and ponds) located with Study Area A and C compared with Study Area C.

The primary vegetation communities comprising the GCWRA are scrub-shrub, juniper woodlands/savannah, and grassland. Wetlands and other waters of the U.S. are very limited within the GCWRA, comprising less than 0.1% of the GCWRA and are primarily restricted to stock tanks and ponds within upland areas of the GCWRA and ephemeral streams and pools within canyon bottoms. Seven federal listed plant species are listed as occurring in Coconino County and 16 state sensitive (highly restricted or salvage restricted) plants are listed as occurring in the Canyon Diablo and/or Middle Little Colorado Watersheds (AZGFD 2009a, USFWS 2009). The majority of these plants have highly restricted distributions and very specific habitat requirements and are not expected to occur in the GCWRA. The Peebles Navajo cactus has moderate potential to occur within the GCWRA. Field surveys for the species have not occurred. Pre-construction surveys within construction zones are recommended to avoid direct impacts to the species.

Of the wildlife species protected under the Federal Endangered Species Act, 13 species are listed as occurring within Coconino County including four birds, one mammal, one reptile, one amphibian, five fish, and one snail (AZGFD 2009a, USFWS 2009). None of the fish species have the potential to occur in the GCWRA, and the remaining species have a very low probability of occurrence. Fourteen species considered wildlife of special concern by the AZGFD are listed as occurring in the Canyon Diablo and/or Middle Little Colorado Watersheds including seven birds, one mammal, two reptiles, two amphibians, and two fish. None of the bird species are likely to nest within the GCWRA, but several

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may occur as rare winter visitors or pass through the GCWRA during migration. During these these periods, these species are at risk of turbine-collision, however, previous studies of Study Area A (Young et al 2009) do not suggest these species migrate in abundance over that portion of the GCWRA. Therefore, during migration periods impacts are not anticipated to occur which would result in significant impact to these species which would affect populations.

Breeding bird species found at Study Area A during 2007-2008 avian surveys (Young et al 2009) do not suggest the potential for breeding rare or sensitive bird species. Breeding habitats for the federal-listed western yellow-billed cuckoo, southwestern willow flycatcher and Mexican spotted owl are absent from the GCWRA and Evaluation Area, and therefore no potential exists for significant direct or indirect impacts to breeding populations. There is extremely low potential for these species to transient or disperse over the GCWRA. The Navajo Mexican vole has a low potential for occurrence based on habitat association, and both the bald eagle and the little Colorado sucker have been documented as occurring within five miles of the GCWRA according to the Arizona Natural Heritage database (Appendix 1). No surveys have been conducted for Navajo Mexican vole, however, existing ground disturbances in the forms of roads, ROWs and transmission lines exist. Construction may result in disturbance of habitat, though the extent of disturbance is unknown at this time. Construction impacts are not anticipated to result in impacts to populations as the GCWRA does not contain unique habitat to the region and no documented populations of the species have been recorded within the Project Area. Impacts to Colorado Sucker are not anticipated due to avoidance of aquatic features during project planning. BMP associated with minimization of impacts to watersheds are recommended to avoid potential indirect effects to the species. No suitable breeding habitat for bald eagle is present within the GCWRA.

Potentially suitable wetland and waterbody features exist within the GCWRA which could support the Chiricahua leopard frog (federal threatened and state species of concern), northern leopard frog (state species of concern) and the little Colorado sucker (state species of concern). Of these these three species, only the Colorado sucker has been previously documented within a five-mile radius of the Evaluation Area. All three species are considered to have low probability of occurrence within the GCWRA. These species are restricted to aquatic features located in canyon bottom ephemeral streams and pools, and waterbodies and wetlands associated with stock tanks and ponds found throughout the GCWRA. Project planning which avoids impacts to waterbodies and wetlands would negate potential direct impacts on sensitive wildlife and plant species which could potentially occur at aquatic features found within the GCWRA. A final Project layout has not been determined at this time. BMP associated with minimization of impacts to watersheds are recommended to avoid potential indirect effects to the species.

Seventeen diurnal raptor species have the potential to occur as residents and/or migrants in the GCWRA at some point during the year. In addition, five owl species and one vulture may also occur in the area. Potential nesting habitat for raptors is located primarily along the major drainages within the GCWRA: Canyon Diablo and Grapevine



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Canyon in the central portion of the GCWRA, Yaeger and Anderson Canyons in the northwest, and Jack's Canyon in the southeast. Stands of oak and cottonwood in canyon bottoms, as well as canyon walls and rock outcroppings likely provide nest sites for raptors. Additionally, small areas of pinyon-juniper woodland, juniper savannah, and ponderosa pine forest, but may also provide nesting structures for tree-nesting species. Open, grassland habitat for ground-nesting species such as burrowing owls is present throughout the GCWRA, particularly within prairie-dog colonies which have been documented in Study Area A of the proposed project (Young et al 2009). Raptor nest surveys were completed at Study Area A in spring 2008 (Young et al 2009). Pre-construction raptor nest surveys are recommended for the spring immediately preceding construction in order to provide data on the location of raptor nest structures throughout the GCWRA and Evaluation Area so that Project planning may be informed by the location of nesting raptors. Avoidance of direct impacts to nesting structures and avoidance of construction activities within the immediate area of nests to avoid disturbance and potential nest failures is recommended. Breeding locations for nesting raptors are not located within likely construction zones or proposed turbine locations and therefore, impacts to breeding raptors may be minimized through pre-construction surveys and appropriate project planning.

The GCWRA lies within the Intermountain West region of the extensive American Pacific Flyway, one of five primary migratory routes for waterbirds, shorebirds, songbirds, and raptors. The seasonal migration of birds through Arizona generally occurs in a broad front throughout the state. The GCWRA contains a limited amount of stopover habitat for songbirds, waterfowl, and shorebirds in the forms of grassland, shrubland, pinyon-juniper woodland, and a few wetland/riparian areas, and it is likely that migrating birds utilize these areas during migration. The majority of the GCWRA is not likely to concentrate migrating birds; however, there is some potential for migrating birds that follow topography to concentrate along canyon rims, such as raptors that utilize updrafts and thermals created by topography. Additionally, the presence of prairie dog colonies and waterfowl/shorebirds concentrated at water sources could attract resident and migrating raptors to the GCWRA. Pre-construction prairie dog town mapping is recommended throughout the GCWRA and Evaluation Area for the spring immediately preceding construction in order to provide data on the location of concentrated prey sources, which have the potential to concentrate raptors. Direct impacts anticipated to migrating and resident birds within Study Area A is described in detail in Young et al 2009. A post-construction monitoring study is recommended to determine the overall level of avian fatalities resulting from operation of the GCWRA. In addition, avian and bat protection measures should be developed prior to construction to mitigate potential direct impacts to avian resources. Such measures may include construction requirements; post-construction avian survey and reporting requirements; avian mortality monitoring; and adaptive management practices.

High bat mortality at other wind-energy facilities is a concern and some species that appear to be at greatest risk are likely to occur in the GCWRA, for example red, hoary, and silver-haired bats. There are a number of bat species that occur in Arizona; 20 of which have the potential to occur within the GCWRA at some time during the year.

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Caves, crevices, and rock outcrops along canyon walls likely provide habitat for roosting and hibernating bats. Riparian woodlands in canyon bottoms, pinyon-juniper woodlands, and ponderosa pine forests within the GCWRA and Evaluation Areas may also provide habitat for tree-roosting species. Creeks, springs, and stock tanks throughout the GCWRA are likely to concentrate both resident and migrant bats. Due to the lack of studies of wind turbines and bat interactions in this region, it is difficult to predict the potential for bat fatalities at the Project. Direct impacts anticipated to migrating and resident bats within Study Area A is described in detail in Young et al 2009. A post-construction monitoring study is recommended to determine the overall level of bat fatalities resulting from operation of the GCWRA. In addition, avian and bat protection measures should be developed prior to construction to mitigate potential direct impacts to bats. Such measures may include construction requirements; post-construction bat survey and reporting requirements; bat mortality monitoring; and adaptive management practices.

The GCWRA falls within the range of the Anderson Mesa herd of pronghorn antelope. Due to the lack of data regarding the potential impacts of energy development on big game, it is difficult to predict the effects of wind-energy development on pronghorn throughout the GCWRA.

**Table 4.1. Summary of the potential for wildlife conflicts in the proposed GCWRA<sup>1</sup>. VH = Very High, H = High, M = Medium, and L = Low**

Issue	VH	H	M	L	Notes
Potential for raptor nest Project Areas			✓		Limited nesting habitat within GCWRA; mainly within canyons; also in woodlands.
Raptor flight potential			✓		A number of raptors are likely to utilize the GCWRA; prairie dog colonies and waterfowl/shorebirds at water sources may attract raptors; raptors may concentrate along canyon rims and near prey concentrations. Raptor activity moderate-high during 2007-2008 study of Study Area A.
Potential for migratory pathway			✓		GCWRA lies within Intermountain West region of Pacific Flyway; birds likely migrate through GCWRA in broad front; some potential for raptors to concentrate along canyon rims during migration.
Potential for raptor prey species			✓		Potential for rodent and lagomorphs species within GCWRA; small active prairie dog colonies documented within GCWRA.
Potential for federal protected species to occur				✓	Thirteen federal-listed or candidate species listed for Coconino County, only four have at least some potential for occurrence.
Potential for State issues				✓	Fourteen state species of special concern listed as occurring in Canyon Diablo and/or Middle Little Colorado Watershed (seven birds, one mammal, two reptiles, two

Grapevine Canyon Wind Project  
Site Characterization Report

					amphibians, and two fish); potential impacts to big game populations occurring in GCWRA.
Uniqueness of habitat at wind plant				✓	GCWRA itself generally not unique to area – dominant land cover within the GCWRA (scrub-shrub and grassland) is similar to the surrounding area; several canyons in Evaluation Area have important habitat features; Anderson Mesa immediately to west has wetland and forest habitat, important to wildlife.
Potential for rare plants to occur				✓	Numerous federal and state listed plant species known to occur in Coconino County and/or GCWRA’s watersheds; potential for some sensitive plant species to occur in native shrub, grassland, woodland, or wetland habitats in Project and Evaluation Areas.
Potential for use by bats			✓		Twenty bat species have the potential to occur; bat species that have shown high fatalities at other Study Areas are likely to be present. Acoustic study (2007-2008) at Study Area A showed moderate bat activity.

<sup>1</sup> Summarized for the GCWRA as a whole but the habitat of the area varies throughout in its ability to support species of concern.

## 5.0 REFERENCES

Arizona Antelope Foundation. 2006. 2006 Region II Pronghorn Survey Results. September 2, 2006. Available at: [http://www.azantelope.org/Facts\\_\\_\\_Research/2006\\_Region\\_II\\_Pronghorn\\_Survey\\_Results.pdf](http://www.azantelope.org/Facts___Research/2006_Region_II_Pronghorn_Survey_Results.pdf)

Arizona Game and Fish Department (AZGFD). 2009a. Special Status Species listed in ascending order by Watershed Code, Taxon, and Scientific Name. Arizona Game and Fish Department, Heritage Data Management System. Updated June 1, 2009. Available at: [http://www.azgfd.com/w\\_c/edits/documents/ssspecies\\_bywatershed.pdf](http://www.azgfd.com/w_c/edits/documents/ssspecies_bywatershed.pdf)

Arizona Game and Fish Department (AZGFD). 2009b. Plant and Animal Abstracts, Distribution Maps, and Illustrations compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. Available at: [http://www.azgfd.com/w\\_c/edits/hdms\\_abstracts.shtml](http://www.azgfd.com/w_c/edits/hdms_abstracts.shtml).

Arizona Game and Fish Department (AZGFD). 2009c. California Condor Recovery. Available at: [http://www.azgfd.gov/w\\_c/california\\_condor.shtml](http://www.azgfd.gov/w_c/california_condor.shtml)

Grapevine Canyon Wind Project  
Site Characterization Report

Arizona Game and Fish Department (AZGFD). 2009d. Black-footed Ferret. Available at:  
[http://www.azgfd.gov/w\\_c/blackfooted\\_ferret.shtml](http://www.azgfd.gov/w_c/blackfooted_ferret.shtml)

Arizona Game and Fish Department (AZGFD). 2009e. Raymond Wildlife Area.  
Available at:  
[http://www.gf.state.az.us/outdoor\\_recreation/wildlife\\_area\\_raymond\\_ranch.shtml](http://www.gf.state.az.us/outdoor_recreation/wildlife_area_raymond_ranch.shtml)

Arizona Game and Fish Department (AZGFD). 2007. Pronghorn Management Plan.  
December 7, 2007. Available at:  
[http://www.azgfd.gov/pdfs/h\\_f/management/PronghornManagementPlanDecember.pdf](http://www.azgfd.gov/pdfs/h_f/management/PronghornManagementPlanDecember.pdf)

Arizona Game and Fish Department (AZGFD). 2006. DRAFT. Arizona's Comprehensive  
Wildlife Conservation Strategy: 2005-2015. Arizona Game and Fish Department,  
Phoenix, Arizona.

Arnett, E.B. technical editor. 2005. Relationships between bats and wind turbines in  
Pennsylvania and West Virginia: an assessment of bat fatality search protocols,  
patterns of fatality, and behavioral interactions with wind turbines. A final report  
submitted to the Bats and Wind Energy Cooperative. Bat Conservation International.  
Austin, Texas, USA.

Arnett, E.B. 2007. Written statement to oversight hearing on "Gone with the Wind:  
Impacts of Wind Turbines on Birds and Bats" before the Subcommittee of Fisheries,  
Wildlife and Oceans U.S. House of Representatives Committee on Natural  
Resources May 2007.

Arnett, E.B., W.K. Brown, W.P. Erickson, et al. 2008. Patterns of bat fatalities at wind  
energy facilities in North America. *J. Wildl. Manage.* 72(1):61-78.

Barclay, R.M., E.F. Baerwald, and J.C. Gruver. 2007. Variation in bird and bat fatalities  
at wind energy facilities: assessing the effects of rotor size and tower height.  
*Canadian Journal of Zoology* 85: 381-387.

Bat Conservation International, Inc. (BCI). 2009. Species and Profiles: Bat Species of  
Texas. Bat Conservation International, Inc., Austin, Texas. Available online at:  
<http://www.batcon.org/index.php/education/article-and-information/species-profiles.html>

Chatfield, A., W. Erickson and K. Bay. Avian and Bat Fatality Study Dillon Wind  
Energy Facility, Riverside, California. Technical report prepared for Iberdrola  
Renewables by WEST Inc. 21pp.

Corman, T.E., and C. Wise-Gervais. 2005. The Arizona Breeding Bird Atlas. University  
of New Mexico Press, Albuquerque. 646 pp.

Grapevine Canyon Wind Project  
Site Characterization Report

- Cryan, P.M., and J.P. Veilleux. 2007. Migration and the use of Autumn, Winter, and Spring roosts by tree bats. In: Lacki, M.J., J.P. Hayes, and A. Kurta, (eds.). *Bats and Forests*. Baltimore, MD: The Johns Hopkins University Press. p. 153-175.
- Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, K.J. Sernka, and R.E. Good. 2001. *Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States*. National Wind Coordinating Committee (NWCC) Resource Document. August 2001.
- Fiedler J.K. 2004. Assessment of bat mortality and activity at Buffalo Mountain Windfarm, Eastern Tennessee. M.S. Thesis, University of Tennessee, Knoxville, TN.
- Gauthreaux, S.A. Jr. C.G. Belser, and D. van Blaricom. 2003. Using a network of WSR 88-D weather surveillance radars to define patterns of bird migration at large spatial scales. Pp. 335-346 In *Avian Migration*, P. Berthold, E. Gwinner, and E. Sonnenschein, eds. Berlin: Springer.
- Gruver, J.C. 2002. Assessment of bat community structure and roosting habitat preferences for the hoary bat (*Lasiurus cinereus*) near Foote Creek Rim, WY. M.S. Thesis, University of Wyoming, Laramie, WY.
- Gruver, J.C. K. Bay and D. Young. 2009. Interim report. Bat acoustic studies of the Sunshine Wind Park, Coconino County, Arizona. Technical report prepared for Sunshine Wind Energy by Western EcoSystems Technology, Inc.
- Johnson, G.D. 2005. A review of bat mortality at wind-energy developments in the United States. *Bat Research News* 46: 45-49.
- Johnson, G., M. Perlik, W. Erickson, M. Strickland, P. Sutherland, Jr. 2003. *Bat Interactions With Wind Turbines at the Buffalo Ridge, Minnesota Wind Resource Area: An Assessment of Bat Activity, Species Composition, and Collision Mortality*. EPRI, Palo Alto, California, and Xcel Energy, Minneapolis, Minnesota.
- Johnson, G.D., W. P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. *Wildlife Society Bulletin* 30:879-887.
- Koford, R., A. Jain, G. Zenner. 2005. *Avian Mortality Associated with the Top of Iowa Wind Farm. Progress Report, Calendar Year 2004*. Iowa State University and Iowa Department of Natural Resources.
- Kerns, J. and P. Kerlinger. 2004. *A Study of Bird and Bat Collision Fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual Report for*

Grapevine Canyon Wind Project  
Site Characterization Report

2003. Technical Report prepared for FPL Energy and Mountaineer Wind Energy Center Technical Review Committee. Curry and Kerlinger, LLC. 39 pp.

Kunz, T.H., E.B. Arnett, W.P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin, M.D. Strickland, R.W. Thresher, M.D. Tuttle. 2007. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. *Frontiers in Ecology and the Environment* 5(6):315-324.

Liguori, J. 2005. *Hawks From Every Angle: How to identify raptors in flight*. Princeton University Press, Princeton, New Jersey.

McCarty, K.M. and K.V. Jacobson. 2008. Arizona bald eagle management program 2008 summary report. Nongame and Endangered Wildlife Program Technical Report 252. Arizona Game and Fish Department, Phoenix, Arizona.

National Audubon Society. 2009. Important Bird Areas in the U.S. Available at: <http://www.audubon.org/bird/iba>.

National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects.

National Wind Coordinating Committee (NWCC) 2004, 2006 Available online at: [<http://www.nationalwind.org/publications/default.htm>]

Orloff, S. and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final Report. P700-92-001. Prepared for Planning Department of Alameda, Contra Costa and Solano Counties and the California Energy Commission, Sacramento, CA, by BioSystems Analysis, Inc., Tiburon, CA. March 1992.

Orloff, S. and A. Flannery. 1996. A Continued Examination of Avian Mortality in the Altamont Pass Wind Resource Area. Consultant Report. P700-96-004CN. Prepared for California Energy Commission, Sacramento, CA, by BioSystems Analysis, Inc., Tiburon, CA. August 1996.

Peurach, S.C. 2003. High-altitude collision between an airplane and a hoary bat, *Lasiurus cinereus*. *Bat Research News* 44(1):2-3.

Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, DRAFT Results and Analysis 1966 - 2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center, Laurel, MD.

Smallwood, K.S., L. Rugge, S. Hoover, M.L. Morrison and C.G. Thelander. 2001. Intra- and inter-turbine string comparison of fatalities to animal burrow densities at Altamont Pass. In Schwartz S.S. ed, Proceedings of the National Avian-Wind Power Planning Meeting IV. RESOLVE, Inc. Washington D.C. pp. 23-37

Grapevine Canyon Wind Project  
Site Characterization Report

- Tidhar, D. and A. Chatfield. 2010. Wildlife and botanical report Grapevine Canyon Wind Resource Area transmission line right of way. Prepared for Grapevine Wind LLC by Western EcoSystems Technology, Inc. Cheyenne, Wyoming.
- Thelander, C.G. and K.S. Smallwood. 2007. The Altamont Pass Wind Resource Area's effects on birds: A case history. In *Birds and Windfarms: Risk assessment and mitigation*, M.J. de Lucas, G.F.E. Janss and M. Ferrer eds. Quercus, Madrid, Spain.
- Thelander, C.G., K.S. Smallwood and L. Ruge. 2003. Bird risk behaviors and fatalities at the Altamont Wind Resource Area. Report by BioResource Consultants to the National Renewable Energy Laboratory, Golden, Colorado.
- U.S. Environmental Protection Agency (USEPA). 2004. Level III Ecoregions of the Conterminous United States. U.S. Environmental Protection Agency, Corvallis, OR. Available at: [http://www.epa.gov/wed/pages/ecoregions/level\\_iii.htm](http://www.epa.gov/wed/pages/ecoregions/level_iii.htm).
- U.S. Fish and Wildlife Service (USFWS). 2009. Threatened and Endangered Species. County by County Endangered Species Lists. USFWS, Southwest Region, Arizona Ecological Services. Available online at: <http://www.fws.gov/southwest/es/arizona/Documents/CountyLists/Coconino.pdf>. Accessed November 12, 2009.
- U.S. Fish and Wildlife Service. (USFWS). 2008. Birds of conservation concern 2008. Division of Migratory Bird Management, Arlington, Virginia. 93 pp. [<http://www.fws.gov/migratorybirds/reports/BCC2008/BCC2008m.pdf>]
- U.S. Fish and Wildlife Service (USFWS). 2004. Wetlands Geodatabase. National Wetlands Inventory. Division of Habitat and Resource Conservation. <http://wetlandsfws.er.usgs.gov/nwi/>.
- U.S. Geological Survey (USGS). 2001. National Land Cover Database Zone 34 Land Cover Layer. U.S. Geological Survey, Sioux Falls, SD.
- Western EcoSystems Technology, Inc. (WEST). 2006. Avian studies of the Sunshine Wind Park, Coconino County, Arizona. Technical report prepared for Sunshine Wind Energy by Western EcoSystems Technology, Inc.
- Young, Jr., D.P. and W.P. Erickson. 2006. Wildlife issue solutions: What have marine radar surveys taught us about avian risk assessment? Paper presented to Wildlife Workgroup Research Meeting VI, NWCC, November 14-16, 2006, San Antonio, TX.
- Young, Jr., D.P., D. Strickland, W. P. Erickson, K. J. Bay, R. Canterbury, T. Mabee, B. Cooper, and J. Plissner. 2004. Baseline Avian Studies Mount Storm Wind Power Project, Grant County, West Virginia, May 2003 - March 2004. Technical report Prepared for: NedPower Mount Storm, LLC. 141 pp.



**APPENDIX A**  
**Western EcoSystems Technology, Inc. correspondence with**  
**AZGFD and USFWS**

Grapevine Canyon Wind Project  
Site Characterization Report



Western EcoSystems Technology, Inc. 2003 Central Ave., Cheyenne, WY 82001  
Phone: 307.634.1756 Fax: 307.637.6981 Web site: www.west-inc.com

November 17, 2009

Wally Murphy  
US Fish and Wildlife Service  
New Mexico Ecological Services Field Office  
2105 Osuna NE  
Albuquerque, NM 87113  
phone: 505-761-4726, fax: 505-346-2542

Subject: Proposed Grapevine Canyon Wind Energy Project,  
Coconino County, Arizona  
Sensitive Species/Sensitive Habitat Review Request

Dear Mr. Murphy:

Our client, Grapevine Wind, LLC, is evaluating the feasibility of developing a wind energy project in Coconino County, AZ (see attached map). The area of interest includes portions of the following Township/Ranges: T17N/R11E, T17N/R12E, T17N/R13E, T18N/R10E, T18N/R11E, T18N/R12E, T18N/R13E, T19N/R12E, T19N/R13E. We have been asked to do an environmental screening analysis for the project. The wind farm is in the early stage of development so specific attributes (i.e. project size, turbine types, etc.) and construction dates are currently unknown.

We request that you review the proposed project area and surrounding areas and provide us with information about listed, proposed, and candidate species (including plants) or sensitive environmental areas that could potentially be affected by the project. If your review indicates that threatened and endangered species may be affected by the project, please provide detailed location and life history information for each species. This information will be treated as confidential and will be used for project purposes only.

The proposed wind energy project is comprised of three distinct phases (A, B and C), as well as a proposed Tie-Line extending to the west from Area A, as indicated on the map. Please provide a separate review for each of the individual Areas and the Tie-Line.

Thank you for your assistance. If you have any questions or require additional information, please contact David Tidhar, Project Manager/Research Biologist at 802-377-2720.

Sincerely,

David Tidhar  
Project Manager / Research Biologist  
Northeast and Mid-Atlantic Region  
Western EcoSystems Technology Inc. (WEST)  
26 North Main St., Waterbury VT 05676  
Mobile: 802.377.2720

# Grapevine Canyon Wind Project Site Characterization Report



Western EcoSystems Technology, Inc. 2003 Central Ave., Cheyenne, WY 82001  
Phone: 307.634.1756 Fax: 307.637.6981 Web site: www.west-inc.com

17 November 2009

Arizona Game and Fish Department  
WMHB - Project Evaluation Program  
5000 W. Carefree Highway  
Phoenix, AZ 85086-5000

Subject: Proposed Grapevine Canyon Wind Energy Project,  
Coconino County, Arizona  
Sensitive Species/Sensitive Habitat Review Request

To whom it may concern:

Our client, Grapevine Wind, LLC, is evaluating the feasibility of developing a wind energy project in Coconino County, AZ (see attached map). The area of interest includes portions of the following Township/Ranges: T17N/R11E, T17N/R12E, T17N/R13E, T18N/R10E, T18N/R11E, T18N/R12E, T18N/R13E, T19N/R12E, T19N/R13E. We have been asked to do an environmental screening analysis for the project. The wind farm is in the early stage of development so specific attributes (i.e. project size, turbine types, etc.) and construction dates are currently unknown.

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The proposed wind energy project is comprised of three distinct phases (A, B and C), as well as a proposed Tie-Line extending to the west from Area A, as indicated on the map. Please provide a separate review for each of the individual Areas and the Tie-Line.

Thank you for your assistance. If you have any questions or require additional information, please contact David Tidhar, Project Manager/Research Biologist at 802-377-2720.

Yours truly,

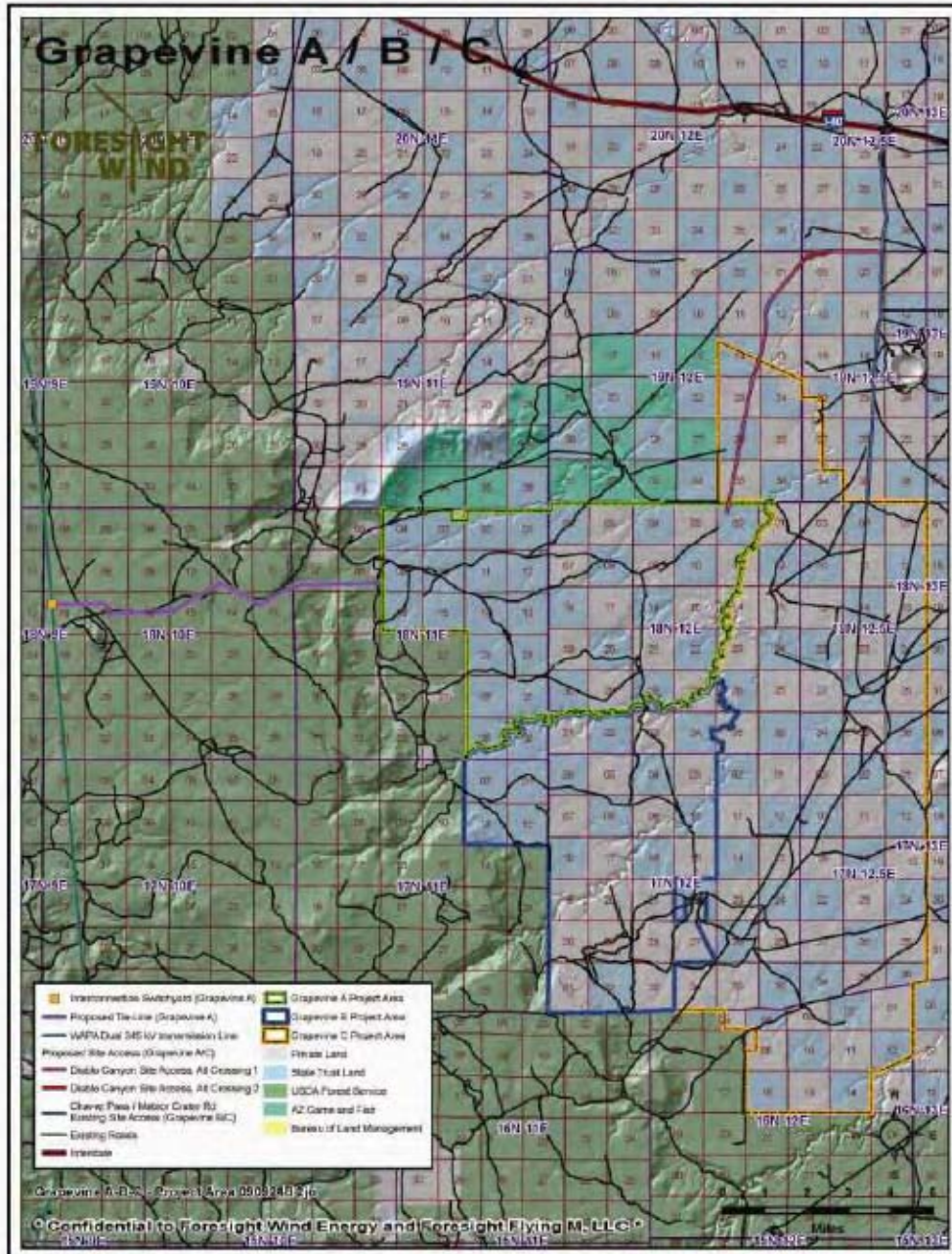
David Tidhar  
Project Manager / Research Biologist  
Northeast and Mid-Atlantic Region  
Western EcoSystems Technology Inc. (WEST)  
26 North Main St., Waterbury VT 05676  
Office: 802.244.1755  
Mobile: 802.377.2720



# Grapevine Canyon Wind Project Site Characterization Report



Western EcoSystems Technology, Inc. 2003 Central Ave., Cheyenne, WY 82001  
Phone: 307.634.1756 Fax: 307.637.6981 Web site: www.west-inc.com



# Grapevine Canyon Wind Project Site Characterization Report

**David Tidhar**

---

**From:** Wally\_Murphy@fws.gov  
**Sent:** Tuesday, November 24, 2009 4:32 PM  
**To:** David Tidhar  
**Subject:** Re: Grapevine wind project  
**Attachments:** Request\_Grapevine\_USFWS.doc

David if your in a big hurry please look at our web site for the appropriate county-wm

Wally "J" Murphy  
US Fish and Wildlife Service  
Supervisor  
New Mexico Ecological Services Field Office  
Albuquerque NM 87113  
Off. 505/761-4781  
CP 505/480-4821

"David Tidhar" <[dtidhar@west-inc.com](mailto:dtidhar@west-inc.com)>

To <[wally\\_murphy@fws.gov](mailto:wally_murphy@fws.gov)>, <[Lynn\\_Gemio@fws.gov](mailto:Lynn_Gemio@fws.gov)>

cc

11/24/2009 08:18 AM

Subject Grapevine wind project

Wally and Lynn,

I sent a hard copy of the attached information request for the proposed Grapevine wind project last week to your office. My client, Grapevine Wind, is very much hoping for a fast response from the USFWS regarding this Project. If you could please fast track a response for information pertaining to listed species and known information regarding sensitive species and/or habitats within the Project area I would be very grateful. If you have any questions please don't hesitate to contact me.

Have a very Happy Thanksgiving and thanks again for your time.

Best,  
David

David Tidhar  
Project Manager / Research Biologist  
Northeast and Mid-Atlantic Region  
Western EcoSystems Technology Inc. (WEST)  
26 North Main St., Waterbury VT 05676  
Office: 802.244.1755  
Mobile: 802.377.2720

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# Grapevine Canyon Wind Project Site Characterization Report



THE STATE OF ARIZONA  
**GAME AND FISH DEPARTMENT**

5000 W. CAREFREE HIGHWAY  
PHOENIX, AZ 85086-5000  
(602) 942-3000 • WWW.AZGFD.GOV

REGION II, 3500 S. LAKE MARY ROAD, FLAGSTAFF, AZ 86001

**GOVERNOR**  
JANICE K. BREWER  
**COMMISSIONERS**  
CLAISSAN, BOB HEINBERG, TUCSON  
JENNIFER L. MARTIN, PHOENIX  
ROBERT R. WOODHOUSE, ROLL  
NORMAN W. FREEMAN, CHINO VALLEY  
JACK F. HUSTED, SPRINGERVILLE  
**DIRECTOR**  
LARRY D. VOYLES  
**DEPUTY DIRECTORS**  
GARY R. HOWATTER  
ROBERT D. BROSCHEID



December 15, 2009

David Tidhar  
Project Manager / Research Biologist  
Northeast and Mid-Atlantic Region  
Western EcoSystems Technology Inc. (WEST)  
26 North Main St., Waterbury VT 05676  
Office: 802.244.1755  
Mobile: 802.377.2720

Re: **Special Status Species Information for Township/Ranges: T17N/R11E, T17N/R12E, T17N/R13E, T18N/R10E, T18N/R11E, T18N/R12E, T18N/R13E, T19N/R12E, T19N/R13E.**

Dear Mr. Tidhar:

The Arizona Game and Fish Department (Department) has reviewed your request, dated November 17, 2007, regarding special status species information associated with the above-referenced 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 vicinity (5-mile buffer).

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 we appreciate the close coordination with West, Inc on this project. We look forward to continue opportunities 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. As you are aware, the Department is also concerned about other resource values, such as other wildlife, including game species, and wildlife-related recreation.

If you have any questions regarding this letter, please contact me at 928-214-1251. General status information, county and watershed distribution lists and abstracts for some special status species are also available on our web site at <http://www.azgfd.gov/hdms>.

Sincerely,

Andi Rogers

AN EQUAL OPPORTUNITY REASONABLE ACCOMMODATIONS AGENCY

Habitat Specialist, Region II, Flagstaff, Arizona

Attachment: Special Status Species Request

cc: Project Evaluation Program Supervisor  
Habitat Program Manager, Region II

AGFD #M09-12155443

# Grapevine Canyon Wind Project

## Site Characterization Report

**David Tidhar**

---

**From:** Andi Rogers [ARogers@azgfd.gov]  
**Sent:** Friday, April 02, 2010 5:30 PM  
**To:** David Tidhar  
**Cc:** Jeff Corcoran; Holly Hicks; Sarah Reif; Michael Rice  
**Subject:** comments on Site Characterization Report

David,

Here are a few comments.. Overall, I think the Site Characterization is a good and fair assessment of the area. I had our aquatic's person look at portions and I think the raptor characterization is accurate. I didn't have as much time with it as I would have liked.. Hopefully you will find the comments on the T and E issues and more extensively on the pronghorn parts helpful..

Pg2: AGFD 2006 publication states "improper grazing".. I don't know if this is from the CWCS or the pronghorn literature, but it would sure help from a relationship standpoint to soften this language.. Either "improper historic grazing" or "improper in portions of the study area".. we work closely with the Diablo Trust on grazing issues and I would say that in 2010 we would not consider the area as improperly grazed.. these are very progressive ranchers by and large.

Pg 26: As a heads up, I would say that the USFWS would not concur that there is NO potential for the condor to be in this area. The Department would also agree that there is a chance these birds could be in the area, especially within the lifetime of a wind project. While these birds have not ventured to this area specifically, we have seen them on short trips to Sedona and other areas much further away than the Grapevine area. I would feel more comfortable calling this extremely low.

Pg 29.. The Department and Babbitt Ranches have been working together to release ferrets on Babbitt Ranches NW of Williams, AZ. There are ferrets there now on private and state lands.. This site is roughly 100 miles NW of the Grapevine Site, so there is obviously still not a likely effect on BFF's, but I thought you might want to include this area in the report. For more information on the site and the project contact Jeff Corcoran [jcorcoran@azgfd.gov](mailto:jcorcoran@azgfd.gov) 928-422-0155. With respect to Gunnison's p-dogs, I pulled up the data from our 2007 survey effort and there seems to be several dog towns in Phase A and C. To get more information on this data contact Holly Hicks [hhicks@azgfd.gov](mailto:hhicks@azgfd.gov) 623-236-7499

Pg iii, 56, 57: Related to the discussions of the pronghorn data and maps that we gave you, I think the results may have been a bit over analyzed in the report. I should have given you more detail on timing and scope of the project. I apologize for that.

1. The pronghorn that had transmitters on them (from 2003-2006) were animals that were captured on top of the Mesa (west of the project area). They were collared in order to gain information on migratory movements on and of the Mesa. Because the migratory herd was the focus, I don't think we can reliably say that "pronghorn don't spend much time in the study areas or in the treatment areas". It is only if we are able to transmitter animals from the year-round herd, on state and private lands, that we will be able to reliably say how much time is spend within the GCWRA and/or in the treatment areas.
2. With respect to the treatment areas, a majority of the habitat work (according to project personnel) was implemented and completed AFTER the pronghorn transmitters had fallen off.. Because of this fact, we cannot deduce that "overall use of habitat treatments areas by pronghorn within the GCWRA is low"- pg 56. We simply haven't had enough time to assess the use of these treatment areas yet.
3. Lastly, the map that we provided for "fawning locations" (pg 64) is a bit misleading.. The title says fawning locations, but cannot be interpreted as actual locations. Instead, this is a period of time in which fawning may have occurred. We need to be careful to talk about the impacts of the wind farm on fawning, because the



## Grapevine Canyon Wind Project Site Characterization Report

“actual” fawning locations may not be focused on the lower elevation state and private lands for these migratory animals. Again we need more data from the year-round animals.

Generally speaking, I don't think that the data that we have provided can fully address the impact that the wind farm may or may not have on pronghorn, their movements, fawning, or how much time they may or may not spend in the treatment areas. I think it's best to be VERY general about the pronghorn issue and state what the data can and cannot tell us about this area. I also think it would be worthwhile mentioning that to fully address impacts we would need a subsequent study (something our Agency is still very interested in).

From the report it sounds as if you are having some trouble getting in touch with the USFWS. Who have you been trying to reach and not getting a response? I can rattle some cages for you if it can help.

Today is “officially” my last day.. Michael Rice (from my email) will be responding to any further questions you may have.. Feel free to contact the other two AGFD bios that I cc'd here and referred to in the comments for BFF and P-dog info. Thanks David for letting us review this early draft.. Are you guys doing any more field work out there this spring/summer? I'll be in touch in July..

Have a great spring..

*Andi Rogers, Habitat Specialist, Region II  
Arizona Game and Fish Department  
3500 S. Lake Mary Road  
Flagstaff, AZ 86001  
Phone (928) 214-1251  
Fax (928) 779-1825*

Grapevine Canyon Wind Project  
Site Characterization Report



**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  
22410-2010-TA-0346

April 20, 2010

Mr. David Tidhar  
Project Manager/Research Biologist  
Northeast and Mid-Atlantic Region  
Western EcoSystems Technology, Inc. (WEST)  
26 North Main Street  
Waterbury, Vermont 05676

RE: Proposed Grapevine Canyon Wind Energy Project, Coconino County, Arizona

Dear Mr. Tidar:

Thank you for your April 6, 2010, request for our review of the proposed Grapevine Canyon Wind Energy Project, Coconino County, Arizona. We received your request for comments on April 6, 2010. Foresight Flying M is evaluating the feasibility of developing a wind energy project east of Flagstaff on Arizona State Land Department and private lands. The U.S. Fish and Wildlife Service (FWS) supports the development of alternative energy sources, including wind energy. We fully recognize the importance of such development to both the Nation's economy and the global environment. Any form of energy production, however, including renewable energy, comes with certain environmental responsibilities. Through this letter, we offer you technical assistance in evaluating potential negative impacts on our Nation's trust wildlife and habitat resources from your proposed wind facilities in order to avoid or minimize such impacts.

We understand that the wind farm is in the early stages of development so specific attributes (e.g., project size, turbine type, etc.) and construction dates are currently unknown. However, the proposed energy project is comprised of three distinct phases (A, B, and C) as well as a proposed Tie-Line extending to the west of Area A. You requested that we provide you with any available information regarding wildlife movements, habitat issues, or seasonal concerns along the proposed action site and its immediate vicinity. You also requested a separate review for each of the individual areas and the Tie-Line. However, at this point, it is difficult for us to break-out individual recommendations for each area as habitats are very similar and the areas are adjoining. We will be as specific as possible for each area you noted on the map and note when recommendations apply to the entire project area.

Recently published studies indicate that wildlife can be negatively affected by wind energy development; for example, directly when birds or bats collide with wind turbine rotors, and

# Grapevine Canyon Wind Project

## Site Characterization Report

Mr. David Tidhar

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indirectly when sensitive wildlife species are displaced by altering or removing key components of their habitat. Such impacts likely can be reduced or avoided by strategic placement of turbines and associated infrastructure (e.g., access roads and distribution and transmission lines), as well as other best management practices that can minimize impacts of these structures.

The FWS holds certain resources in trust for the American people, including migratory birds, inter-jurisdictional fishes, federally-listed threatened and endangered species, and units of the National Wildlife Refuge System. The FWS administers natural resource protection laws germane to wind energy production and transmission. These statutes include the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.), the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d), the Endangered Species Act (ESA) (16 U.S.C. 1531 et. seq.), the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), and the National Environmental Policy Act (NEPA) (Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, et. seq.).

### **Migratory Birds and Eagles**

The FWS is the principal Federal agency charged with protecting and enhancing populations and habitat of migratory bird species (e.g., waterfowl, shorebirds, birds of prey, songbirds) that spend all or part of their lives in the United States. The MBTA prohibits the taking, killing, possession, and transportation (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. Currently, the list of federally protected migratory birds includes 1007 species (50 CFR Part 10.13). The MBTA has no provision for allowing unauthorized take of migratory birds that may be killed or injured by otherwise lawful activities. Companies are encouraged to work closely with FWS biologists to identify available protective measures when developing project plans and/or avian (and bat) protection plans, and to implement those measures during construction and operation of facilities and equipment.

In order to avoid violations of the MBTA through destruction of active bird nests, habitat clearing for this project should occur outside the local avian nesting season. In this region the months September through March would constitute the non-breeding season for most species, although even in those months some nesting may occur. Once the specific region for the project is identified, this office (as well as our Migratory Birds Office and Arizona Game and Fish Department [AGFD]) will be able to identify potential nesting species during the “non-breeding” months.

The Bald and Golden Eagle Protection Act does provide for very limited issuance of permits that authorize take of eagles when such take is associated with otherwise lawful activities, cannot practicably be avoided, and is compatible with the goal of stable or increasing eagle breeding populations. This law also affords eagles additional protections beyond those provided by the MBTA, in particular, by making it unlawful to “disturb” eagles.

We understand that a Phase 1 study for the site was completed, but we have not received a copy of that report. Therefore, we may be recommending surveys or actions that you have already conducted. If you could send this report and other information you have collected to our office, we would be very appreciative.

# Grapevine Canyon Wind Project

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We recommend you conduct an inventory of active raptor nests before construction begins to determine their locations and if there are any golden eagle territories in the vicinity. Golden eagles nest throughout this region wherever there are suitable cliffs and an appropriate food supply, thus it is likely that there will be some nesting pairs either within or adjacent to the project area. Wintering bald eagles are known to use the proposed project area and surrounding habitats on the Coconino National Forest. Bald eagles tend to be more numerous in this area from mid-October through mid-April.

In addition to eagles, other species of raptors that may nest in or near the project area include red-tailed, ferruginous, and Swainson's hawks, great horned, barn, and burrowing owls, and possibly peregrine and prairie falcons. Turbine placement should take into account nest locations and movement patterns of these species (particularly the eagles and falcons) and avoid those areas as much as possible. Further, eagle and other raptor movements through this region during spring and fall migrations are not well known; these should be monitored through each of those seasons during the pre-construction phase to identify concentration corridors that should potentially be avoided.

A thorough understanding of the status and distribution of all birds of conservation concern found in the project area will help to reduce impacts to declining species during the habitat-altering activities. This should include those species identified as conservation priorities in the USFWS 2008 list of Birds of Conservation Concern (<http://www.fws.gov/migratorybirds>), the Partners in Flight Species Assessments for that region (<http://www.rmbo.org/pif/pifdb.html>), and the Arizona State Wildlife Action Plan ([http://www.azgfd.gov/w\\_c/cwcs.shtml](http://www.azgfd.gov/w_c/cwcs.shtml)). One of these species of concern is the gray vireo, which is a habitat specialist in the project area (pinyon-juniper and associated brushlands). Impacts to this species in particular should be addressed prior to construction and gray vireo locations avoided if possible. Other species of concern in the project vicinity include loggerhead shrike and olive-sided flycatchers.

Because bats are also an issue with wind energy facilities, seasonal and annual occurrence of bats, locations of hibernacula, breeding colonies, and roosts should be thoroughly assessed as well as locations of predictable flight lines. These assessments should include migratory bats such as those in the Lasiurine group (e.g. hoary bat, silver-haired bat), which have been shown to be particularly vulnerable to blade strikes.

These recommendations would apply to each of the individual areas (A, B, and C) and the Tie-line location as well.

### **Other Resources**

The FWS's voluntary "Interim Guidelines to Avoid and Minimize Impacts from Wind Turbines" (<http://www.fws.gov/habitatconservation/wind.html>) might be helpful to evaluate your proposed wind energy facility. The guidance contains a site evaluation and ranking process to assess potential facility impacts, as well as recommendations for conducting post-construction monitoring. Appendices of the guidance also provide more information on wildlife laws and permitting. Agreed-on protocols for reducing the impact of wind energy facilities on wildlife

# Grapevine Canyon Wind Project Site Characterization Report

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have been drafted by the Wind Turbine Advisory Committee (formed in accordance with the Federal Advisory Committee Act). On April 13, 2010, the FWS transmitted a set of final recommendations on how to minimize the impacts of land-based wind farms on wildlife and its habitat to Secretary of the Interior Ken Salazar. The document contains both policy recommendations and recommended voluntary guidelines for siting and operating wind energy projects in order to avoid or minimize potential impacts to wildlife and habitat. After the Interior Secretary's review, the FWS will use the Committee's recommendations to develop and publish its revised guidelines in the Federal Register and open them for public comment. The document, as well as a complete list of Committee members, is available for download at:

[http://www.fws.gov/habitatconservation/windpower/wind\\_turbine\\_advisory\\_committee.html](http://www.fws.gov/habitatconservation/windpower/wind_turbine_advisory_committee.html).

In addition, the AGFD created Wind Energy Guidelines entitled "Guidelines for Reducing Impacts to Wildlife from Wind Energy Development in Arizona." These guidelines can be found on AGFD's website at <http://www.azgfd.gov/hgis/guidelines.aspx>.

## **Comments Specific to the Proposed Grapevine Canyon Project Areas**

Based upon information in our files, we do not know of any listed species that occur within or immediately adjacent to areas A, B, or C or the Tie-line. However, along the drainages that run off of Anderson Mesa, there may be winter bald eagle roosts in the ponderosa pine stringers. In addition, the topographic change from the rim of the mesa down to the pinyon-juniper and grassland areas provides a unique transition habitat that migratory birds likely use during migration and for breeding. In addition, there are many lakes on Anderson Mesa that draw birds and other wildlife (e.g., deer, elk, and pronghorn) from the brushland, pinyon-juniper, pine-stringer, and grassland habitats up to the Mesa and back down. We believe that the drainages running off the mesa are likely important wildlife corridors. We recommend that when siting any structures, the project avoid development in or near habitat features that congregate wildlife such as water resources, habitat edges, etc.

## **FWS Contacts**

We hope you will accept our offer of technical assistance and engage in dialog with us early in your planning process. We are available to meet and discuss this facility, potential impacts to Federal trust resources, and appropriate best management practices with you. Additionally, we would like to discuss further pre-construction data collection. Please contact Shaula Hedwall, Senior Fish and Wildlife Biologist, Arizona Ecological Services (Flagstaff Suboffice) at 928-226-0614 (x103) or email [shaula\\_hedwall@fws.gov](mailto:shaula_hedwall@fws.gov) for further information or to arrange a meeting.

We appreciate your coordination with us on this matter. In keeping with our trust responsibility to American Indian Tribes, for proposed actions that may affect Indian lands, Tribal trust resources, or Tribal rights, we encourage you to invite the affected Tribes and Bureau of Indian Affairs to participate in the comment process and, by copy of this letter, are notifying the Hopi Tribe and Navajo Nation. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department and Coconino National Forest.



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Site Characterization Report

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Should you require further assistance or if you have any questions, please contact Shaula Hedwall (x103) or Brenda Smith (x101) of our Flagstaff Suboffice at (928) 226-0614.

Sincerely,



Steven L. Spangle  
Field Supervisor

cc (electronic copy):

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ  
Regional Supervisor, Arizona Game and Fish Department, Flagstaff, AZ  
Forest Biologist, Coconino National Forest, Flagstaff, AZ  
John Nystedt, Fish and Wildlife Service, Flagstaff, AZ

cc (hard copy):

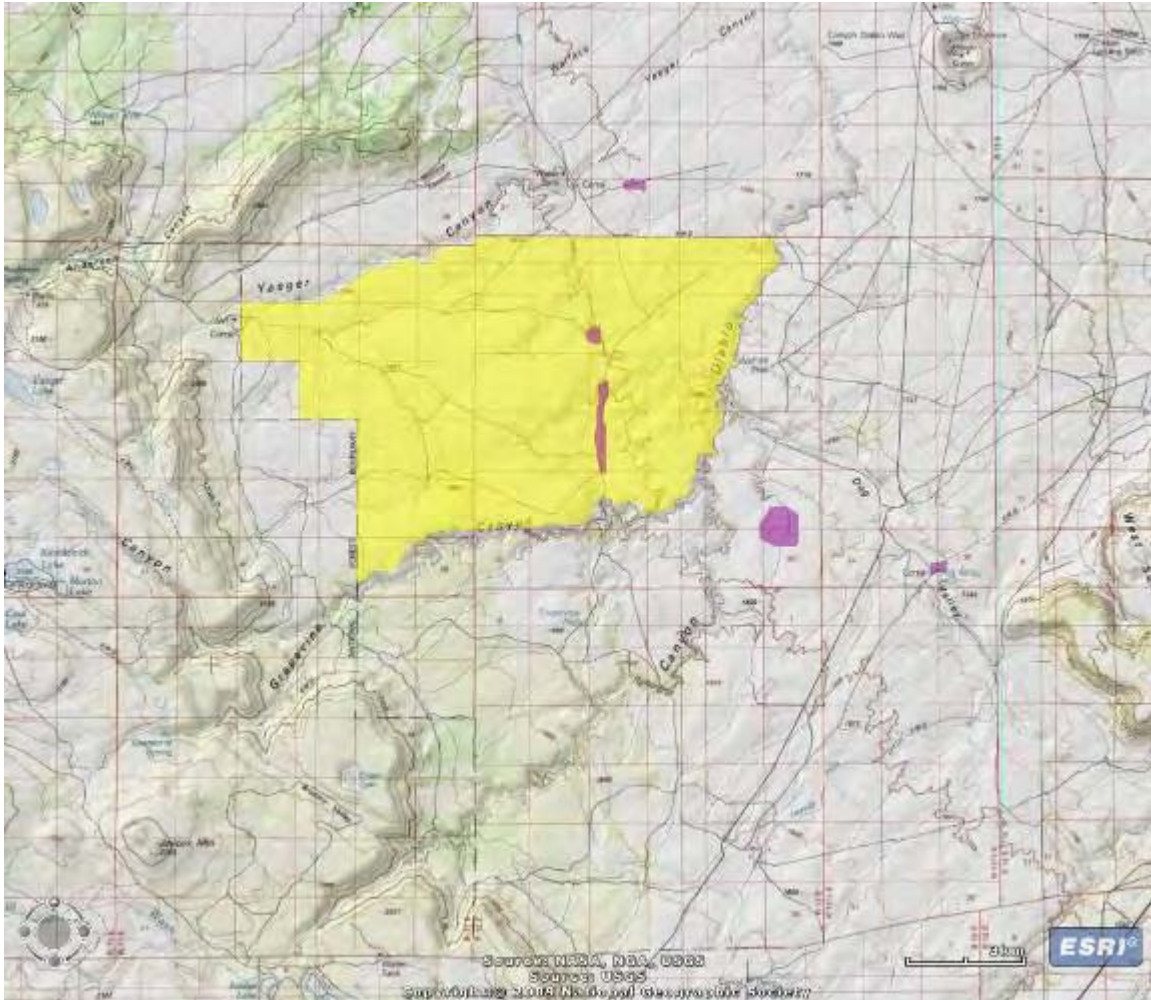
Environmental Specialist, Environmental Services, Western Regional Office, Bureau of  
Indian Affairs, Phoenix, AZ  
Director, Hopi Cultural Preservation Office, Kykotsmovi, AZ  
Director, Historic Preservation Department, Navajo Nation, Window Rock, AZ

W:\Shaula Hedwall\Grapevine Canyon Wind Energy Project 4-19-10.docx:cgg

# Grapevine Canyon Wind Project Site Characterization Report

Hi David

After comparing your pictures with my data it looks like there is 1 other large colony that would fall in your study area c. The 2 that you mapped in 07-08 correspond pretty well with the data we collected in '07. All colonies on my map are active colonies. I am not sure if you are looking for any other information other than localities of other colonies but feel free to contact me again if you need additional information.



Thanks

Holly Hicks  
Small Mammals Biologist  
Nongame Branch  
Arizona Game and Fish Department  
5000 W Carefree Hwy  
Phoenix AZ 85086  
623-236-7499



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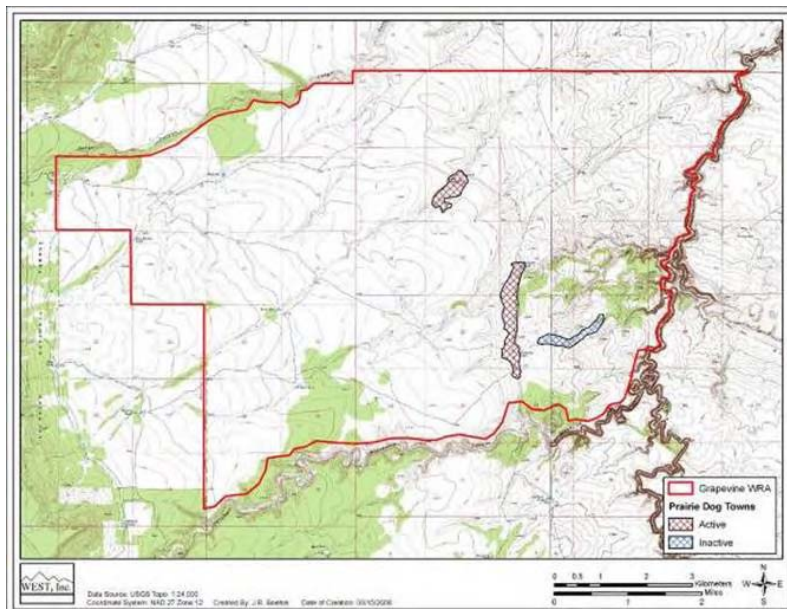


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---

**From:** David Tidhar [mailto:dtidhar@west-inc.com]  
**Sent:** Friday, April 30, 2010 2:03 PM  
**To:** Holly Hicks  
**Subject:** Grapevine wind park prairie dog information

Hi Holly, please see the attached map of the entire Grapevine wind park, in addition to the map below which shows prairie dog maps we mapped during surveys we completed on Study Area A in 2007-2008.



**Figure 3.2 Location of prairie dog colonies within Study Area A (Young et al. 2008).**

Best,

## Grapevine Canyon Wind Project Site Characterization Report

David

David Tidhar  
Project Manager / Research Biologist  
Northeast and Mid-Atlantic Region  
Western EcoSystems Technology Inc. (WEST)  
26 North Main St., Waterbury VT 05676  
Office: 802.244.1755  
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**From:** Holly Hicks [mailto:HHicks@azgfd.gov]  
**Sent:** Wednesday, April 28, 2010 2:58 PM  
**To:** David Tidhar  
**Subject:** RE: grapevine wind prairie dog towns

Hi David

Sorry for the delayed response. I didn't have much of a chance to discuss this with Andi before she left. Can you be more specific about where the Grapevine Wind park is located? We have prairie dog colonies all over northern Arizona and I am not familiar with this project location.

Thanks

Holly Hicks  
Small Mammals Biologist  
Nongame Branch  
Arizona Game and Fish Department  
5000 W Carefree Hwy  
Phoenix AZ 85086  
623-236-7499

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---

**From:** David Tidhar [mailto:dtidhar@west-inc.com]  
**Sent:** Sunday, April 11, 2010 5:35 AM  
**To:** Holly Hicks  
**Cc:** Michael Rice; Andi Rogers  
**Subject:** grapevine wind prairie dog towns

Hi Holly, Andi mentioned in the email below that you have information related to Gunnison's prairie dogs in the Grapevine Wind park. If you could pass on any maps or data regarding these towns I would be grateful.

Best,  
David

David Tidhar  
Project Manager / Research Biologist  
Northeast and Mid-Atlantic Region  
**Western EcoSystems Technology Inc. (WEST)**  
26 North Main St., Waterbury VT 05676  
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Grapevine Canyon Wind Project  
Site Characterization Report

**Natural heritage data request response from AZGFD, December 15, 2009**

**Special Status Species within 5 Miles of the Grapevine Wind Energy Proposal Area (T16N,R12E; T17N,R11E;  
T17N,R12E; T17N,R12.5E; T18N,R10E; T18N,R11E; T18N,R12E; T18N,R12.5E; T18N,R13E; T19N,R12E;  
T19N,R13E)**

NAME	COMMON NAME	FWS	USFS	BLM	STATE	QUAD	TOWNRANGE
<i>Haliaeetus leucocephalus</i> (wintering pop.)	Bald Eagle - Winter Population	SC,BGA	S	S	WSC	34111-F2	150N110E
<i>Aquila chrysaetos</i>	Golden Eagle	BGA				34111-G2	160N110E
<i>Catostomus sp. 3</i>	Little Colorado Sucker	SC	S	S	WSC	34110-G8	160N130E
<i>Aquila chrysaetos</i>	Golden Eagle	BGA				34110-G8	170N140E
<i>Aquila chrysaetos</i>	Golden Eagle	BGA				34110-H8	180N130E
<i>Salvia pachyphylla</i> ssp. <i>eremopictus</i>	Arizona Rose Sage					35111-A1	190N125E
<i>Lasiurus cinereus</i>	Hoary Bat	No Status				35111-A1	200N125E
<i>Myotis thysanodes</i>	Fringed Myotis	SC				35111-A1	200N125E
<i>Haliaeetus leucocephalus</i> (wintering pop.)	Bald Eagle - Winter Population	SC,BGA	S	S	WSC	35111-C5	200N080E

No Critical Habitats within Project area.

Arizona Game and Fish Department, Heritage Data Management System, November 20, 2009.

**APPENDIX B**  
**Photos taken during Project site visit on November 10 and 12, 2009**



*Desert Scrub/shrub and Grassland Habitats present in the GCWRA (Photos from Study Area C)*



*Desert Scrub/shrub and Juniper Savannah present in the GCWRA (Photos from Study Area )*

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*Canyons present in the GCWRA (Photos from Study Area C – Diablo Canyon)*



*Canyons present in the GCWRA (Photos from Study Areas A and B – Grapevine Canyon)*



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*Ephemeral stock pond and stream present in the GCWRA (Photos from Study Area A )*



*Stock tanks present in the GCWRA (Photos from Study Areas A and B)*



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**APPENDIX D.2**

---

WILDLIFE AND BOTANICAL REPORT

Available online at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)

**Wildlife and Botanical Report**  
Grapevine Canyon Wind Resource Area  
Transmission Line Right of Way  
Coconino County, Arizona

*Prepared for:*

Grapevine Wind, LLC  
c/o Foresight Wind Energy

*Prepared by:*

David Tidhar and Andrea Chatfield

Western EcoSystems Technology, Inc.  
2003 Central Avenue  
Cheyenne, Wyoming



June 3, 2010

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## 1.0 INTRODUCTION

Grapevine Canyon Wind, LLC is proposing to construct an approximately 10-mile long transmission line inter-connection from the proposed Grapevine Canyon Wind Resource Area (GCWRA) to an existing transmission line located approximately three-miles east of the village of Mormon Lake, Coconino County, Arizona (Figure 1.1). At the request of Grapevine Canyon Wind, Western EcoSystems Technology, Inc. (WEST) has prepared the following Wildlife and Botanical Report for the proposed transmission line right of way (ROW) to satisfy data requests for the draft Environmental Impact Statement (EIS) for the GCWRA and for a Biological Assessment and Biological Evaluation (BABE) for the proposed transmission line ROW, which bisects US Forest Service (USFS) lands. The area evaluated in this report consists of 1) the proposed transmission ROW including the area within a 100-m (meter) buffer of the ROW and an 18-acre switchyard area at the interconnection of the existing WAPA 345-kV lines (jointly defined as the *Transmission Line*) and 2) a one-mile evaluation area<sup>1</sup> of the Transmission Line (*Evaluation Area*; Figure 1.2). The Transmission Line includes the *Proposed* t-line route and switchyard as well as the *Alternative* t-line route. Important wildlife and botanical differences between the Proposed and Alternative routes are noted in the report, as well as any important differences between the switchyard and the transmission line. The purpose of this report is to characterize wildlife and botanical resources within the proposed Transmission Line and Evaluation Area, and determine the potential effects of the proposed action on biological resources.

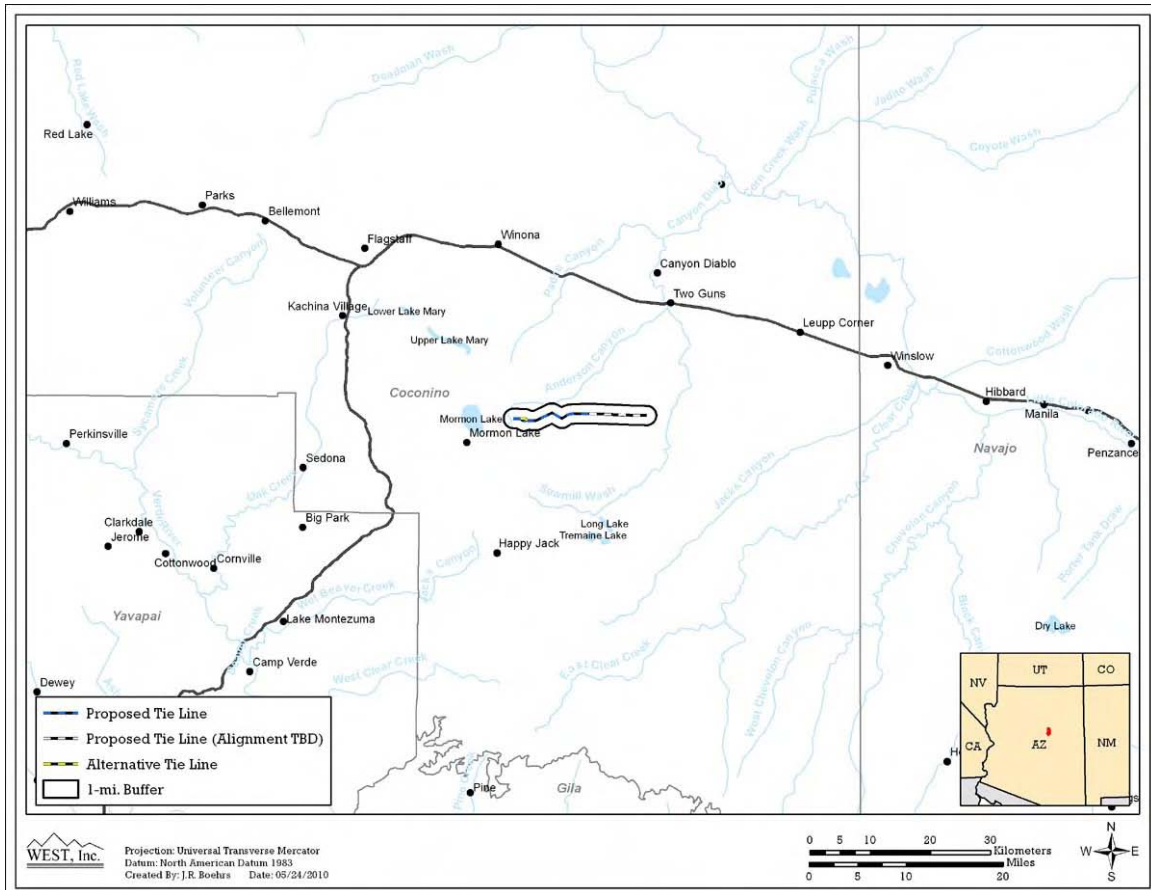
Biological resources within the Transmission Line and Evaluation Area were evaluated through a search of existing data, and a site visit. Several sources of available data were used to identify biological resources within the Transmission Line, including published literature, field guides, and public data sets. Arizona Game and Fish Department (AZGFD), USFS, and U.S. Fish & Wildlife Service (USFWS) were contacted concerning the presence of sensitive species and habitats within the Transmission Line (Appendix A). To date, responses have been received from the AZGFD and USFS and information provided is present in the report. A written response from the USFWS has not been received at this time. A site visit was conducted on November 11 and 12, 2009 by Mr. David Tidhar of WEST Inc. to evaluate: 1) landcover, habitats, and current land use within the area; 2) the potential for sensitive plants and wildlife to occur; 3) the potential for use of the area by breeding and migratory birds, and; 4) to look for raptor nests. Numerous photographs were taken of the Transmission Line and Evaluation Area (Appendix B).

In 2007 and 2008 WEST conducted pre-construction baseline wildlife surveys within Study Area A of the GCWRA, located immediately to the east of the Transmission Line (Figure 1.2: Young et al. 2008). The primary objective of those surveys was to generate data on seasonal and annual use by birds and bats that would be useful in evaluating potential impacts from the proposed wind-energy facility; however, the surveys also provide information on wildlife species potentially impacted by the proposed transmission line. Results of these surveys are referenced throughout this report. In addition, WEST is currently preparing a Site Characterization Report

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<sup>1</sup> In general, when evaluating prospective wind-energy sites, a 2-mile buffer of project facilities is considered. However, due to differences in potential impacts between a transmission line and wind turbines, a one-mile buffer of the Transmission Line was deemed appropriate in this situation.

for the GCWRA (Tidhar and Chatfield 2010). The objective of the Site Characterization Report is to provide additional information on biological resources for the draft EIS which may not have been directly addressed during pre-construction wildlife surveys completed at Study Area A in 2007 and 2008; notably a determination of potential state and federal sensitive species and/or habitat within the GCWRA.



**Figure 1.1 Location of the proposed and alternate transmission line right of way for the Grapevine Canyon Wind Resource Area.**

## 1.1 Regional Environmental Setting

The proposed Transmission Line is located in south-central Coconino County in central Arizona. The Transmission Line lies in the transition zone between the Arizona/New Mexico Plateau Ecoregion which covers much northern Arizona and northwestern New Mexico, and the higher elevation Arizona/New Mexico Mountain Ecoregion immediately to the west (USEPA 2004). The vegetation of the Arizona/New Mexico Plateau Ecoregion is predominantly Great Basin shrublands and grasslands; however, higher elevations within the region may support pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus spp.*) woodlands. Improper grazing management has caused widespread habitat degradation throughout much of this region.

Some vegetation communities within the Transmission Line are more characteristic of the Arizona/New Mexico Mountain Ecoregion which lies immediately to the west of the

Transmission Line. Chaparral is common on the lower elevation slopes of this Ecoregion, but is not present within the proposed Transmission Line or Evaluation Area, with Pinyon-juniper and oak (*Quercus* spp.) woodlands found on lower and mid elevations, and open to dense ponderosa pine (*Pinus ponderosa*) forests occur at higher elevations. Forests of spruce (*Picea* spp.), fir (*Abies* spp.) and Douglas fir (*Pseudotsuga menziesii*) are found in only a few high-elevation parts of the region, and are not present within the proposed Transmission Line or Evaluation Area.

The Transmission Line is located within the east-central portion of the Coconino National Forest. Topography within the Project and Evaluation Areas is characterized as flat to gently sloping with the exception of a few small ridges and canyons. The eastern portion of the Transmission Line has greater topographic relief and is characterized by a low ridge running north to south. Two small canyons, Anderson Canyon and Yaeger Canyon, are present along the northern boundary of the Evaluation Area and the eastern Transmission Line, respectively. The western and central portion of the Transmission Line are located atop Anderson Mesa, which begins about nine miles southeast of Flagstaff, and continuous as a gently sloping tableland for approximately 25 miles to the southeast. Elevations within the Transmission Line range from approximately 1,930 – 2,200 meters (m; 6,330 – 7,480 feet [ft]) above sea level, and elevations within the Evaluation Area range from approximately 1,900 – 2,280 m (6,230 – 7,480 ft; Figures 1.2 and 1.3). The proposed GCWRA, comprised of private and State Trust lands, lies immediately to the east of the Transmission Line and the Raymond Wildlife Area, comprised of State Trust and Game and Fish Commission Lands, lies approximately two miles northeast of the Transmission Line.

Grapevine Canyon Transmission Line ROW  
Wildlife and Botanical Report

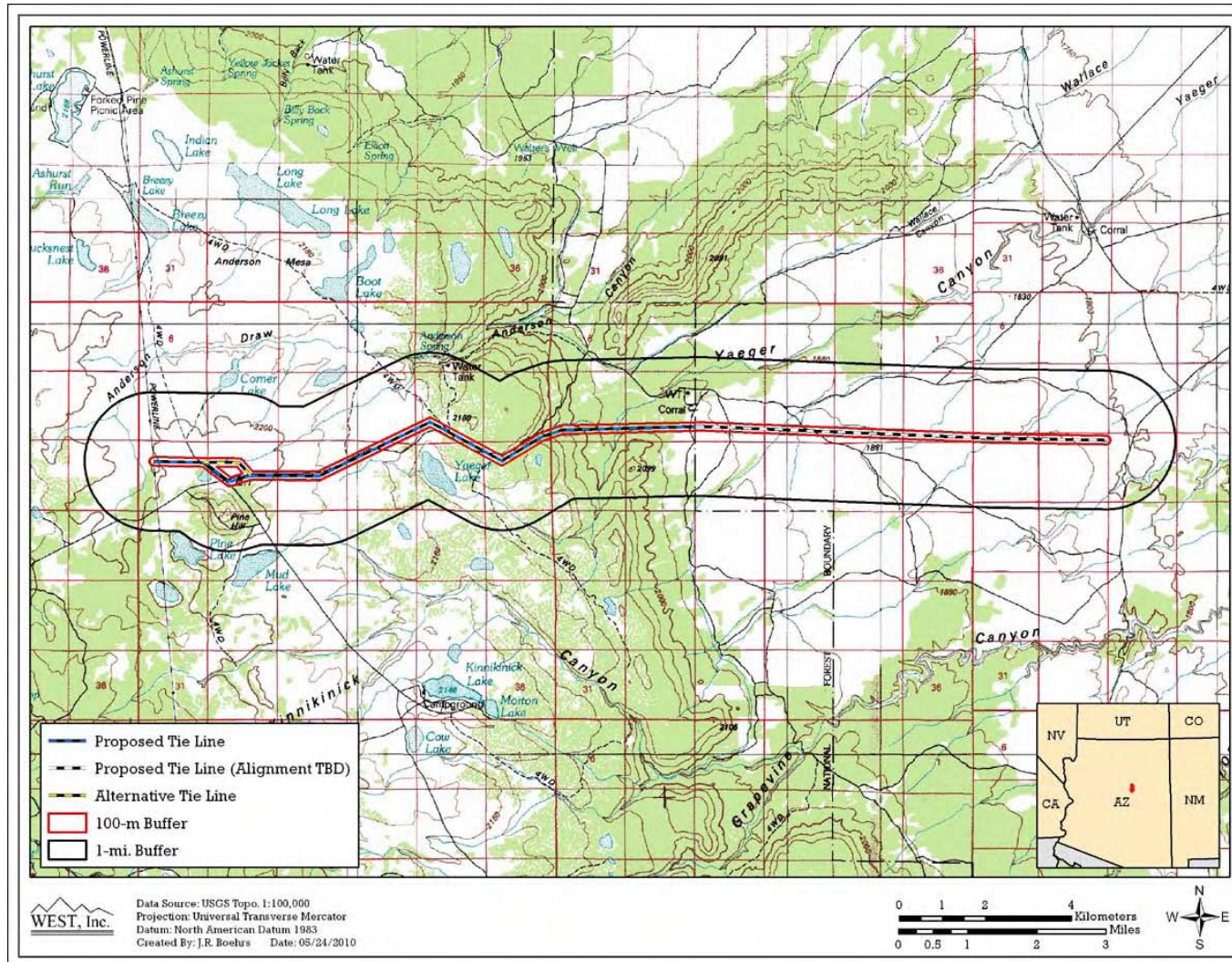


Figure 1.2 Topographic map of the Transmission Line and Evaluation Area.



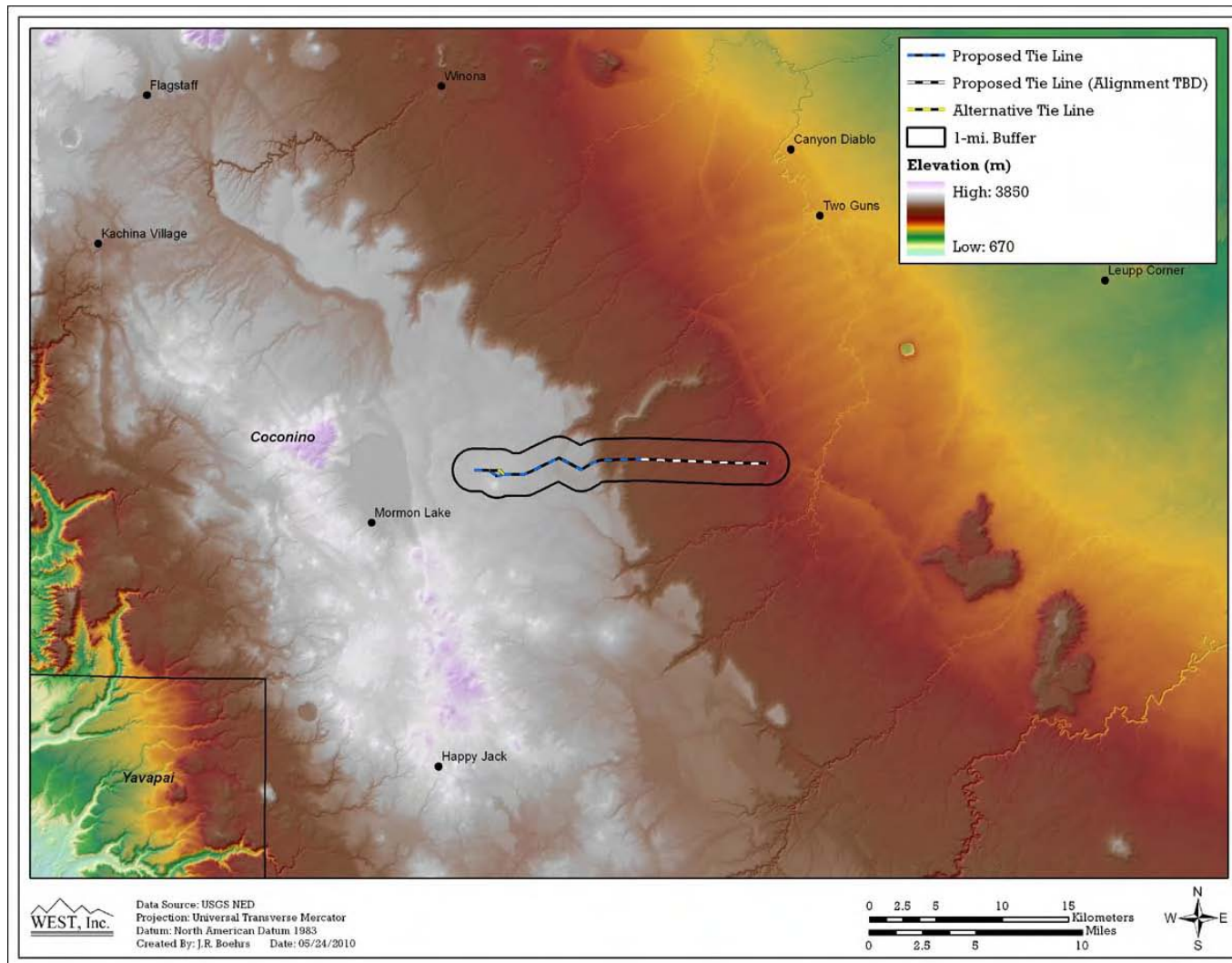


Figure 1.3 Digital elevation model of the Transmission Line and Evaluation Area.

## 2.0 LAND COVER

Land cover was analyzed using US Geological Survey (USGS) National Land Cover Database (NLCD) maps (2001). The Transmission Line encompasses approximately 678 acres in southern Coconino County. The dominant cover type within the Transmission Line is grassland which comprises 428.21 acres, or 63.2% of the Transmission Line, followed by pinyon-juniper woodland which comprises another 233.41 acres, or 34.4% of Transmission Line. The remaining 2.4% (16.07 acres) of the Transmission Line is comprised of very small amounts of ponderosa pine forest. Plains grassland which covers the majority of the Transmission Line consists of a grass-forb association dominated by western wheatgrass (*Agropyron smithii*). Pinyon-juniper woodlands are composed of Utah juniper (*Juniperus osteosperma*) intermixed with varying amounts of pinyon pine (*Pinus edulis*). The proposed transmission line transverses only a very small amount of ponderosa pine (*Pinus ponderosa*) habitat, limited to two small areas in the western portion of the proposed transmission corridor. The areas of pine forest that would be impacted by the proposed transmission line are located along the very edge of larger tracts of mature to intermediate-aged pure ponderosa pine forest to the south of the Transmission Line. Habitat types found along the alternative transmission line are generally similar to those of the proposed transmission line with the exception of an approximately one-mile long stretch of the route. This portion of the proposed route cuts through ponderosa pine forests, while the alternative route transverses the grasslands to the north (Figure 2.1).

The Evaluation Area, which includes a one-mile buffer surrounding the Transmission Line, encompasses approximately 12,669 acres, and has a composition that is generally similar to that of the Transmission Line (Table 2.1; Figures 2.1 and 2.2). The Evaluation Area has a slightly lower percentage of grassland (52.0%) than the Transmission Line, but a higher percentage of ponderosa pine forest (9.1%). The Evaluation Area also contains 103.29 acres (0.8%) of wetland which are not present within the Transmission Line. Forests within the Evaluation Area are restricted to the southwestern corner and consist mainly of pure stands of intermediate-aged to mature ponderosa pine. Additionally, canyon bottoms within the Evaluation Area contain oak (*Quercus* spp.) and cottonwood (*Populus fremontii*) trees, as well as riparian shrub species, not present within the Transmission Line.

**Table 2.1. Land use/habitat types present within the Transmission Line and Evaluation Area (US Geological Survey (USGS) National Land Cover Database 2001).**

Cover Type	<u>Transmission Line</u>		<u>Evaluation Area</u>	
	Acreage	% Composition	Acreage	% Composition
Grassland	428.21	63.2	6486.54	51.2
Pinyon/Juniper Woodland	233.41	34.4	4929.00	38.9
Ponderosa Pine	16.07	2.4	1150.63	9.1
Wetlands	0	0	103.29	0.8
<b>Total</b>	<b>677.68</b>	<b>100</b>	<b>12,669.46</b>	<b>100</b>

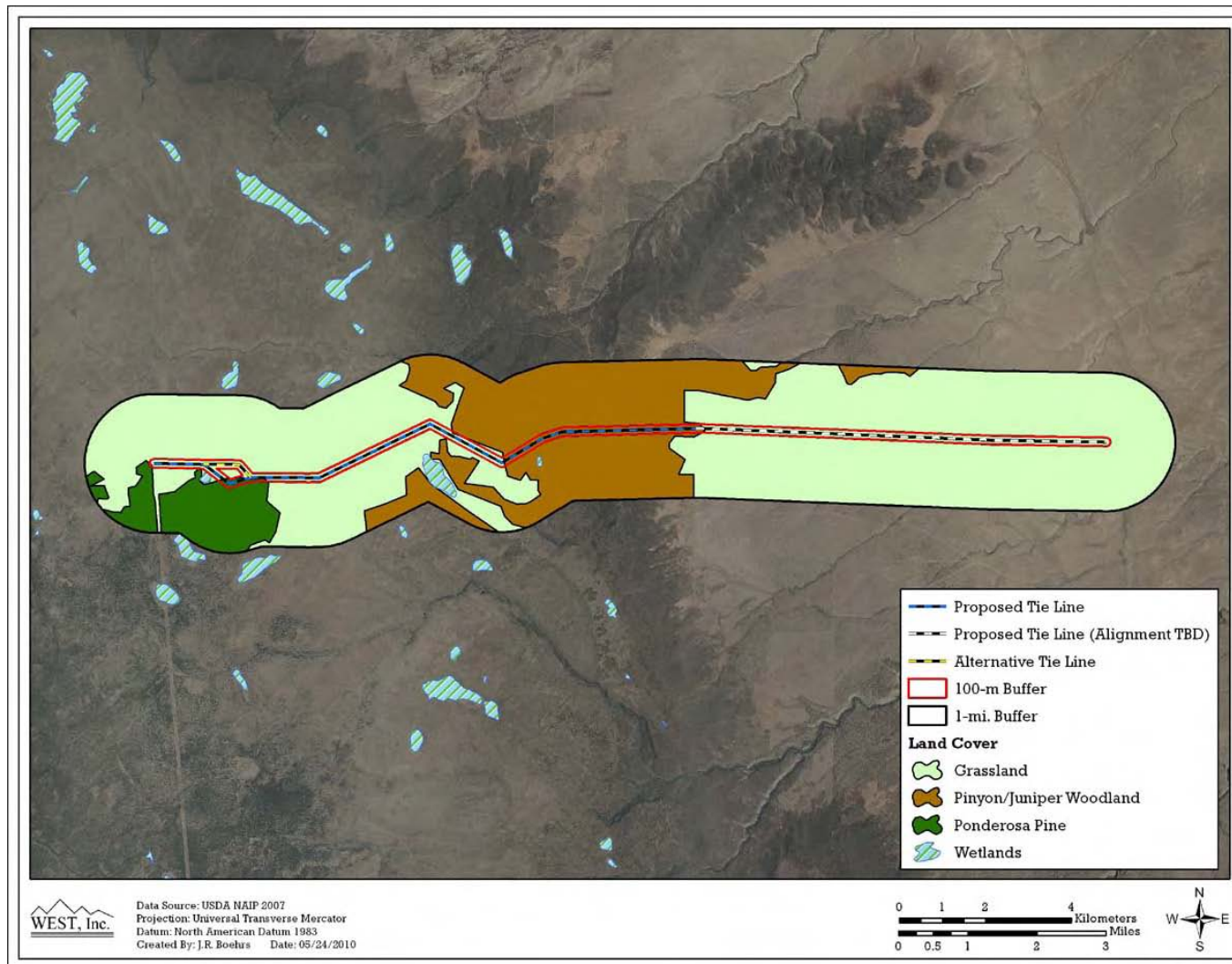


Figure 2.1 Land cover types within the Transmission Line and Evaluation Area.



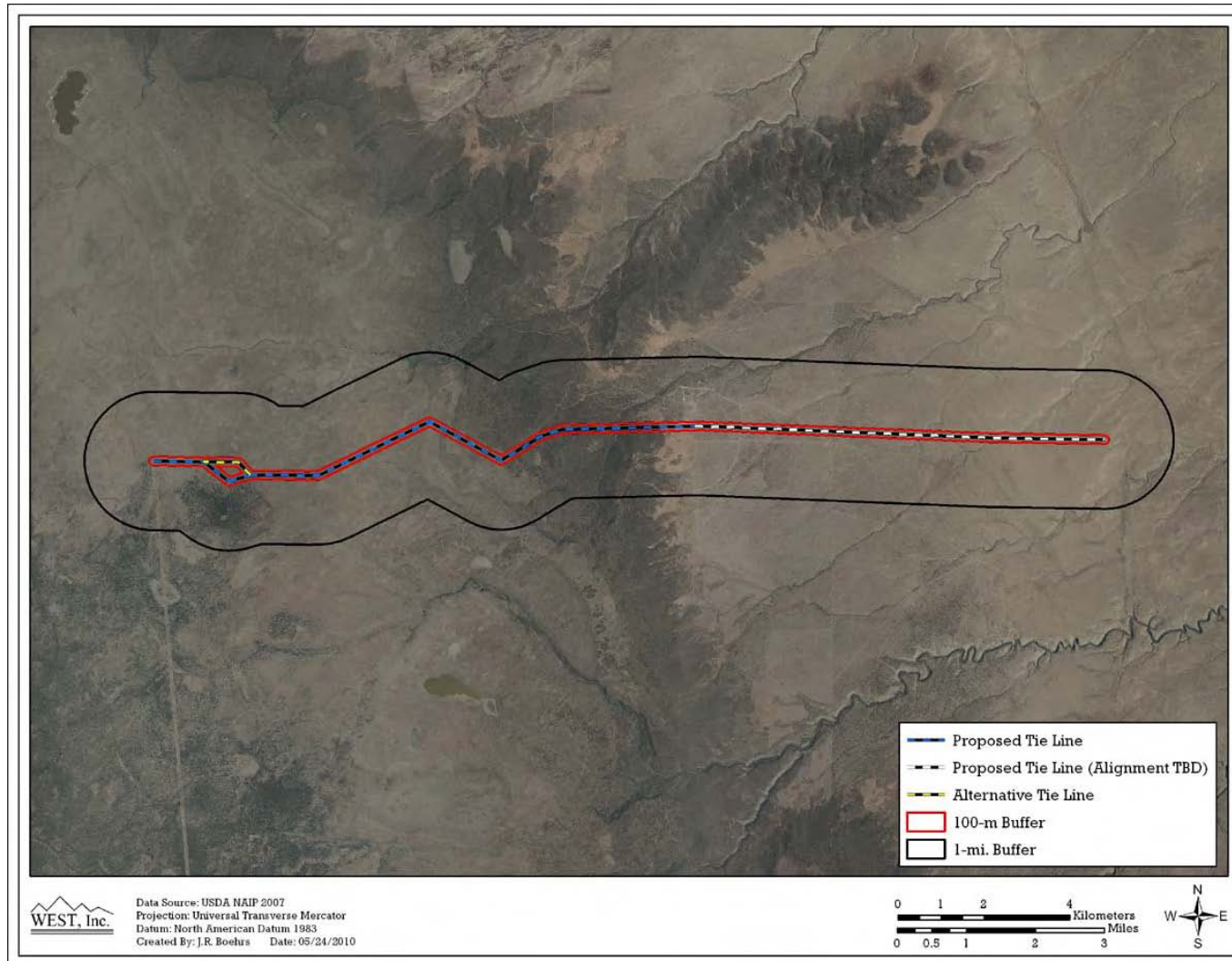


Figure 2.2 Aerial photograph of the Transmission Line and Evaluation Area.

## 2.1 Wetlands and Riparian Areas

Broad-scale information concerning wetlands is based on wetland delineations completed by the USFS (Table 2.1; Figure 2.1), data from the USFWS National Wetlands Inventory (USFWS 2004; Figure 2.3), aerial photography (Figure 2.2), and the site visit. Based on USFS wetland delineations and USFWS National Wetland Inventory data, there is no wetland habitat within the Transmission Line. Based on wetland delineations completed by the USFS, the Evaluation Area contains 103.29 acres of wetland habitat, or 0.8% of the total Evaluation Area (Table 2.1; Figure 2.1). According to USFWS National Wetland Inventory data, 163.77 acres or 1.2% of the total Evaluation Area is classified as wetland habitat (USFWS 2004). Of this, 140.41 acres are classified as lake habitat and 23.36 acres are classified as pond habitat.

The Transmission Line falls within the east-central portion of the Canyon Diablo Watershed. Water drains the Transmission Line in a general west to east direction. The Anderson Mesa, on which the majority of the Transmission Line and Evaluation Area lie, contains a network of small seasonal wetlands which contain water following periods of monsoon rainfall or winter snowfall, and provide habitat for a diversity of waterfowl and other wildlife and plant species. Seasonal wetlands are generally dominated by common spikerush (*Eleocharis macrostachya*) and wheatgrass (*Pascopyrum smithii*); however, grazing ungulates (cattle and elk) have severely degraded the herbaceous vegetation at the periphery of some of the wetlands (Appendix B). While none of these seasonal wetlands fall within the Transmission Line, several small lakes are present within the Evaluation Area including Pine Lake and Yaeger Lake. A number of additional lakes are located just outside of the Evaluation Area, the largest of which are Mud Lake and Corner Lake. A network of small intermittent creeks drains these wetlands, generally to the east and northeast. Larger waterways include Anderson Draw/Anderson Canyon along the northern boundary of the Evaluation Area and Yeager Canyon which crosses the eastern end of the Transmission Line (Figure 2.3).

Grapevine Canyon Transmission Line ROW  
Wildlife and Botanical Report

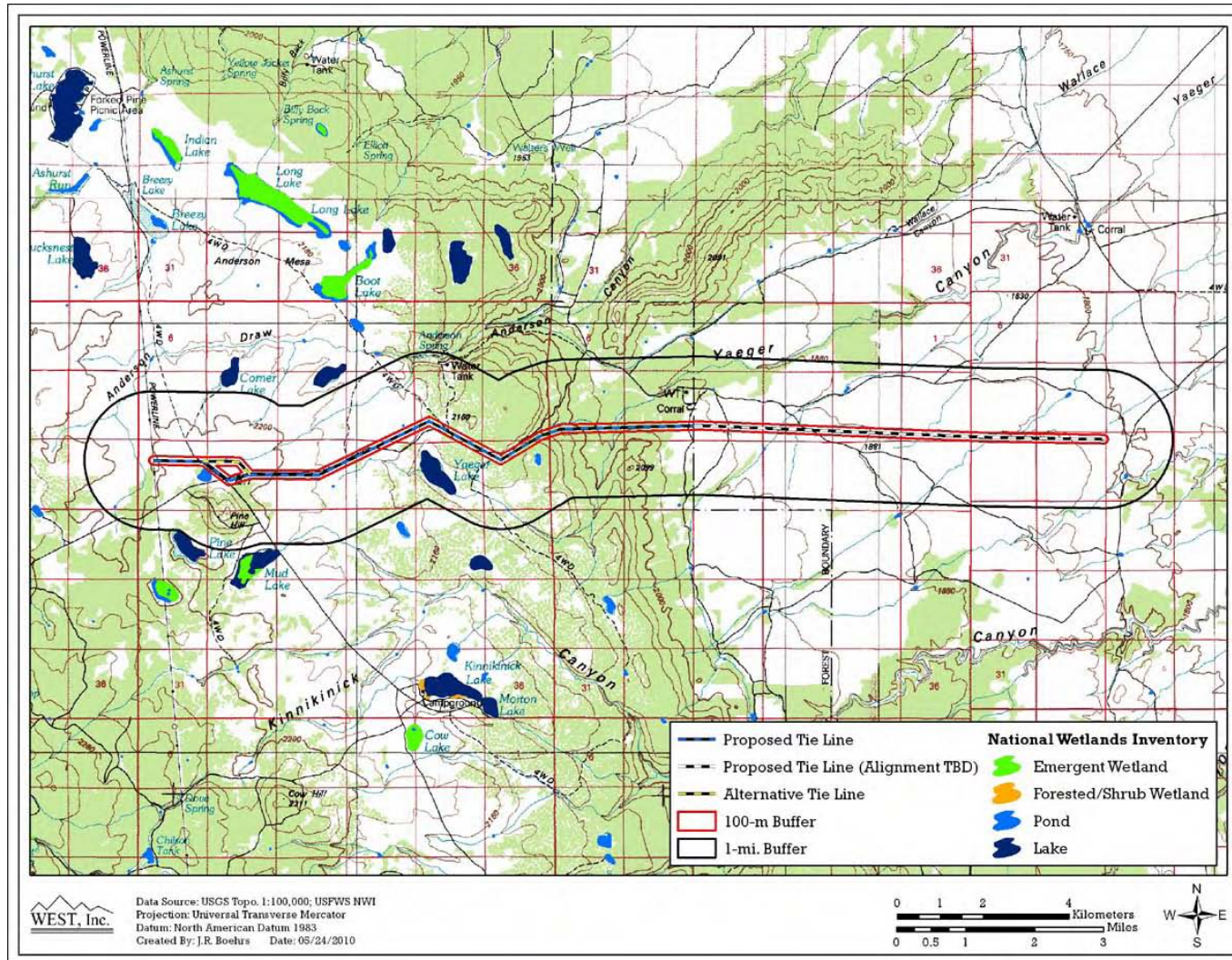


Figure 2.3 National Wetlands Inventory map of Transmission Line and Evaluation Area.

### 3.0 ASSESSMENT OF BIOLOGICAL RESOURCES

Species habitat and distribution information was reviewed and species were ranked for potential of occurrence qualitatively through a classification ranging from no potential for occurrence (“none”), to highest probability for occurrence (“high”) (Table 3.1). Each classification was assigned a numerical score from 0-4. Wildlife classification distinctions were made when appropriate for breeding populations/seasons and other seasons.

**Table 3.1 Rank classifications used for determining probability of occurrence.**

<b>Classification</b>	<b>Definition</b>
None	No potential for occurrence. Known range and distribution do not overlap study area. Potential habitat completely absent from study area. No species accounts for study area or surrounding area exist <sup>2</sup> .
Extremely Low	Extremely low probability of occurrence. Known range and distribution may not include study area. Very limited potential habitat is available within study area. No species accounts for study area or surrounding area exist <sup>2</sup> .
Low	Low probability of occurrence. Known range and distribution include study area. Potential habitat available patchily or in isolated areas within study area. No species accounts for study area or surrounding area exist <sup>2</sup> .
Moderate	Moderate probability of occurrence. Range and distribution include study area. Habitat present within study area. Species accounts for study area or surrounding area may exist <sup>2</sup> .
High	Highest probability of occurrence. Range and distribution overlap study area. Habitat abundant within study area. Species accounts exist for study area <sup>2</sup> .

<sup>2</sup>= secondary qualifier for rank. Species accounts are not available equally across geographic regions and are influenced by survey effort, land ownership and access, financing of natural heritage programs and other factors. This information is useful for confirming that a given species was present in the study area, but may not be sufficient information to confirm absence.

#### 3.1 Special-Status Plant Species

##### 3.1.1 Threatened, Endangered, and Sensitive Plant Species

The USFS (2009) has compiled a list of 14 threatened, endangered, and sensitive plant species for the Mormon Lake and Peaks Ranger Districts in the Coconino National Forest (Table 3.2). Due to a very limited distribution, and/or specific habitat requirements, thirteen of the species



have no potential to occur in the Transmission Line (Arizona bugbane [*Cimicifuga arizonica*], Arizona leatherflower [*Clematis hirsutissima* var. *hirsutissima*], Arizona sneezeweed [*Helenium arizonicum*], Arizona sunflower [*Helianthus arizonensis*], Bebb's willow [*Salix bebbiana*], Blumer's dock [*Rumex orthoneurus*], crenulate moonwort [*Botrychium crenulatum*], disturbed rabbitbrush [*Chrysothamnus molestus*], Flagstaff pennyroyal [*Hedeoma diffusa*]), rock fleabane [*Erigeron saxatilis*], San Francisco Peaks groundsel [*Senecio franciscanus*]), Rusby's milk-vetch [*Astragalus rusbyi*], and Sunset Crater beardtongue [*Penstemon clutei*]). One species has extremely low potential for occurrence (Flagstaff beardtongue [*Penstemon nudiflorus*]).

Within the Evaluation Area there was increased potential of occurrence for a few species due to the presence, or increase in the amount of, suitable habitat. These species included Arizona bugbane (Extremely Low), Arizona sneezeweed (Moderate), Arizona sunflower (Extremely Low), Bebb's Willow (Moderate). All other species concurred with the Transmission Line probability of occurrence classification. Correspondence received from the USFS indicates that suitable habitat is present within Transmission Line only for Flagstaff beardtongue (USFS 2009). Based on information received from the AZGFD (2009d), no threatened, endangered or sensitive plant species are known to occur within five miles of the proposed GCWRA. The switchyard does not contain suitable habitat for Flagstaff beardtongue.

**Table 3.2 Threatened, endangered and sensitive plant species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
Arizona bugbane <i>Cimicifuga arizonica</i>	FSC/HS/SEN	Along moist, shady canyon bottoms or lower canyon slopes; occurs in mixed conifer and high elevation riparian deciduous forests.	<b>None.</b> Habitat very limited and no mixed forests present within Transmission Line	<b>Extremely Low.</b> Seasonal ponds/wetlands and Riparian habitat present within Evaluation Area.
Arizona leatherflower <i>Clematis hirsutissima</i> <i>var. hirsutissima</i>	---/HS/SEN	Limestone outcroppings in ponderosa pine forest or in moist mountain meadows, prairies, and open woods and thickets within limestone soils of ponderosa pine woodland of the Petrane Montane Conifer Forest between 2100-2438m (7,000 to 8,500 ft) or more.	<b>None.</b> Habitat not suitable within Transmission Line; mesa is created by basalt outcroppings not limestone. Known distribution does not overlap Transmission Line	<b>None.</b> Habitat not suitable within Evaluation Area; mesa is created by basalt outcroppings not limestone. Known distribution does not overlap Evaluation Area.
Arizona sneezeweed <i>Helenium arizonicum</i>	---/---/SEN	Found in regions of ponderosa pine forests, especially around wet places such as bogs, ponds, lakes, and roadside ditches	<b>None.</b> No ponds/wetlands within Transmission Line.	<b>Low.</b> Several seasonal ponds/wetlands occur within Evaluation Area and species range overlap Evaluation Area.
Arizona sunflower <i>Helianthus arizonensis</i>	---/---/SEN	Grows in dry, frequently sandy soil at 1219-2100m (4,000–7,000 ft); appears to grow in areas with regular grazing.	<b>None.</b> No sandy soil on the mesa where project is proposed; collected from east side of Anderson Mesa (USFS 2007).	<b>Extremely Low.</b> No sandy soil on the mesa where project is proposed; collected from east side of Anderson Mesa (USFS 2007).

**Table 3.2 Threatened, endangered and sensitive plant species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
Bebb's willow <i>Salix bebbiana</i>	---/---/SEN	Dominated or co-dominated shrub in early seral willow communities along streambanks, overflow areas, and seeps.	<b>None.</b> No riparian habitat within Transmission Line.	<b>Moderate.</b> Seasonal ponds/wetlands and Riparian habitat present within Evaluation Area with possible range overlapping boundaries.
Blumer's dock <i>Rumex orthoneurus</i>	FSC/HS/SEN	Mid- to high-elevation wetlands; moist, organic soil; adjacent to perennial springs or streams in canyons or meadow situations.	<b>None.</b> No suitable habitat present and range does not appear to overlap with Transmission Line.	<b>None.</b> Several seasonal ponds/wetlands occur within Evaluation Area; however range does not appear to overlap.
crenulate moonwort <i>Botrychium crenulatum</i>	FSC/---/SEN	In Arizona, collected on San Francisco Peaks and White Mountains; found in bare, gravelly soils among spruce and fallen logs at high elevations.	<b>None.</b> No suitable habitat present and range does not appear to overlap with Transmission Line.	<b>None.</b> Several seasonal ponds/wetlands occur within Evaluation Area, although overall habitat appears unsuitable and range does not overlap.
disturbed rabbitbrush <i>Chrysothamnus molestus</i>	FSC/---/SEN	Found in open pinyon-juniper grasslands on low-moderate slopes and flats; found exclusively on calcareous / limestone soils.	<b>None.</b> Mesa is basalt although associated vegetation does exist. Range does not overlap with Transmission Line.	<b>None.</b> Known range is to north of Evaluation Area, but suitable habitat may be present.
Flagstaff beardtongue <i>Penstemon nudiflorus</i>	---/---/SEN	Occurs in dry ponderosa pine forests in mountainous regions south of the Grand Canyon, restricted to small, scattered limestone and sandstone outcrops.	<b>Extremely Low.</b> Mesa is basalt although associated vegetation does exist. No known locations within T-line though some nearby.	<b>Extremely Low.</b> Mesa is basalt although associated vegetation does exist. No known locations within T-line though some nearby.



**Table 3.2 Threatened, endangered and sensitive plant species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
Flagstaff pennyroyal <i>Hedeoma diffusa</i>	---/SR/SEN	Open, ponderosa pine habitats; prefers weathered limestone solution pockets filled with 4-6 inches of soil, but also grows in vertical cracks and around edges of limestone/sandstone boulders.	<b>None.</b> Mesa is basalt although associated vegetation does exist.	<b>None.</b> Mesa is basalt although associated vegetation does exist. Range may overlap with Evaluation Area.
rock fleabane <i>Erigeron saxatilis</i>	---/---/SEN	Shaded canyon walls, moist north-facing slopes, and steep rock outcrops and boulders in the stream beds of shady canyons. 1,340-2,130m.	<b>None.</b> Habitat not suitable within Transmission Line and known range does not appear to overlap Project boundaries	<b>None.</b> Habitat not suitable within Transmission Line and known range does not appear to overlap Evaluation Area boundaries
Rusby's milk-vetch <i>Astragalus rusbyi</i>	---/---/SEN	Openings or meadows in ponderosa pine forests or at edge of thicket or aspen groves; grows on dry basaltic soils.	<b>None.</b> Species has limited range on the lower slopes of the San Francisco Peaks and Oak Creek Canyon. Extremely little suitable habitat (ponderosa pine forests).	<b>None.</b> Species has limited range on the lower slopes of the San Francisco Peaks and Oak Creek Canyon. Suitable habitat (ponderosa pine forests) and basalt soils exist.
San Francisco Peaks groundsel <i>Senecio franciscanus</i>	FT/HS/SEN	In cracks and crevices of talus slopes in alpine fellfields on San Francisco Peaks; primary succession species.	<b>None.</b> Known only from San Francisco Peaks north of Flagstaff; alpine species – no potential to occur in Transmission Line.	<b>None.</b> Known only from San Francisco Peaks north of Flagstaff; alpine species. No potential to occur in Evaluation Area.

**Table 3.2 Threatened, endangered and sensitive plant species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
sunset crater beardtongue <i>Penstemon clutei</i>	FSC/SR/SEN	Cinder fields devoid of soil covering and where other herbaceous vegetation is sparse; generally above 6,100 ft.	<b>None.</b> Known only from volcanic fields north of Flagstaff; alpine species – no potential to occur in Transmission Line.	<b>None.</b> Known only from San Francisco Peaks north of Flagstaff; alpine species. No potential to occur in Evaluation Area.

<sup>1</sup>FT = Federal Threatened; FSC = Federal Species of Concern; HS = Highly Safeguarded (no collection allowed); SR = Salvage Restricted (collection only by permit); SEN = Forest Service sensitive species

<sup>2</sup>Habitat and species distribution information from AZGFD (2006); USFWS 2009

#### Arizona Bugbane

Arizona bugbane is an herbaceous perennial that reaches 3-6 feet in height. This species produces rather showy white flowers (summer (Jul-Aug), which grow on long stalks and bloom in slender clusters of small, petal-less flowers. The seeds resemble furry little bugs. This is a rare plant that has very narrow habitat restrictions. It exists in only four small population areas in Arizona, but is not federally protected. It is often found in the transition zone between coniferous forest and riparian habitat at elevations of 5300 to 8300 feet (1829 to 2529 meters). This species is often found near perennial or intermittent streams, and appears to prefer locations with high humidity and moist, rich, fertile soils. The species often occurs in mixed coniferous forest with deciduous understory. It does not spread into the forest although it appears to be adapted to deep shade. Arizona bugbane is only found in central Arizona, (Coconino and Gila counties). All known populations occur within three National Forests; the Coconino, Kaibab, and Tonto (CPC 2009). All known locations in the Coconino Forest are deep shady canyons. There is no likelihood of occurrence within the Transmission Line due to the limited riparian habitat available and lack of mixed-forest composition. However, it may be found within the Evaluation Area since there are seasonal ponds and wetlands present with Ponderosa pine.

#### Arizona Leatherflower

Arizona leatherflower is an herbaceous perennial understory species with purple nodding bell-shaped flowers. The showy purple flowers are displayed individually at the end of each stem and become heads of golden feathery seeds in late summer. This flower is found on limestone outcroppings in ponderosa pine forest or in moist mountain meadows, prairies, and open woods and thickets within limestone soils of *Pinus ponderosa* woodland of the Petrane Montane Conifer Forest between 7,000 to 8,500 or more feet. Its current range is from the Flagstaff vicinity along the Rio de Flag and Lower Lake Mary, upper Volunteer Canyon, San Francisco Peaks, and the Tusayan area, Coconino County (CPC 2009). Based on habitat requirements and known distribution, there is no potential that Arizona leatherflower will occur within either the Project or Evaluation Areas.

#### Arizona Sneezeweed

Arizona sneezeweed is a biennial or annual herb, up to 4 ft (12.2 dm) tall with dark green narrow leaves and yellow flowers occur singly at the tips of the stems, up to 2 inches wide. They bloom from July (August) to September. They are found in regions of ponderosa pine forests, especially around wet places such as bogs, ponds, lakes, and roadside ditches (NatureServe 2003). Arizona sneezeweed requires moist soils, often in association with seasonally wet meadows within ponderosa pine forests. Other associated species include *Populus tremuloides* (quaking aspen) and *Picea* (spruce). They can occur between 6,000 - 8,000 ft. (1830-2440 m) in elevation with a semi-open exposure. This plant is endemic to north-central Arizona, mainly in Coconino County, but also found in Apache, Gila and Navajo counties (AZGFD (2006). There is no suitable habitat within the Transmission Line to support Arizona sneezeweed, therefore the probability of occurrence is none. There is suitable habitat within the Evaluation Area in the form of seasonal ponds and wetlands with low potential for occurrence within those areas.

#### Arizona Sunflower

Arizona sunflower is an herbaceous perennial with long creeping roots that function like rhizomes with yellow flowers that bloom through the summer into the fall (USFS 2007). It

inhabits open pine woodlands; 1200–2100m (4,000-7,000 ft) in Arizona requiring dry, frequently sandy soil to grow. It has a fairly broad range but appears to be very rare. It is perhaps being confused with the more common blueweed (*Helianthus ciliaris*) that is taller and has reddish rather than yellow disk flowers. This plant appears to grow in habitats that are regularly grazed. There is a known collection from the east side of Anderson Mesa (NMRPTC 1999). The Transmission Line does not have evidence of sandy soil, therefore the potential to support the Arizona Sunflower is none. There does not appear to be sandy soil within the Evaluation Area either, however, with confirmed reports of the sunflower along the eastern side of the mesa, it may be possible to have an isolated population. Therefore, the potential for this species to occur within the Evaluation is considered extremely low.

#### Bebb's Willow

Bebb's willow is a large native shrub ten feet tall or a small bushy tree fifteen to twenty-five feet. The bark is thin, reddish, olive-green, or gray tinged with red and slightly divided by shallow fissures and produces long beaked and sparsely hairy capsule fruit. Bebb's willow is a fast growing but short-lived species that occurs most commonly under the shade of trees. It is adapted to a wide variety of soil textures and tolerates moderate alkaline soils but not extremely alkaline conditions. It prefers moist sites but is drought tolerant. It is frequently found in swamps, lakes, borders of streams, open woods and forests (EOL 2009). In the western U.S., Bebb's willow occurs along stream channels, on the edges of drainages, along seeps, and in perched sites that appear to be receiving little water. It's populations in the San Francisco Peaks and the White Mountains in Arizona represent the southernmost extent of its distribution in North America. Bebb's willow occurs in high elevation riparian habitats in New Mexico and Arizona. It occurs with alder (*Alnus tenuifolia*) and conifers, although it comprises up to 90% of the total tree density at some sites including Fern Mt., AZ, and Fenton Lake, NM. Willows are often replaced by alder and spruce at higher elevations and successional in undisturbed habitats. Disturbances such as major flooding or fire stand to open up colonizable habitat for Bebb's willow, reducing competition for resources such as sunlight, space, water and nutrients. Bebb's willow does establish readily in disturbed sites (e.g. roadway margins). Bebb's willow populations face several threats; a lack of replacement by younger age classes and accelerated successional replacement. Prolonged suppression of fire in Bebb's willow habitat may pose a threat to the persistence of this species (NatureServe 2009). There is no potential for Bebb's willow to occur within the Transmission Line due to absence of suitable habitat. There is moderate potential for the species to occur in the Evaluation Area at wetland features.

#### Blumer's Dock

Blumer's dock is a robust long-lived perennial herb, up to 2 m tall with huge semi-succulent basal leaves and numerous small flowers in a branched cluster at the top of the flowering stem. It blooms from July to mid-August (NatureServe 2009). They prefer Mid- to high-elevation wetlands (4,480 - 9,660 ft. (1,366 - 2,946 m) with moist, organic, loamy soils adjacent to perennial springs or streams in canyons or meadow situations (CPC 2009). They are associated with Madrean Subalpine Grassland meadows (within the Madrean Montane Conifer or Mixed Conifer forests) or Interior Southwestern Riparian Deciduous Forest (AZGFD 2002). Several populations are known in Arizona, limited primarily to the sites in the Pinaleno, Chiricahua, Huachuca, and Sierra Ancha mountains (CPC 2009). However, this species is not well defined, and some populations now considered *Rumex orthoneurus* may actually be the more widespread

*R. occidentalis*. If so, then *R. orthoneurus* is even more restricted in distribution than currently thought (NatureServe 2009). Populations "in dispute" include those in the White Mountains (Apache County) and Pinaleno Mountains (Graham County) in Arizona (AZGFD 2002). Probability of occurrence within the Transmission Line is classified as none because no suitable habitat is present and the range of this species does not encompass the region. Within the Evaluation Area, there is suitable habitat present in the form of seasonal ponds and wetlands; however the species range does not overlap; therefore, there is no probability of occurrence.

#### Crenulate Moonwort

Crenulate moonwort is a small, perennial fern with a single aboveground frond. The frond is usually 10 cm or less tall, yellow-green, and divided into two segments which share a common stalk. The longer segment is branched (often like a tiny Christmas tree). It inhabits wet, marshy, and springy areas, including marshy meadows, edges of marshes, saturated soils of seeps, bottoms and stabilized margins of small streams, and (occasionally) wet roadside swales, ditches, and drainageways. Sites tend to be partly to heavily shaded and usually have a dense, diverse cover of forbs and graminoids. Dominant plant species may include spruce, alders, and dogwood; this species has also been reported from western red cedar habitats. Often found on soils influenced by reprecipitated calcium. It occurs at mid to high elevations (montane zone), 1200 - 2500 m (NatureServe 2009). In Arizona, it has been recorded to occur in the Inner Basin, San Francisco Peaks, Coconino County, and Mount Baldy, White Mountains, Apache County. The FNA (1993+) range map shows it in the extreme northwest part of the state. In the San Francisco Peaks (ASU-90357, in SEINet), it was usually observed in patches of bare gravelly soil in rocky terrain, among scattered spruce and fallen logs (AZGFD (2006). The USFS documents this species as only occurring on the San Francisco Peaks and indicates that it is rare and sporadic throughout its broader range in the western US and Canada (USFS 2007). There is no probability of occurrence within the Transmission Line or the Evaluation Area. There is no suitable habitat is present and it appears that the range of this species does not overlap the Evaluation Area.

#### Disturbed Rabbitbrush

Disturbed rabbitbrush is a perennial prostrate shrub or sub-shrub that produces profuse yellow rayless flowers in the fall and can be distinguished from common rabbitbrush by its hairy leaves which are less than 2 mm wide. This species is typically found in open pinyon-juniper grasslands where periodic natural fires naturally occur at an interval of every 15 to 30 years (CPC 2009). Habitat is lost when woodlands become denser from absence of fire (USFS 2007). It has only been documented on the Coconino Plateau in northern Arizona, patchily distributed on limestone-derived soils in Coconino County (CPC 2009). The Transmission Line and Evaluation Area do not have evidence of limestone soils; instead the mesa is built upon a basalt soil foundation. The probability of occurrence for disturbed rabbit bush within both areas of consideration is considered none due to the absence of limestone-derived soil.

#### Flagstaff Beardtongue

Flagstaff beardtongue is a perennial herb with blue-whitish leaves and stems which produces lavender flowers in summer. It occurs within dry ponderosa pine in mountainous regions south of the Grand Canyon, 1370-2130 m in elevation (NatureServe 2009). This species is endemic to Arizona, found only in Apache, Coconino, Gila, Navajo, and Yavapai counties (AZGFD 2003).

It is restricted to small, scattered limestone and sandstone outcrops of relatively undisturbed habitats. Associated vegetation includes ponderosa pine, gambel oak, blue grama, and alligator juniper (USFS 2007). Locations in the Coconino Forest include sites with similar forest characteristics to those found in portions of the Transmission Line and Evaluation Area: mixed oak and pinyon-juniper woodlands. The switchyard does not contain suitable habitat for the species. The Transmission Line and Evaluation Area do not have evidence of limestone or sandstone outcrops; instead the mesa is built upon a basalt soil foundation. The probability of occurrence for both areas of consideration is considered extremely low due to the absence of limestone-derived soil but the presence of mixed oak-pinyon juniper woodlands.

#### Flagstaff Pennyroyal

Flagstaff pennyroyal is an herbaceous perennial that forms dense, circular, prostrate mats, 15-23 cm (6-10 in.) in diameter, with numerous shoots branching prolifically at base. It flowers in late May. This plant prefers open spots with weathered limestone solution pockets filled with 4-6 inches of soil, but it can also grow in the shallow soil of the rock crevices and weathered pockets of exposed limestone and small outcrops; also found on sandstone outcrops and boulders. It does seem to be restricted to these small and scattered limestone and sandstone outcrops of relatively undisturbed habitat; openings within the ponderosa pine vegetation type, Pran Montane Conifer Forest. Associated species include: *Aquilegia desertorum* (desert columbine), *Bouteloua gracilis* (blue grama), *Festuca arizonica* (Arizona fescue), *Geranium caespitosum* (purple cluster crane's-bill), *Juniperus deppeana* (alligator juniper), *Pinus ponderosa* (ponderosa pine), and *Quercus gambelii* (gambel oak) (AZGFD 2003). This species has been recorded on the San Francisco Plateau of the Colorado Plateau Province; Flagstaff and southward in Coconino and Yavapai counties, including the rims of Oak Creek and Sycamore canyons (AZGFD 2003; USFS 2007). The Transmission Line and Evaluation Area do not have evidence of limestone or sandstone outcrops; instead the mesa is built upon a basalt soil foundation. The probability of occurrence for disturbed rabbit bush within both areas of consideration is considered none due to the absence of limestone-derived soil.

#### Rock Fleabane

Rock fleabane is an Herbaceous perennial with small stems and relatively large white ray flowers. It flowers between April - October, with a peak during May – July. All fleabane species are restricted to mountains within Arizona. The rock fleabane is the northernmost species found above the Mogollon Rim (AZGFD 2006). Its preferred habitat is shaded cliff-faces and boulders in streambeds of shady canyons above the Mogollon Rim, within Coconino and Yavapai counties, Arizona, elevation range of 1340-2130 m. Within Coconino County this species has been documented in Barbershop Canyon, East Clear Creek, Little Elden Mtn., Oak Creek Canyon, Tule Canyon, Walnut Canyon, and West Fork of Oak Creek Canyon. It is associated most with the Rocky Mountain Riparian Deciduous Forest communities. The potential for rock fleabane to occur in either the Transmission Line or Evaluation Area is none, due to the known range and habitat restrictions of this species.

#### Rusby's Milk-Vetch

Rusby's milk-vetch is a perennial herb, stems 1.5-4 cm tall, with white to lavender flowers which in bloom June-September. It inhabits meadows in yellow (ponderosa) pine forest, or edge of thickets and aspen groves, in dry or temporarily moist basaltic soils. Within Arizona, this species

has a very limited range on the lower slopes of the San Francisco Peaks and Oak Creek Canyon (USFS, 2007). It occurs within elevations ranging from 2130-2440 m (7,000-8,000 ft) down to 1650 m (5,400 ft) in Oak Creek Canyon (AZNPS 2008). Both the Transmission Line and the Evaluation Area contain suitable habitat (vegetation) and growing conditions (basaltic soils). However, the known range for this species is very limited and specific, which does not overlap the Evaluation Area, based on habitat availability. There is no probability for occurrence within the Transmission Line.

#### San Francisco Peaks Groundsel

San Francisco Peaks groundsel is a dwarf perennial alpine plant that grows low to the rocky ground to a height of only 3 to 10 cm (1.25-4 inches). Stems emerge from ruffled-edge leaves with purple undersides which hold clusters of 8 to 13 yellow ray flowers (CPC 2009). They bloom in August and early September (NatureServe 2009). They require gravelly, sandy loams of talus in alpine fellfield; 11,000-12,400 ft (3350-3780 m) elevation (AZGFD 2003). The San Francisco Peaks groundsel is found only on the talus slopes in the alpine zone on San Francisco Peaks. San Francisco Peaks is a strato-volcano that rises abruptly from 2130 meters (7000 feet) to an elevation of 3852 meters (12,633 feet). This volcano is located north of Flagstaff, Arizona, and is the highest point in the southwestern United States. It is the home of the only true alpine zone in Arizona (CPC 2009). There is no potential for this species to occur within either the Transmission Line or Evaluation Area based on known distribution and habitat requirements.

#### Sunset Crater Beardtongue

Sunset crater beardtongue is an herbaceous plant that has one to several stems that grow up to 32 inches tall with bright pink tubular flowers that appear from late April through early August. They are only known from the Cinder Hills area northeast of Flagstaff, in the vicinity of the Sunset Crater and the Indian Flat area of Coconino County (USFS 2007; CPC 2009). They are found specifically within the volcanic fields associated with the Sunset Crater eruption at 6500-8500 ft elevation (CPC 2009). There are several discontinuous populations surrounding Sunset Crater. It grows in cinder fields with little soil development or other vegetation in ponderosa pine forest (USFS 2007). For successful growth, volcanic ash-cinders need to be approximately 5-10 cm thick with a layer of silty soil of similar thickness below. There is no potential for this species to occur within either the Transmission Line or Evaluation Area based on known distribution and habitat requirements.

### *3.1.2 Vegetation Summary and Conclusions*

The primary vegetation community comprising the Transmission Line is grassland and pinyon-juniper woodland. There are no wetlands or waterbodies within the Transmission Line, based on USFS wetland delineations and USFWS National Wetland Inventory data. 1.2% of the larger Evaluation Area is classified as wetland habitat (primarily seasonal ponds and lakes). Based on information provided from the USFS, 14 federal or state-listed plant species, or USFS sensitive plant species are listed as occurring within the Mormon Lakes and Peaks Ranger Districts. The majority of these plants have limited distributions and specific habitat requirements and are not expected to occur in the Transmission Line. The Transmission Line does contain areas of native woodland containing oak and pinyon-juniper which could potentially support Flagstaff beardtongue; however, soils are basalt and therefore the potential for occurrence is considered



extremely low. The Evaluation Area has greater potential than the Transmission Line to support plant diversity, especially plants associated with wetland habitats and pine forests such as Arizona sneezeweed, Arizona sunflower, Bebb's willow and Flagstaff beardtongue. Canyon bottoms containing riparian areas within the Evaluation Area may also support wetland and mesic plant species not found within the Transmission Line, though the probability for occurrence for these species is generally very low.

## **3.2 Wildlife**

### **3.2.1 Special-Status Wildlife Species**

#### *3.2.1.1 Endangered, Threatened, and Sensitive Species*

Based on information provided by the USFS, 22 special-status wildlife species occur on the Mormon Lakes and Peaks Ranger Districts (Table 3.3). This list includes federal threatened, endangered, and candidate wildlife species, Arizona state wildlife of special concern, and USFS sensitive wildlife species. The species and their potential to occur (Table 3.3) is discussed below.

**Table 3.3 Threatened, endangered, and sensitive wildlife species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
<b>Birds</b>				
American peregrine falcon <i>Falco peregrinus anatum</i>	FSC/WSC/SEN	Found where sufficient prey is present near tall cliffs; optimum habitat considered steep, sheer cliffs overlooking woodlands, riparian areas, or other habitats supporting avian prey species in abundance.	<b>None (Nesting); Low (Presence)</b> In Arizona most nesting occurs in cliff areas of Mogollon Rim, Grand Canyon, and Colorado Plateau; not likely to nest in Transmission Line, but may occur as migrant.	<b>None (Nesting); Moderate (Presence).</b> Not likely to nest in Evaluation Area, they may use the wetlands areas for foraging and may occur as migrants.
bald eagle <i>Haliaeetus leucocephalus</i>	---/WSC/SEN	Found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; roost communally especially in winter	<b>None (Nesting); Moderate (Presence).</b> Historically nested on the Mogollon Rim including at Mormon Lake; not likely to nest in Transmission Line, but will likely occur as occasional winter visitor/transient.	<b>None (Nesting); Moderate (Presence).</b> Historically nested on the Mogollon Rim including at Mormon Lake; not likely to nest in Evaluation Area, but will likely occur as occasional winter visitor/transient.
Clark's grebe <i>Aechmophorus clarkia</i>	---/WSC/SEN	Marshes, lakes and bays; in migration and winter also sheltered seacoasts; less frequently along rivers. Nest among tall plants growing in water on edge of large areas of open water.	<b>None (Nesting), Extremely Low (Presence).</b> Suitable lake habitat not present within Transmission Line; some potential for species to occur during migration.	<b>Moderate (Nesting and Presence).</b> Suitable lake habitat present within Evaluation Area; may be utilized during breeding season, and during migration.

**Table 3.3 Threatened, endangered, and sensitive wildlife species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
ferruginous hawk <i>Buteo regalis</i>	FSC/WSC/SEN	Inhabits open country, primarily prairies, plains, and badlands; nests in tall trees along streams or on steep slopes, cliff ledges, hillsides, or power line towers	<b>None (Nesting), Extremely Low (Presence).</b> Currently nests in northern and southeastern Arizona; not likely to nest in Transmission Line; may occur as migrant.	<b>None (Nesting), Extremely Low (Presence).</b> Currently nests in northern and southeastern Arizona; not likely to nest in Transmission Line; may occur as migrant.
Mexican spotted owl <i>Strix occidentalis lucida</i>	FT/WSC/SEN	Nest in canyons and dense mixed-conifer forests with multi-layered foliage structure.	<b>None (Nesting), Extremely Low (Presence).</b> Known to occur in forested areas to west of Transmission Line; habitat not suitable within Transmission Line;	<b>None (Nesting), Extremely Low (Presence).</b> Known to occur in forested areas to west of Evaluation Area; habitat overall not suitable.
northern goshawk <i>Accipiter gentilis</i>	FSC/WSC/SEN	Nest is variety of forest types including deciduous, conifer, and mixed forests; typically nest in large tracts of mature or old-growth forest.	<b>None (Nesting), Extremely Low (Presence).</b> Known to nest along Mogollon Rim; no potential to nest in pine forests in Transmission Line but may occur as rare transient, winter visitor, or migrant.	<b>Extremely Low (Nesting), Moderate (Presence).</b> Known to nest along Mogollon Rim; some potential to nest in pine forests in Evaluation Area but may also occur as occasional winter visitor or migrant.

**Table 3.3 Threatened, endangered, and sensitive wildlife species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>	Habitat <sup>2</sup>	Potential for Occurrence	
	Federal/State/USFS		Transmission Line	Evaluation Area
western burrowing owl <i>Athene cunicularia hypugaea</i>	FSC/---/SEN	Open, well-drained grasslands, steppes, deserts, prairies, and agricultural lands; often associated with burrowing mammals.	<b>Extremely Low (Nesting and Presence).</b> Open grassland present in the Transmission Line; little evidence of burrowing mammals.	<b>Extremely Low (Nesting and Presence).</b> Open grassland present; little evidence of burrowing mammals.
<b>Mammals</b> Allen's lappet-browed bat <i>Idionycteris phyllotis</i>	FSC/---/SEN	Found most often in ponderosa pine, pinyon-juniper, and riparian forest areas; boulder piles, rocky outcrops, or lava flows at or near most collection sites; roost in caves and abandoned mineshafts.	<b>Extremely Low (Breeding); Low (Presence).</b> Woodland habitat present in Project; cracks and fissures within rocky features along mesa are present.	<b>Extremely Low (Breeding); Low (Presence).</b> Woodland habitat present in Project; cracks and fissures within rocky features along mesa are present.
black-footed ferret <i>Mustela nigripes</i>	FE, XN/WSC/SEN	Grasslands; arid plains; generally associated with prairie dog colonies.	<b>None.</b> Restricted to Aubrey Valley in west-central Coconino County where re-introduced in 1996.	<b>None.</b> Restricted to Aubrey Valley in west-central Coconino County where re-introduced in 1996.
dwarf shrew <i>Sorex nanus</i>	---/---/SEN	Alpine tundra, montane forests, rockslides, and dry short-grass prairies.	<b>None.</b> Extremely restricted range in northern Arizona; Suitable habitat also not present.	<b>None.</b> Extremely restricted range in northern Arizona; Suitable habitat also not present.

**Table 3.3 Threatened, endangered, and sensitive wildlife species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
greater western mastiff bat <i>Eumops perotis californicus</i>	FSC/---/SEN	Lower and upper Sonoran desertscrub near cliffs; prefer rugged rocky canyons with abundant crevices. Roost in rock crevices, often allowing a vertical drop of 10 feet or more; typically roost in groups of 100 or more individuals; severely limited by availability of drinking water.	<b>None (Breeding) Presence (Extremely Low).</b> Suitable cliff habitat not present within Transmission Line; no waterbodies of minimum size present	<b>None (Breeding) Presence (Moderate).</b> May forage/drink at ponds and lakes in Evaluation Area.
long-tailed vole <i>Microtus longicaudus</i>	---/---/SEN	Mesic habitats with ample vegetative cover in mixed-conifer zone; prefers areas with grassy understory; good indicator of permanent water.	<b>None.</b> Mesic forest habitats not present in Transmission Line.	<b>Extremely Low.</b> Mesic forest habitats generally not present in Evaluation Area, but there is presence of wet areas; species not likely to occur.
Merriam's shrew <i>Sorex merriami leucogenys</i>	---/---/SEN	Arid, montane, coniferous forests.	<b>Low.</b> Montane conifer forest present within Transmission Line. Range is unknown.	<b>Low.</b> Montane conifer forest present within Evaluation Area. Range is unknown.

**Table 3.3 Threatened, endangered, and sensitive wildlife species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
Navajo Mogollon vole <i>Microtus mogollonensis</i> <i>Navaho</i>	---/---/SEN	Variety of habitats depending on locale and elevation; thickets that provide dense cover, areas of high litter and bare ground, dry, grassy areas, usually adjacent to ponderosa pine forests, or sometimes as low as juniper woodland or stands of sagebrush, or as high as spruce-fir.	<b>Extremely Low.</b> Suitable habitat present within Transmission Line, range may overlap boundaries	<b>Low.</b> Increased suitable habitat available, including wetland areas, providing increased foraging opportunity. Range may overlap Area boundaries.
pale Townsend's big-eared bat <i>Corynorhinus townsendii</i> <i>pallascens</i>	FSC/--/SEN	In summer, day roosts are caves and mines from desertscrub up to woodlands and coniferous forests; night roosts may often be in abandoned buildings. In winter, hibernate in cold caves, lava tubes and mines mostly in uplands and mountains.	<b>None (Breeding) Presence (Low).</b> No caves/mines present within T-line; may occur during foraging or migration periods.	<b>None (Breeding) Presence (Low)..</b> No caves/mines present; may forage over wetlands, ponds and lakes in Evaluation Area and occur during foraging or migration periods..

**Table 3.3 Threatened, endangered, and sensitive wildlife species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
spotted bat <i>Euderma maculatum</i>	FSC/WCS/SEN	Various habitats from low deserts scrub to ponderosa pine and mixed-conifer forests to high desert and riparian habitats; may be an elevational migrant; roost site characteristics are poorly known, but observations suggest the species prefers to roost singly in crevices and cracks in cliff faces.	<b>None (Breeding) Presence (Extremely Low).</b> Rock outcrops and cliffs not present within Transmission Line; May occur during foraging or migration periods.	<b>None (Breeding) Presence (Low).</b> Rock outcrops and cliffs generally not present within Evaluation Area but may utilize rocky cracks. May occur during foraging or migration periods.
Wupatki Arizona pocket mouse <i>Perognathus amplus cineris</i>	FSC/---/SEN	Various types of desert scrub habitats (greasewood, rabbitbrush, creosote bush, cactus, mesquite, palo verde, scrub oak, etc.); sleeps and rears young in underground burrows.	<b>None.</b> Desert scrub habitat not present within Transmission Line.	<b>None.</b> Desert scrub habitat not present within Evaluation Area.
<b>Reptiles</b> narrow-headed gartersnake <i>Thamnophis rufipunctatus</i>	FSC/WSC/SEN	Pinyon-juniper and pin-oak woodland into ponderosa pine forest; in permanently flowing streams.	<b>None.</b> Known along Mogollon Rim of to west and south of Transmission Line; stream habitat for species does not occur in Transmission Line.	<b>None.</b> Known along Mogollon Rim of to west and south of Evaluation Area; stream habitat for species does not occur in Evaluation Area



**Table 3.3 Threatened, endangered, and sensitive wildlife species for the Mormon Lake and Peaks Ranger Districts (USFS 2009).**

Species	Status <sup>1</sup>		Potential for Occurrence	
	Federal/State/USFS	Habitat <sup>2</sup>	Transmission Line	Evaluation Area
<b>Amphibians</b>				
northern leopard frog <i>Rana pipiens</i>	---/WSC/SEN	Variety of habitats including grassland, shrubland, woodlands, and forests; typically in permanent water with rooted aquatic vegetation.	<b>None.</b> Occurs in northern and central Arizona suitable wetland habitat not present.	<b>Low.</b> Occurs in northern and central Arizona; some potential to occur in Evaluation Area within seasonal ponds/wetland areas .
<b>Insects</b>				
blue-black silverspot butterfly <i>Speyeria nokomis nokomis</i>	---/---/SEN	Moist meadows, seeps, marshes, streamsides.	<b>None.</b> Suitable habitat not present within Transmission Line.	<b>Extremely Low.</b> Habitat present within Evaluation Area in the form of wetlands, ponds and lakes.
mountain silverspot butterfly <i>Speyeria nokomis nitocris</i>	---/---/SEN	Alpine meadows	<b>None.</b> Alpine species – no potential for occurrence.	<b>None.</b> Alpine species – no potential for occurrence.
spotted skipperling <i>Piruna polingii</i>	---/---/SEN	Moist woodland openings with lush vegetation, meadows, ravines and streamsides in the mountains.	<b>None.</b> Suitable habitat not present within Transmission Line.	<b>Extremely Low.</b> Suitable habitat present within Evaluation Area; wetlands, ponds, and lakes.

<sup>1</sup>FE = Federal Endangered; FT = Federal Threatened; FSC = Federal Species of Concern; WSC = Arizona State Wildlife of Special Concern; SEN = Forest Service sensitive species

<sup>2</sup>Habitat and species distribution information from AZGFD (2009b) and USFS (2007).

### American Peregrine Falcon

The American peregrine falcon (*Falco peregrinus anatum*) is generally found in open country with tall cliffs for roosting or nesting and with open water, woodland, or riparian areas nearby that support abundant avian prey species. In Arizona, the majority of peregrine falcon nesting occurs in the tall cliffs of the Mogollon Rim, the Grand Canyon, and the Colorado Plateau (AZGFD 2009b). The species is unlikely to nest within the Transmission Line or Evaluation Area due to the lack of suitable cliffs for nesting; however, Peregrine falcons are regularly observed foraging at wetlands on the Anderson Mesa (H. Provencio, pers. comm.), and there is potential for peregrines forage at the lakes within the Evaluation Area. As a result, there is low and moderate potential, respectively for the species to pass through the Transmission Line and Evaluation Area while traveling between foraging areas, or during migration. There is no potential for the species to breed within the Transmission Line or Evaluation Area.

### Bald Eagle

Delisted from the federal endangered species act in 2007, the bald eagle (*Haliaeetus leucocephalus*) remains protected under the federal Bald and Golden Eagle Protection Act (1940), and is a state species of special concern in Arizona. In 2008, the USFWS determined the Sonoran Desert population of bald eagles occurring in central Arizona and northwestern Mexico to be a distinct population segment (DPS), however, the USFWS announced on February 25, 2010 that neither this population nor its habitat warrants protection under the Endangered Species Act (1973). The Sonoran Desert DPS occurs to the south and west of Coconino County, and bald eagles occurring within the Evaluation Area are not listed under the federal Endangered Species Act. Breeding bald eagles are found near large lakes, reservoirs, or perennial streams throughout central Arizona, where they perch in large riparian trees, pines, or on cliffs (Corman and Wise-Gervais 2005). Bald eagles generally construct nests in the tallest trees in an area near water; however, in Arizona, they frequently nest on cliff faces, ledges, or pinnacles. Within the State's 56 known bald eagle breeding areas, all but two nests are located within one mile of water (McCarty and Jacobson 2008). Historically, bald eagles nested along the Mogollon Rim including at Mormon Lake and Lake Mary, approximately 3.5 miles to the west and eight miles to the northwest of the Transmission Line, respectively (AZGFD 2009b). Additionally, the lakes support wintering populations of bald eagles. The nearest known bald eagle breeding area is greater than three miles away (McCarty and Jacobson 2008); however, there is some potential for wintering or transient eagles to occur in the Transmission Line. Bald eagles have been observed at the Raymond Wildlife Area immediately to the north of the Transmission Line (AZGFD 2009c), and were observed during 2007/2008 baseline avian studies at study area A of the GCWRA (Young et al. 2008). There is no potential for the species to nest within the Transmission Line or Evaluation Area and moderate potential for the species to occur during transient flights.

### Clark's Grebe

Clark's grebe (*Aechmophorus clarkia*) occurs on freshwater lakes and marshy areas, and less frequently along rivers. The species nests among tall plants growing in water, often building nests of floating vegetation on the edge of large areas of open water (AZGFD 2009b). In Arizona, Clark's grebe maintains local populations year-round in the lower Colorado River Valley (AZGFD 2009b). There is no suitable open water nesting habitat within the Transmission Line, and the species is not likely to occur (extremely low potential) as a summer or winter

resident in the area; however there is some moderate potential for Clark's grebe to use seasonal wetlands within the Evaluation Area for breeding or stopover habitat during migration.

#### Ferruginous Hawk

Ferruginous hawks (*Buteo regalis*) are found in various open habitats such as grasslands, shrublands, and deserts where rodent and lagomorphs prey species are available. In Arizona, ferruginous hawks generally breed in open scrublands, woodlands, grasslands, and semi-desert grasslands in the northern Colorado Plateau and southeastern portion of the state (AZGFD 2009b). Nests in Arizona are primarily constructed in isolated juniper trees (Corman and Wise-Gervais 2005). In winter, ferruginous hawks can be found statewide in these same habitats along with agricultural areas. Hunting typically occurs in open grasslands and agricultural fields; preferably with low hills or short trees which serve as perches. They are not currently known to nest within this portion of the state (Corman and Wise-Gervais 2005; AZGFD 2009b). There is no potential for the species to breed within the Transmission Line or Evaluation Area. They are more likely to occur as occasional winter visitors or migrants through both the Project and Evaluation Areas. Ferruginous hawks have been observed at the Raymond Wildlife Area approximately two miles northeast of the Transmission Line (AZGFD 2009c).

#### Mexican Spotted Owl

In Arizona, Mexican spotted owls (*Strix occidentalis lucida*) are distributed patchily throughout forested mountains statewide, but also in steep canyons of the Colorado Plateau including the Grand Canyon (AZGFD 2009b). They generally nest and roost in dense, old-growth mixed-conifer forest with multi-layered foliage structure located on steep slopes, especially deep, shady ravines. In Arizona, they occur primarily in mixed-conifer and pine-oak forests, but may also occur in ponderosa pine forests and rocky canyonlands. Mexican spotted owls are known to occur in the forested mountains and canyons to the west and south of the Project and Evaluation Areas (AZGFD 2009b); however, suitable nesting habitat is not present within the Project or Evaluation Area, and there is no probability of nesting in either the Project or Evaluation Area. Although unlikely, there is a slight possibility (extremely low) that the Mexican spotted owl may utilize (forage) or move through either the Transmission Line or Evaluation Area as coniferous forests occur within each.

#### Northern Goshawk

Northern goshawks (*Accipiter gentilis*) inhabit a wide range of forest types including deciduous, coniferous, and mixed forests. They typically nest in large tracts of mature or old-growth forests. In Arizona, goshawks nest in high, forested mountains and plateaus, and are most abundant in ponderosa pine forests along the Mogollon Rim, on the Kaibab Plateau, and in the southeastern mountains (AZGFD 2009b). While goshawks in Arizona are primarily resident, some may move to lower elevations in the winter when food resources become scarce (Corman and Wise-Gervais 2005). In 2001 there were 66 known nesting territories within the Coconino National Forest, 12 of which were occupied, and 7 of which successfully fledged young (USFS 2002). While the total number of territories has increased and the statewide Breeding Bird Survey data indicates a significant increase, some indicators of occupancy and productivity appear to be declining on the Forest (USFS 2002). Presently, the nearest known nesting territory is located approximately 1.5 miles from the Transmission Line (H. Provencio USFS, pers. comm.). While there is no suitable nesting habitat within the Transmission Line, approximately 9.1% of the Evaluation Area is

classified as ponderosa pine forest, and there is extremely low potential for goshawks to occur as residents, or more likely, as transients in this area.

#### Western Burrowing Owl

Western burrowing owls (*Athene cunicularia hypugaea*) are found in open, well-drained habitats such as grasslands, steppes, deserts, prairies, and agricultural lands. They typically roost and nest in burrows made by colonial mammals such as prairie dogs. Throughout most of Arizona the species occurs year-round; however in the northeastern portion of the state, burrowing owls are believed to be migratory with only a few winter records on the Colorado Plateau (AZGFD 2009b). The Project and Evaluation Areas contain a substantial amount of grassland habitat (63.2% and 52.0%, respectively), however, little evidence of colonial burrowing mammals were observed during the site visit. Burrowing owls have been documented within the Raymond Wildlife Area located approximately two miles to the northeast of the Transmission Line (AZGFD 2009c). While the lack of burrowing mammals diminish the probability for the species to nest within the Transmission Line or Evaluation Area, there is extremely low probability the species could transient or forage within these areas.

#### Allen's Lappet-Browed Bat

Allen's lappet-browed bat (*Idionycteris phyllotis*) occurs throughout much of Arizona but most collections have been made in the southern Colorado Plateau, the Mogollon Rim, and adjacent mountain ranges (AZGFD 2009b). They primarily inhabit ponderosa pine, pinyon-juniper, and pine-oak woodlands, and riparian areas of sycamore, cottonwood, and willow (BCI 2009), but have also been documented in white fir and Mohave desert scrub habitats (AZGFD 2009b). Maternity colonies and roosts have been found in caves, abandoned mines, rock piles, and beneath the loose bark of large ponderosa pine snags (BCI 2009). While the species is not listed by the AZGFD as occurring within five miles of the proposed GCWRA, the bat has been documented within the Canyon Diablo Watershed, in which the Transmission Line occurs. Suitable woodland habitat is present within the Project and Evaluation Area. There is extremely low potential for the species to breed within either the Transmission Line or Evaluation Area, and low potential for the species to occur during the migration or maternity seasons.

#### Black-Footed Ferret

In Arizona, the historic range of the black-footed ferret (*Mustela nigripes*) is characterized as plains and Great Basin grassland communities (AZGFD 2009b). Black-footed ferrets are closely associated with prairie dogs which comprise more than 90% of their diet. An estimate 40-60 ha of prairie dog colony is necessary to support a single ferret (AZGFD 2009b). In the late 1900s a national effort to eradicate prairie dogs resulted in a drastic decline in black-footed ferret populations due to the ferrets' extreme dependence on prairie dogs. After an approximate 60 year absence in Arizona, the AZGFD reintroduced 35 captive-breed ferrets in Aubrey Valley, located approximately 90 miles west of the Transmission Line in west-central Coconino County (AZGFD 2009a). While a single active Gunnison's prairie dog colony was documented during wildlife surveys in the GCWRA in 2008 (Young et al. 2008), the black-footed ferret population remains very restricted within the State and there is currently no potential for the species to occur in the Project or Evaluation Areas.

#### Dwarf Shrew

The dwarf shrew (*Sorex nanu*) is a true habitat generalist occurring in a variety of habitats, including rocky areas (fellfield, rock stripes and polygons) and meadows in alpine tundra and subalpine coniferous forest (spruce-fir), rocky slopes and meadows in lower-elevation forest (e.g., ponderosa pine, aspen, Douglas-fir) with a mixed shrub component, sedge marsh, subalpine meadow, arid sagebrush slopes, arid shortgrass prairie, dry stubble fields, and pinyon-juniper woodland. However, they have been reported most often from rocky habitats in alpine tundra and subalpine coniferous forests. Its range within Arizona includes the Kaibab Plateau, White Mountains, and San Francisco Peaks of northern Arizona. Dwarf shrews are active throughout the year and feed primarily on insects, soft-bodied spiders, and other small invertebrates. The dwarf shrew nests in underground burrows (Beauvais and Dark-Smiley 2003). There is no potential for the dwarf shrew to occur within the project or evaluation areas based on distribution and lack of suitable habitat.

#### Greater Western Mastiff Bat

The greater western mastiff bat (*Eumops perotis californicus*) is considered a year-round resident in Arizona; however, it is uncertain whether or not the species hibernates in winter (AZGFD 2009b). The greater western mastiff bat typically occurs in lower and upper Sonoran desertscrub habitats near cliffs. They prefer rugged rocky canyons with abundant crevices, often crowding into tight crevices to roost. They can roost singly or in small groups, but more frequently form colonies of up to 100 individuals (AZGFD 2009b). Greater western mastiff bats have very long, narrow wings which make launching difficult. For this reason, they regularly use roosts allowing a vertical drop of at least 10 feet. For the same reason, they are severely limited by available drinking water, and are precluded from drinking at ponds less than 100 feet in length (BCI 2009), of which none are found within the Transmission Line. Roosting habitat in cliffs is absent from the Transmission Line; however suitable cliff habitat may be available in the eastern Evaluation Area. Additionally, the species may forage at larger ponds within the Evaluation Area and surrounding region. The greater western mastiff bat has been documented by the AZGFD (2009b) as occurring within the Canyon Diablo Watershed in which the Transmission Line occurs. There is no potential and extremely low potential for the species to breed within the Transmission Line or Evaluation Area, respectively and extremely low potential for the species to occur during the migration or maternity seasons within the Transmission Line.

#### Long-Tailed Vole

The total range in Arizona in which the long-tailed vole (*Microtus longicaudus*) is restricted is the Pinaleno (=Graham) Mountains, Graham County, Arizona (AZGFD 2009b). Its primary habitat consists of grassy meadows and flats, along boggy stream bottoms, cienegas, and openings in coniferous forests and along roadsides. They may also be found on steep slopes with bunchgrasses. Its food consists of a variety of plant parts and species. Grasses form a major component of the diet. Green, succulent vegetation also seems to be very important. Other food items include grass seeds, the bark of willows and alders, roots and fungi. This animal builds runways through thick grass, providing easy access from its burrows to its grassy food supplies. Nests of grass are built within the burrows. This vole is active during the day and throughout the winter. At times it is semi-aquatic, freely swimming and diving. Given the estimated distribution and the lack of suitable habitat present within the Transmission Line, it is unlikely that this species will occur. Potential to occur within the Evaluation Area is considered extremely low as

there are seasonal wetlands and ponds present which may provide suitable habitat. Although distribution indicates that range does not overlap with Evaluation Area boundaries, there is a very slight possibility that an isolated population may exist.

#### Merriam's Shrew

Merriam's shrews (*Sorex merriami leucogenys*) are associated with sagebrush throughout their range. It is likely that a relatively wide range of habitat floristics and structure is suitable for Merriam's shrew, but not necessarily equally preferable. Characteristics that influence the presence and abundance of Merriam's shrew in any habitat are poorly understood. In Arizona, specimens have been taken in or near open ponderosa pine woodlands, spruce-fir stands, and grasslands with patches of aspen and spruce. Merriam's shrews are active at all hours, and their diet consists of spiders, beetles, caterpillars and other small invertebrates, and perhaps vertebrate carrion. Runways and burrows of small rodents are used extensively for foraging. (CDW 2005) There is some montane conifer forest present within the Transmission Line and Evaluation Area, which have a low potential of supporting this species.

#### Navajo Mogollon Vole

The Navajo Mogollon Vole's (*Microtus mogollonensis navaho*) range within Arizona includes the Navajo Mountain (Navajo County) and Defiance Plateau (Apache County), and more recently from the south rim of the Grand Canyon, and the Flagstaff and Williams area (Coconino County). They occupy a variety of habitats depending on locale and elevation; prostrate thickets of a variety of shrubs that provide dense cover, in areas of high litter and bare ground, dry, grassy areas, usually adjacent to ponderosa pine forests, or sometimes as low as juniper woodland or stands of sagebrush, or as high as spruce-fir. These voles forage for grasses, forbs and other vegetation which are clipped and eaten right away or taken back to the burrow. They have two daily activity peaks, one at mid-day and the other in early evening. Its globular nest, constructed of dried grass and forbs, is placed in a dense clump of vegetation, under a log or rock, in a depression on the ground, or in a chamber in its burrow (AZGFD 2009b). There is suitable habitat present within the Transmission Line, and slightly more within the evaluation area with the range of the species potentially overlapping Area boundaries, so the potential for this species to occur on the Project and Evaluation Areas is considered extremely low and low, respectively.

#### Pale Townsend's Big-Eared Bat

Pale Townsend's big-eared bat (*Corynorhinus townsendii pallascens*) is widespread in Arizona. They typically occur in arid desert scrub habitats up to woodlands and coniferous forests. In spring and summer, females form maternity colonies in mines, caves, or buildings, while males roost individually (BCI 2009). In winter they hibernate in cold caves and mines mostly in uplands and mountains (AZGFD 2009b). At roost sites, Townsend's big-eared bats prefer to hang from open ceilings, and typically do not use cracks or crevices, and are extremely sensitive to disturbance at roost sites (BCI 2009). There is no potential for the species to occur during breeding or over-wintering seasons due to the lack of suitable roost sites or hibernacula. The species is widespread and likely forages at wetlands, ponds and lakes and therefore, the potential for occurrence in the Transmission Area and Evaluation Area is considered low for foraging and/or migrating bats.

### Spotted Bat

The spotted bat (*Euderma maculatum*) has been found from low desert habitat to high desert and riparian habitats to conifer forests. In Arizona, the species has primarily been collected in dry, rough, desert scrub habitats, with a few captured or heard (calls audible to the human ear) in ponderosa pine forest (AZGFD 2009b). Roost site locations and characteristics are poorly known but limited evidence suggests that spotted bats prefer to roost singly in crevices and cracks high in cliff faces, often near water sources (AZGFD 2009b; BCI 2009). Roosting habitat in cliffs is absent from the Transmission Line and Evaluation Area. The species may forage at ponds within the Evaluation Area and surrounding region. With known distribution and the presence of suitable foraging habitat nearby, the potential for occurrence of this species is considered extremely low and low for the Transmission Line and Evaluation Area, respectively; while no potential for breeding spotted bats has been determined due to the absence of suitable roost sites.

### Wupatki Arizona Pocket Mouse

Wupatki Arizona Pocket Mouse (*Perognathus amplus cineris*) is distributed within the southwestern half of AZ and extreme northwestern Mexico (AZGFD 2009b). It ranges within a smaller disjunct range of a narrow swath of western Navajo Nation from northern Echo Cliffs south to Wupatki National Monument near Flagstaff, AZ. Potential range on Navajo Nation likely extends from the Colorado River (Marble Canyon) east to Kaibito Plateau, south through Cameron to Leupp area. The primary habitat for the Wupatki Arizona Pocket Mouse is Great Basin desert scrub, usually with sparse ground cover of greasewood (*Sarcobatus vermiculatus*), snakeweed (*Gutierrezia Sarothrae*), rabbitbrush (*Chrysothamnus* ssp.), ephedra (*Ephedra sinica*), shortgrass ssp, and possibly, short junipers. These pocket mice feed extensively, almost exclusively, on seeds of the creosote bush (*Larrea tridentata*,) *Pectacarya* spp, heronbill (*Erodium texanum*), and plantain (*Plantago major* LINN.). They may occasionally consume insects and green vegetation. It appears that food is what limits populations of the Arizona pocket mouse, either because it restricts the number of young that females can produce, or because it determines survival probability, or both. There is no potential for the Wupatki Arizona Pocket Mouse to occur within the Project or Evaluation Area due to the lack of desert scrub habitat.

### Narrow-Headed Gartersnake

The narrow-headed gartersnake (*Thamnophis rufipunctatus*) inhabits pinyon-juniper woodlands, oak-pine forests, and ponderosa pine forests where they are found in or beside clear, rocky streams (AZGFD 2009b). The species is almost strictly aquatic, foraging under water, seeking shelter under rocks and boulders in the streambed, and basking on rocks and vegetation along stream banks. Hibernation takes place in rocky outcropping in late fall and winter. In Arizona, narrow-headed gartersnakes are found primarily in upland drainages in the White Mountains and along the Mogollon Rim. Suitable stream habitat is not present within the Transmission Line and Evaluation Area, and the likelihood of occurrence is considered none.

### Northern Leopard Frog

Northern leopard frogs (*Lithobates pipiens*) inhabit a variety of habitats throughout northern and central Arizona including grassland, shrubland, woodland, and forest ranging high into the mountains (AZGFD 2009b). They are typically found in permanent water with rooted aquatic vegetation, ranging from springs, ponds, and marshes to irrigation ditches, small streams, and



rivers. Suitable wetland habitat is not present within the Transmission Line itself; however, seasonal wetlands are present throughout the Evaluation Area. Northern leopard frogs have been documented in the Raymond Wildlife Area to the northeast of the Transmission Line (AZGFD 2009c). Therefore, potential for the northern leopard frog to occur in the Transmission Line is considered none, while it is considered low within the Evaluation Area.

#### Blue-Black Silverspot Butterfly

Some taxonomists consider this subspecies to be a narrowly endemic subspecies found only at a few locations in Colorado and eastern Utah while others consider it a more broadly distributed taxon found in Colorado, Arizona, Utah, New Mexico and perhaps even Nevada. Regardless of the controversy, the blue-black silverspot butterfly (*Speyeria nokomis nokomis*) inhabits streamside meadows and open seepage areas with an abundance of violets in generally desert landscapes. The caterpillar host plant is northern bog violet (*Viola nephrophylla*). The adults feed on flower nectar including that from thistles. The colonies are often isolated (AZGFD 2009b). There is no potential for the blue-black silverspot butterfly to occur within the Transmission Line due to the lack of suitable habitat. The potential for occurrence within the Evaluation Area increases slightly due to the presence of suitable habitat occurring in the form of wetlands, ponds and lakes.

#### Mountain Silverspot Butterfly

The mountain silverspot butterfly (*Speyeria nokomis nitocris*) has been documented within the White Mountains of Arizona. The host plant for the caterpillar is northern bog violet (*Viola nephrophylla*). The adult butterfly feeds on flower nectar including that from thistles. This species is considered strictly an alpine species inhabiting Alpine meadows. Therefore, there is no potential for the mountain silverspot butterfly to occur within the Project or Evaluation Area (AZGFD 2009b).

#### Spotted Skipperling

The spotted skipperling (*Piruna polingii*) inhabits moist woodland openings with lush vegetation, meadows, ravines and streamsides in the mountains throughout central and southern Arizona (AZGFD 2009b). Caterpillars likely feed on a native grass; *Dactylis glomerata* (Poaceae) is strongly suspected although not confirmed. Adults feed on the nectar of various flowers including yellow composites. There is no suitable habitat present within the Transmission Line so potential for occurrence is considered none. There are wetlands, ponds and lakes present within the Evaluation Area, therefore the potential for the spotted skipperling to occur within the Evaluation area is considered extremely low.

#### *3.2.2 USFS Management Indicator Species*

The Coconino National Forest Plan identifies 17 Management Indicator Species (MIS; USFS 2002) defined as: "... plants or animals whose population change reflects a population change in other species within a group. Management Indicator Species respond to habitat changes early or at low levels of stress and, therefore, are sensors of the effect of management activities that occur in various habitat" (USFS 1987; Table 3.4). As such, MIS were selected to serve as a benchmark for potential effects of management actions on other species within the particular habitat type for which they were chosen.

Of the 17 indicator species identified for the Coconino National Forest, 10 have at least some potential to occur within the ponderosa pine, pinyon-juniper, and grassland habitats of the Transmission Line and eleven have the potential to occur within the Evaluation Area (Table 3.4): Abert squirrel (*Scirurus aberti*), northern goshawk, pygmy nuthatch (*Sitta pygmaea*), wild turkey (*Meleagris gallopavo merriamii*), elk (*Cervus elaphus*), hairy woodpecker (*Picoides villosus*), Mexican spotted owl, mule deer (*Odocoileus hemonius*), juniper titmouse (*Baeolophus griseus*), pronghorn antelope (*Antilocapra americana Americana*), and cinnamon teal (*Anas cyanoptera*). Management indicator species with at least some potential to occur in the Project and/or Evaluation Area are further discussed below.

**Table 3.4 Coconino National Forest Management Indicator Species and their associated habitat type (USFS 2002).**

Species	Habitat	Potential for Occurrence	
		Transmission Line	Evaluation Area
<b>Birds</b>			
cinnamon teal <i>Anas cyanoptera</i>	Wetlands/aquatic	<b>None.</b> No suitable wetland habitat within Transmission Line.	<b>High.</b> Several seasonal lakes present within Evaluation Area; species known to be common breeder of Anderson Mesa wetlands.
hairy woodpecker <i>Picoides villosus</i>	Snag component of ponderosa pine, mixed conifer, and spruce-fir	<b>Low.</b> Very limited ponderosa pine, mixed conifer, or spruce-fir habitat within Transmission Line.	<b>High.</b> ~9% of Evaluation Area is ponderosa pine forest; potential to occur as year-round resident.
juniper titmouse <i>Baeolophus griseus</i>	Late seral and snag component of pinyon-juniper	<b>High.</b> ~34% of Transmission Line is pinyon-juniper woodland; species likely to occur as year-round resident of Transmission Line.	<b>High.</b> ~39% of Evaluation Area is pinyon-juniper woodland; species likely to occur as year-round resident of Evaluation Area.
Lincoln's sparrow <i>Melospiza lincolnii</i>	Late seral, high elevation riparian ( $\geq 7000'$ )	<b>None.</b> No suitable riparian habitat within Transmission Line.	<b>None.</b> No suitable riparian habitat within Evaluation Area.
Lucy's warbler <i>Vermivora luciae</i>	Late seral, low elevation riparian ( $< 7000'$ )	<b>None.</b> No suitable riparian habitat within Transmission Line.	<b>None.</b> No suitable riparian habitat within Evaluation Area.
Mexican spotted owl <i>Strix occidentalis lucida</i>	Late seral mixed conifer and spruce-fir	<b>None (Nesting), Extremely Low (Presence).</b> No mixed conifer or spruce-fir forest within Transmission Line.	<b>None (Nesting), Extremely Low (Presence).</b> No mixed conifer or spruce-fir forest within Evaluation Area; some potential for transient birds to occur within ponderosa pine forests within Evaluation Area.

**Table 3.4 Coconino National Forest Management Indicator Species and their associated habitat type (USFS 2002).**

Species	Habitat	Potential for Occurrence	
		Transmission Line	Evaluation Area
northern goshawk <i>Circus cyaneus</i>	Late seral ponderosa pine	<b>None (Nesting), Extremely Low (Presence).</b> Known to nest along Mogollon Rim; no potential to nest in pine forests in Transmission Line but may occur as rare transient, winter visitor, or migrant.	<b>Extremely Low (Nesting), Moderate (Presence).</b> Potential to nest and forage in pine forests in Evaluation Area; may also occur as occasional transient, winter visitor, or migrant.
pygmy nuthatch <i>Sitta pygmaea</i>	Late seral ponderosa pine	<b>Low.</b> Very limited ponderosa pine habitat within Transmission Line.	<b>High.</b> ~9% of Evaluation Area is ponderosa pine forest; species likely to occur as year-round resident.
Red-naped sapsucker <i>Sphyrapicus nuchalis</i>	Late seral and snag component of aspen	<b>None.</b> No suitable forest habitat within Transmission Line.	<b>None.</b> No suitable forest habitat within Evaluation Area.
wild turkey <i>Meleagris gallopavo merriamii</i>	Late seral ponderosa pine	<b>Low.</b> Very limited ponderosa pine habitat within Transmission Line; some potential to occur in other woodland habitats in Transmission Line.	<b>Moderate.</b> ~9% of Evaluation Area is ponderosa pine forest; potential to occur as year-round resident.
yellow-breasted chat <i>Icteria virens</i>	Late seral, low elevation riparian (<7000)	<b>None.</b> No suitable riparian habitat within Transmission Line.	<b>None.</b> No suitable riparian habitat within Evaluation Area.
<b>Mammals</b> Abert Squirrel <i>Sciurus aberti</i>	Early seral ponderosa pine, but species also associated with intermediate to late-seral pine forests.	<b>Low.</b> Very limited ponderosa pine habitat within Transmission Line.	<b>High.</b> ~9% of Evaluation Area is ponderosa pine forest; species likely to occur as year-round resident.

**Table 3.4 Coconino National Forest Management Indicator Species and their associated habitat type (USFS 2002).**

Species	Habitat	Potential for Occurrence	
		Transmission Line	Evaluation Area
elk <i>Cervus elaphus</i>	Early seral ponderosa pine, mixed conifer, and spruce-fir	<b>Moderate.</b> Very limited ponderosa pine forest within Transmission Line, but potential to occur in pinyon-juniper woodlands in Transmission Line.	<b>High.</b> Potential to occur in forest and woodland habitats within Evaluation Area.
mule deer <i>Odocoileus hemionus</i>	Early seral aspen and pinyon-juniper	<b>High.</b> ~34% of Transmission Line is pinyon-juniper woodland; species likely to occur at some point in the year.	<b>High.</b> ~39% of Evaluation Area is pinyon-juniper woodland; species likely to occur at some point in the year.
pronghorn antelope <i>Antilocapra americana</i> <i>Americana</i>	Early and late seral grasslands	<b>High.</b> ~34% of the Transmission Line is grassland; species likely to occur in these areas at some point during the year.	<b>High.</b> ~39% of the Evaluation Area is grassland; species likely to occur in these areas at some point during the year.
red squirrel <i>Tamiasciurus hudsonicus</i> <i>mogollonensis</i>	Late seral mixed conifer and spruce-fir	<b>None.</b> No suitable forest habitat within Transmission Line.	<b>None.</b> No suitable forest habitat within Evaluation Area.
<b>Invertebrates</b> Macroinvertebrates	Late seral, high and low elevation riparian	<b>None.</b> No suitable riparian habitat within Transmission Line.	<b>None.</b> No suitable riparian habitat within Evaluation Area.

### Cinnamon Teal

Cinnamon teal were selected as indicators of wetlands/aquatic habitats, primarily because they are sensitive to livestock grazing in wetlands, and because they are economically important (USFS 2002). The Cinnamon teal is a small dabbling duck that is primarily a summer resident of the Coconino National Forest. The species inhabits seasonal and semi-permanent wetlands, typically nesting within tall, dense, concealing vegetation within 100 m of water (USFS 2002). At least forty-six seasonal and semi-permanent wetlands exist on the Coconino National Forest, the majority of which are on Anderson Mesa. The condition of wetlands and open water within the Forest are primarily driven by the amount and timing of precipitation and long-term climate change. Semi-permanent wetlands have improved due to management activities that have controlled recreation and grazing, while seasonal wetlands have had less active management and are considered to be stable, but well below their potential habitat value due to grazing by livestock and wild ungulates, and recreation impacts (USFS 2002). While there is no suitable wetland habitat within the Transmission Line, there are several seasonal lakes within the larger Evaluation Area. Cinnamon teal are one of the most common breeding ducks on the Anderson Mesa (Audubon 2009), and are likely summer residents of lakes within the Evaluation Area.

### Hairy Woodpecker

The hairy woodpecker is listed as an MIS for the snag component of ponderosa pine, mixed conifer, and spruce-fir forest habitats. The species is most abundant in mature and intermediate-aged forests with a dense canopy and large old trees suitable for cavity nesting; however, they may also inhabit open woodlands, swamps, well-wooded towns and parks, and open areas with scattered trees (USFS 2002). Hairy woodpeckers nest and roost in live or dead tree cavities, typically excavating a new nest hole each year. Overall, snags in the ponderosa pine habitat type on the Coconino National Forest are being lost faster than they are being replaced, resulting in a downward trend in snag recruitment; however, the snag component of mixed conifer and spruce-fir is increasing (USFS 2002). Data from the Coconino National Forest, as well as statewide data, indicate that hairy woodpecker populations are stable or slightly increasing on a long-range scale, with large fluctuations on a short-term scale (USFS 2002). There are no mixed-conifer or spruce-fir forest habitats within the Transmission Line; however, the southwestern corner of the Evaluation Area is comprised of mature ponderosa pine forest which is likely to support a year-round population of hairy woodpeckers.

### Juniper Titmouse

Juniper titmouse is an MIS for late-seral pinyon-juniper woodlands, particularly the snag component. The species is a year-round resident in Arizona, and an obligate inhabitant of pinyon-juniper woodlands. Juniper titmice are secondary cavity nesters, with the majority of nest cavities located in juniper trees. The Forestwide trend for the juniper titmouse is stable to slightly declining (USFS 2002). While the age class distribution of pinyon-juniper has been relatively stable throughout the recent decade, firewood cutting has probably reduced snag densities of both pinyon and juniper snags, especially near Flagstaff. Additionally, the loss of older pinyon pine trees due to drought creates new snags, but insect attacks result in rapid deterioration of the snag. Some change in pinyon-juniper woodlands has probably been from tree growth and increased density or infill. Juniper titmouse breeding bird density has been documented to decrease with increased tree density, increasing proportion of junipers in a stand, and increasing canopy cover (Latta et al. 1999). Approximately 34% of the Transmission Line (233 acres) is

classified as pinyon-juniper woodland, and juniper titmice are likely to occur, particularly if a snag component is present.

#### Mexican Spotted Owl

The Mexican spotted owl is an MIS for the late-seral stage of mixed conifer and spruce-fir forests. Additionally, the Mexican spotted owl is listed as a federal threatened species under the ESA, and is a USFS Sensitive species. As such, the owl is addressed in the preceding section on endangered, threatened, and sensitive wildlife species (Section 3.2.1).

#### Northern Goshawk

Northern goshawk is an MIS of late-seral stage ponderosa pine habitat. Additionally, the species is considered a USFS Sensitive species and, as such, is also addressed in the preceding section on threatened, endangered, and sensitive wildlife species (Section 3.2.1).

#### Pygmy Nuthatch

The pygmy nuthatch is an MIS for late-seral ponderosa pine forests. The species is generally associated with mature ponderosa pine forest, where it prefers open, park-like stands of pines; however, it is also found in dense pine forest, as long as large trees and snags are present (USFS 2002). Pygmy nuthatches typically excavate their own nest cavities near the top of pine snags, or in the underside of a dead branch; occasionally they nest in aspen snags. In the winter, groups of pygmy nuthatches roost communally in snag or live tree cavities. Due to their dependence on snags for roosting and nesting, declines in the rate of snag recruitment on the Coconino National Forest has been a concern for forest managers. Data for the species indicate that populations within the Coconino National Forest, as well as statewide, are stable on a long-term scale, with dramatic fluctuations on a short-term scale (USFS 2002). Ponderosa pine forest is very limited within the Transmission Line, and the species is not likely to occur; however, the Evaluation Area contains approximately 1,150 acres of mature ponderosa pine forest that likely supports a year-round population of pygmy nuthatches.

#### Wild Turkey

Wild turkey is listed as an MIS for late-seral ponderosa pine forest; however, other habitats used by turkeys include mixed conifer, springs and seeps, and pinyon-juniper (USFS 2002). The species is tied to stands of mature ponderosa pine for nest sites and summer and winter roost sites. Other important habitat attributes include an uneven-aged overstory structure, riparian areas around springs and seeps, and small forest openings for seedhead and invertebrate production. Mast production from ponderosa pine, pinyon pine, juniper, and oak is vital to how well turkeys overwinter and is tied to the amount and timing of precipitation. While ponderosa pine forest is very limited within the Transmission Line, turkeys have some potential to occur within other forest/woodland habitats along the Transmission Line. There is greater potential for turkeys to occur in the Evaluation Area, particularly in the mature ponderosa pine forests in the southwestern corner.

#### Abert Squirrel

Abert squirrel is as an MIS for early-seral stage ponderosa pine forest; however, research indicates the species has a strong association with intermediate to mature ponderosa pine forests (USFS 2002). The Abert squirrel is an obligatory herbivore on ponderosa pine, which it depends



upon for food, cover, and nest sites. Because little forest-specific data on the Abert squirrel exists, the population trend remains inconclusive; however statewide information indicates a stable population of hunter harvests throughout the state. Approximately 2% of the Transmission Line (16.07 acres) is comprised of ponderosa pine forest, the majority of which is mature pine forest, and the Abert squirrel is likely to occur in occur in these areas.

### Elk

Elk is a big game MIS species for early-seral stage ponderosa pine, mixed-conifer, and spruce-fir habitats; however, grasslands and early-seral state woodlands are also important to the species. Elk populations within Arizona are considered to be demonstrably widespread, abundant, and secure state-wide (AZGFD 2009b), with the elk herds occurring in the Coconino National Forest and surrounding state and private lands considered the core of Arizona's elk population (AZGFD 2007a). The elk in this region typically summer in mountain meadows and montane coniferous forests, and winter in lower-elevation pinyon-juniper woodlands and grasslands (USFS 2002; AZGFD 2007a). During the 1980s and 1990s the elk population in the region increased, and resident herds began occurring year-round in pinyon-juniper habitats that were previously used only as winter foraging grounds. This caused concern over impacts to habitat and, as a result, management efforts over the past decade have focused on reducing elk populations back to levels observed in the early 1980s. This effort has been successful and the elk herd occurring in the 5BN Game Management Unit (GMU; AZGFD 2008) in which the Transmission Line and Evaluation Area lie, is considered stable (AZGFD 2007a). Ponderosa pine, pinyon-juniper woodland, and grassland habitats used by elk are present within the Transmission Line and the species is likely to occur during the winter, and possibly throughout the year.

### Mule Deer

Mule deer is a big-game MIS for early seral-stages of aspen and pinyon-juniper woodlands; however, early seral-stages of ponderosa pine are also important to the species. Mule deer typically summer at high elevation aspen and ponderosa pine forests, and winter in lower elevation pinyon-juniper woodlands (USFS 2002). While mule deer populations within Arizona are considered to be demonstrably widespread, abundant, and secure state-wide (AZGFD 2009b), from 1985 to 2001 a declining trend in mule deer populations has been observed on the Coconino National Forest (USFS 2002). This may be due to a number of factors including disease, poaching, climatic conditions (drought), and habitat changes. Populations in the past few years appear to have stabilized, possibly in response to increased precipitation in recent years (AZGFD 2008). An important habitat trend affecting mule deer populations is the loss of early-seral stage aspen stands. Aspen regeneration has not been sufficient to provide replacement for stands lost to natural causes or management actions, and the future outlook for early seral aspen is poor (USFS 2002). While aspen are absent from the Project and Evaluation Area, other habitats used by mule deer spinyon-juniper woodlands and ponderosa pine forests are present within the Transmission Line and Evaluation Area and the species is likely to occur in these areas.

### Pronghorn Antelope

Pronghorn antelope is an MIS for late-seral grasslands. Most pronghorn occur between 3,000 and 7,000 feet elevation and inhabit a variety of habitat types from desert grassland to forest and mountain meadows; however, they generally prefer flat, open grassland areas (AZGFD 2007b).

The Transmission Line falls within the range of the Anderson Mesa herd of pronghorn antelope. This population declined throughout recent decades as a result of habitat degradation and drought, and has been a focus of research and management effort within the state, with low fawn recruitment being the primary concern (AZGFD 2007b; USFS 2002). The pronghorn in this area are functionally split into two groups; one group spends the winter at lower elevation grasslands and spends the rest of the year on Anderson Mesa, the second group lives year-round in the lower elevation habitat. The overall trend for grasslands within the Coconino National Forest is stable to declining due to tree encroachment, fire suppression, long-term climatic trends, short-term drought, and ungulate grazing (USFS 2002). Management actions have converted some forest and shrub habitats to grasslands through fuelwood treatments, prescribed burns, restoration treatments and meadow maintenance (USFS 2002). Approximately 63.2% of the Transmission Line is comprised of grassland habitat and pronghorn antelope likely occur in these areas, particularly during the summer breeding season.

### 3.3 Raptors

#### 3.3.1 Species Likely to Occur in the Area

Determinations were made through a desktop review of existing information (AZGFD 2009b; Corman and Wise-Gervais 2005; Sibley 2001). Seventeen diurnal raptor species have the potential to occur as residents and/or migrants in the Transmission Line at some point during the year. In addition, one species of vulture, and five species of owls occur in the region.

Of the 17 diurnal raptors with the potential to occur in the Transmission Line, eight species have the potential to nest or reside year-round within the Transmission Line or Evaluation Area: sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), northern goshawk, red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), bald eagle, American kestrel (*Falco sparverius*), and prairie falcon (*Falco mexicanus*). A further three species may occur as winter residents and/or migrants in the area: northern harrier (*Circus cyaneus*), ferruginous hawk, and rough-legged hawk (*Buteo lagopus*). Eight species are not likely to reside in the area due to specific habitat requirements, but may pass through the Transmission Line as migrants and/or occasional visitors from the surrounding region: zone-tailed hawk (*Buteo albonotatus*), Swainson's hawk (*Buteo swainsonii*), common black hawk (*Buteogallus anthracinus*), osprey (*Pandion haliaetus*), peregrine falcon, and merlin (*Falco columbarius*). Additionally, turkey vultures (*Cathartes aura*) are likely summer residents and migrants. Of the diurnal raptors and vultures potentially occurring within the Transmission Line, four species are considered Arizona species of special concern and USFS sensitive species: American peregrine falcon, bald eagle, northern goshawk, and ferruginous hawk (see Section 3.2.1).

Five owl species have the potential to occur within the Transmission Line or Evaluation Area: barn owl (*Tyto alba*), long-eared owl (*Asio otus*), western burrowing owl, great-horned owl (*Bubo virginianus*), western screech-owl (*Megascops kennicottii*), northern saw-whet owl (*Aegolius acadicus*), northern pygmy owl (*Glaucidium gnoma*), and flammulated owl (*Otus flammeolus*). Of these, burrowing owl is a USFS sensitive species (see Section 3.2.1).

During baseline wildlife studies conducted at Phase A of the GCWRA by WEST in 2007 and 2008 (Young et al. 2008), ten raptor species were observed using the area either as residents or

during migration: Cooper's hawk, sharp-shinned hawk, red-tailed hawk, northern harrier, bald eagle, golden eagle, American kestrel, merlin, prairie falcon, and burrowing owl. Bald eagles historically nested at Mormon Lake approximately 3.5 miles to the west of the Transmission Line (AZGFD 2009b; Section 3.2.1), bald eagles, ferruginous hawks, sharp-shinned hawks, and burrowing owls have been documented within the Raymond Wildlife Area approximately two miles to the northeast of the Transmission Line (AZGFD 2009c), and peregrine falcons are regularly observed foraging at seasonal wetlands on Anderson Mesa (H. Provencio USFS, pers. comm.).

### *3.3.2 Potential Raptor Nesting Habitat*

Potential nesting habitat for raptors is located primarily within ponderosa pine forests and juniper woodlands located throughout the Project and Evaluation Areas. These forests provide nest structure for tree-nesting raptors such as northern goshawk, Cooper's hawk, sharp-shinned hawk, red-tailed hawk, American kestrel, great-horned owl, western screech-owl, flammulated owl, northern saw-whet owl, and northern pygmy owl. Additional nesting habitat may be present within portions of Anderson and Yaeger Canyons in the east portion of the Evaluation Area. Stands of oak and cottonwood in the canyon bottoms, as well as canyon walls and rock outcroppings may provide potential nest sites for raptors. Open, grassland habitat for ground-nesting species such as burrowing owl is also present within the Project and Evaluation Areas. Burrowing owls are often associated with prairie-dog colonies, which have been observed in low density during the site visit in the Evaluation Area (Appendix B), as well as within Phase A of the GCWRA immediately to the east of the Transmission Line (Young et al. 2008). During the site visit a single occupied red-tailed hawk nesting territory and nest site was documented within the Evaluation Area adjacent to Corner Lake, approximately one mile from the proposed Transmission Line and 1.3 mile from the Alternative Transmission Line (Appendix B). No raptor nests were located within the Transmission Line and given the proximity of an existing road and general lack of optimal nest structures the likelihood of nesting raptors to occur in or proximate to the Transmission Line is low. During raptor nest surveys conducted at the GCWRA by WEST in 2008, one active red-tailed hawk nest was observed in Yaeger Canyon, approximately 1.5 miles northeast of the Transmission Line, and two inactive golden eagle nests were observed within Grapevine Canyon, approximately seven miles southeast of the Transmission Line (Young et al. 2008).

## **3.4 Migratory and Breeding Birds**

### *3.4.1 Important Bird Areas*

The Audubon Society lists Important Bird Areas (IBAs) that are sites providing essential habitat for one or more species of bird (Audubon 2009). These include sites for breeding, wintering and/or migrating birds and can range from a few, to thousands of acres in size. The western portion (approximately 6 miles) of the Transmission Line lies within the Anderson Mesa Important Bird Area, located within the Coconino National Forest (Figure 3.1).

Anderson Mesa begins about nine miles southeast of Flagstaff, and continues as a gently sloping tableland for approximately 25 miles to the southeast. Along the length of the Anderson Mesa are a complex of lakes, including permanent, semi-permanent, and ephemeral lakes and wetlands, grasslands, pinyon-juniper woodland, and conifer forests. The largest of the lakes,

Mormon Lake, lies approximately 3.5 miles to the west of the Transmission Line, and a number of smaller lakes fall within the Evaluation Area. The wetland complex within the Anderson Mesa IBA has been documented as one of two major waterfowl use areas in Arizona during migration, particularly by dabbling ducks during spring migration (Audubon 2009). A variety of land birds also use the IBA for breeding and as a migration stopover site. The extensive pinyon pine and juniper woodlands in the area support populations of pinyon jay (*Gymnorhinus cyanocephalus*), a species of global conservation concern because of the limited distribution of pinyon pine on which the species depends (Audubon 2009).

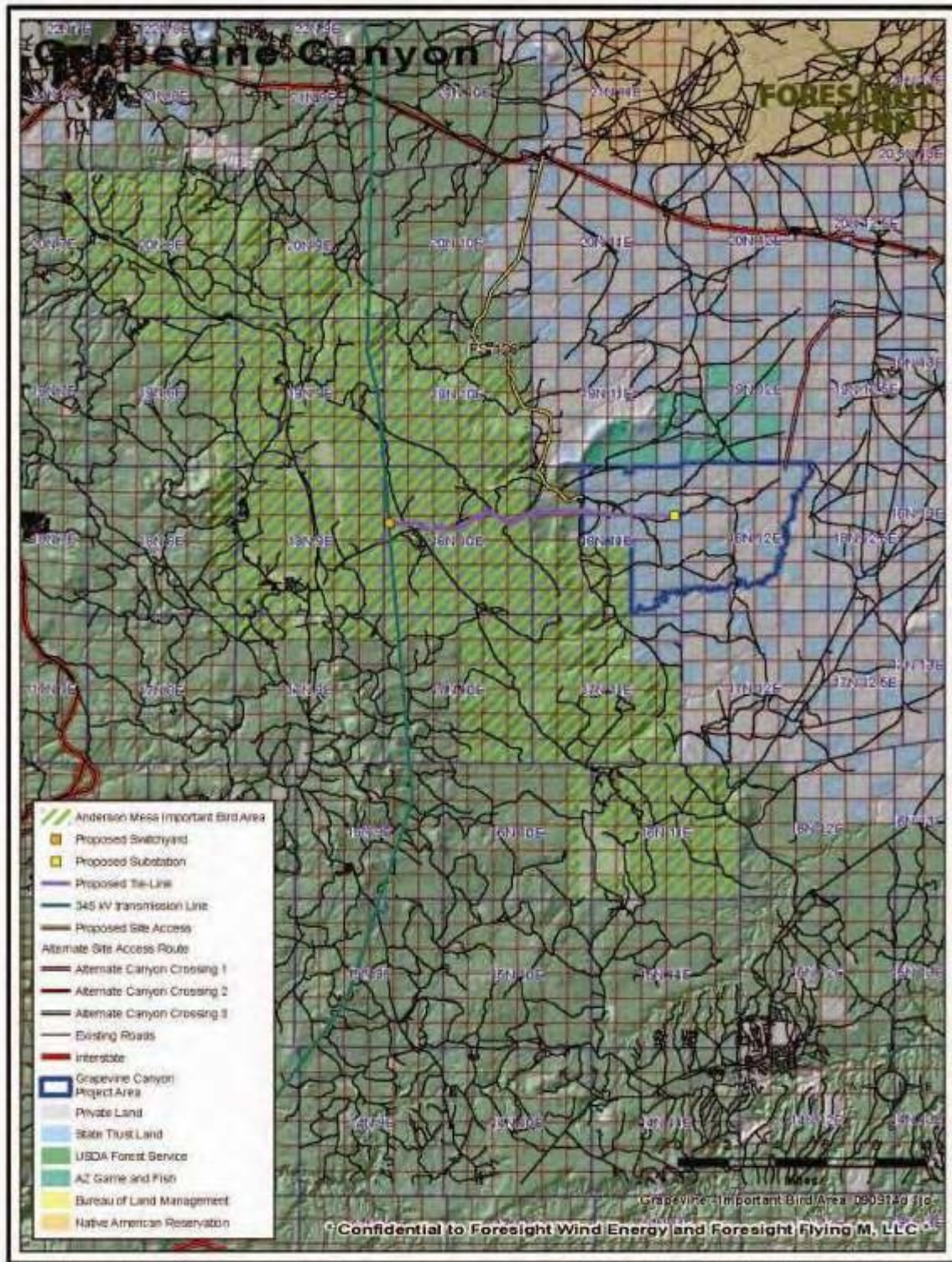


Figure 3.1 Map of the Anderson Mesa Important Bird Area in relation to the proposed transmission line right of way.



### 3.4.2 USFWS Birds of Conservation Concern

The Transmission Line lies near the southwestern boundary of the Southern Rockies/Colorado Plateau Bird Conservation Region. Twenty-seven species are listed by the USFWS as birds of conservation concern within this region (USFWS 2008; Table 3.5). These species do not receive special protection unless they are also listed by the USFWS under the Endangered Species Act or by the AZGFD; but have been identified as vulnerable to population declines in the area by the USFWS (2008). Of these, four species have been documented by Arizona's Natural Heritage Program as occurring within the Canyon Diablo Watershed: bald eagle, ferruginous hawk, peregrine falcon, and burrowing owl (AZGFD 2009d; see Section 3.2.1).

During WEST's 2007/2008 baseline avian surveys for the GCWRA, seven USFWS species of conservation concern were observed in the Phase A Transmission Line: bald eagle, ferruginous hawk, prairie falcon, western burrowing owl, gray vireo (*Vireo vicinior*), pinyon jay, and Cassin's finch (*Carpodacus cassinii*; Young et al. 2008).

### 3.4.3 USGS Breeding Bird Survey

The USGS Breeding Bird Survey (BBS) is a large-scale survey of North American breeding birds. Each June over 3,500 designated routes in the continental U.S. and southern Canada are surveyed by experienced birders. Each BBS route is 24.5 miles long and consists of 50, three-minute point counts along the length of the route. Information gathered from these surveys allows some indication of species that may utilize the region either transiently or for breeding habitat during the summer. The BBS route closest to the Transmission Line is the Happy Jack route which begins approximately eight miles to the southwest and extends to the south (Figure 3.2). The Happy Jack route has been monitored for seventeen years, between 1985 and 2007. A total of 65 species have been observed along this route, including six raptor species and one vulture species (bald eagle, sharp-shinned hawk, northern goshawk, red-tailed hawk, American kestrel, great-horned owl, and turkey vulture; Sauer et al. 2008). The most common species observed along this route were: pygmy nuthatch (*Sitta pygmaea*), American robin (*Turdus migratorius*), violet-green swallow (*Tachycineta thalassina*), dark-eyed junco (*Junco hyemalis*), Grace's warbler (*Dendroica graciae*), and plumbeous vireo (*Vireo plumbeus*), with an average of >10 individuals sighted per year. No federal threatened or endangered species have been observed along the route. Two state wildlife species of special concern and USFS sensitive species (bald eagle and northern goshawk) and two federal species of conservation concern (Grace's warbler, Cassin's finch [*Carpodacus cassinii*]) have been observed along the route (USFWS 2008; AZGFD 2009b; USFS 2009; see Section 3.2.1).

### 3.4.4 Arizona Partners in Flight Priority Species

Partners in Flight is an international program dedicated to conserving bird populations in North and South America. The program was initiated in 1990 as a cooperative effort among federal, state, and local government agencies, professional organizations, conservation groups, academia, industry, and private individuals. The Arizona Working Group of Partners in Flight (APIF) has developed a Bird Conservation Plan (Latta et al. 1999) as part of the international Partners in Flight effort. The purpose of the plan is to identify avian species and habitats most in need of conservation and to establish objectives and conservation efforts for bird populations and habitats within Arizona. The plan addresses 280 breeding bird species within Arizona, including 43 priority species within 13 major habitat types. Of the major habitat types identified within the

plan, three are present within the Project and/or Evaluation Areas: ponderosa pine forest, pinyon-juniper forest, and high elevation grassland. Priority bird species identified for each of these habitat types, and their potential to occur in the Project and/or Evaluation Area is addressed in Table 3.6.

**Table 3.5 Species of Conservation Concern within the Southern Rockies/Colorado Plateau Bird Conservation Region (USFWS 2008)**

<b>Species</b>	<b>Scientific Name</b>
Gunnison sage-grouse	<i>Centrocercus minimus</i>
American bittern	<i>Botaurus lentiginosus</i>
bald eagle (b)	<i>Haliaeetus leucocephalus</i>
ferruginous hawk	<i>Buteo regalis</i>
peregrine falcon (b)	<i>Falco peregrinus</i>
prairie falcon	<i>Falco mexicanus</i>
snowy plover (c)	<i>Charadrius alexandrinus</i>
mountain plover	<i>Charadrius montanus</i>
long-billed curlew	<i>Numenius americanus</i>
yellow-billed cuckoo (a)	<i>Coccyzus americanus</i>
flammulated owl	<i>Otus flammeolus</i>
burrowing owl	<i>Athene cunicularia</i>
Lewis's woodpecker	<i>Melanerpes lewis</i>
willow flycatcher (c)	<i>Empidonax traillii</i>
gray vireo	<i>Vireo vicinior</i>
pinyon jay	<i>Gymnorhinus cyanocephalus</i>
juniper titmouse	<i>Baeolophus ridgwayi</i>
Veery	<i>Catharus fuscescens</i>
Bendire's thrasher	<i>Toxostoma bendirei</i>
Grace's warbler	<i>Dendroica graciae</i>
brewer's sparrow	<i>Spizella breweri</i>
grasshopper sparrow	<i>Ammodramus savannarum</i>
chestnut-collared longspur	<i>Calcarius ornatus</i>
black rosy-finch	<i>Leucosticte atrata</i>
brown-capped rosy-finch	<i>Leucosticte australis</i>
Cassin's finch	<i>Carpodacus cassinii</i>

(a) ESA candidate; (b) ESA delisted; (c) non-listed subspecies or population of Threatened or Endangered species



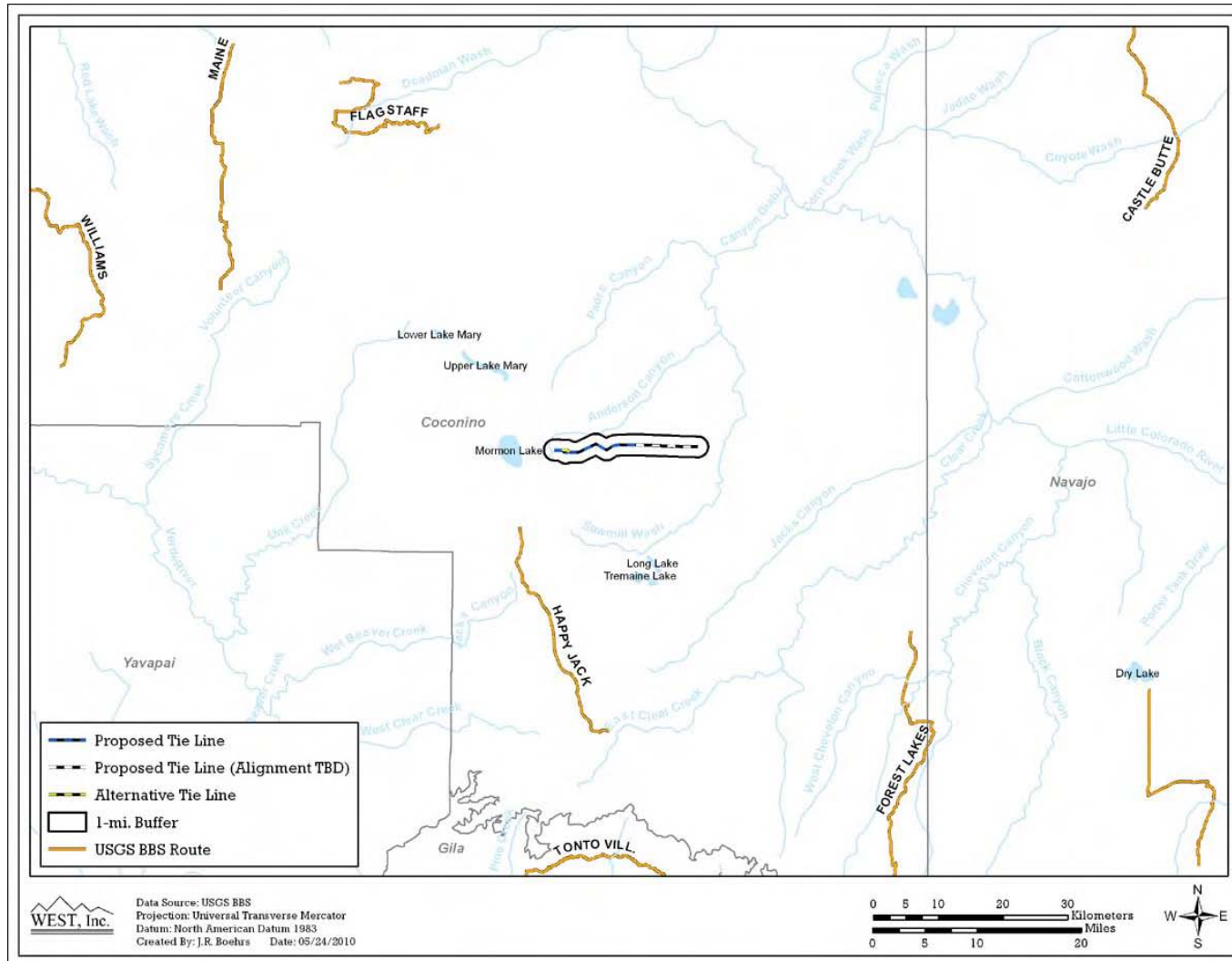


Figure 3.2 USGS Breeding Bird Survey routes closest to the Transmission Line.

**Table 3.6. Priority avian species with potential to occur in the proposed Transmission Line (AFIF 1999).**

Habitat Type	Species	Potential for Occurrence in Transmission Line
Ponderosa pine	northern goshawk <i>Accipiter gentilis</i>	<b>Extremely Low.</b> Known to nest along Mogollon Rim; no potential to nest in pine forests in Transmission Line but may occur as rare transient, winter visitor, or migrant.
	olive-sided flycatcher <i>Contopus cooperi</i>	<b>Low.</b> Very little pine forest within Transmission Line; very little probability of occurrence.
	cordilleran flycatcher <i>Empidonax occidentalis</i>	<b>Extremely Low.</b> Inhabit moist, shady, pine and mixed conifer forests; Transmission Line occurs on very edge of pine forest—habitat generally not suitable.
	purple martin <i>Progne subis</i>	<b>Low.</b> Very little pine forest and wetland habitat within Transmission Line.
Pinyon-juniper	gray flycatcher <i>Empidonax wrightii</i>	<b>Extremely Low.</b> Species range is generally outside of Transmission Line; some potential for the species to occur during migration.
	pinyon jay <i>Gymnorhinus cyanocephalus</i>	<b>High.</b> Known to occur in pinyon-juniper woodlands of Anderson Mesa.
	gray vireo <i>Vireo vicinior</i>	<b>High.</b> Species range includes Transmission Line and pinyon-juniper habitat is present.
	black-throated gray warbler <i>Dendroica nigrescens</i>	<b>Moderate.</b> Species range includes Transmission Line and pinyon-juniper habitat is present.
	juniper titmouse <i>Baeolophus ridgwayi</i>	<b>High.</b> ~34% of Transmission Line is pinyon-juniper woodland; species likely to occur as year-round resident.
High elevation grassland	ferruginous hawk <i>Buteo regalis</i>	<b>Extremely Low.</b> Uncommon breeder in region, may occur as winter resident/transient.
	Swainson's hawk <i>Buteo swainsonii</i>	<b>Extremely Low.</b> Uncommon breeder in region; may occur as winter resident/transient.
	burrowing owl <i>Athene cunicularia</i>	<b>Extremely Low.</b> Suitable habitat present within Transmission Line; very low prey density/burrows available for breeding.
	grasshopper sparrow <i>Ammodramus savannarum</i>	<b>None.</b> Species range is outside of Evaluation Area.

## 4.0 EFFECTS ANALYSIS AND DETERMINATION

The following effects analysis and determination is for resources included in Section 3.0. Standards of significance for impacts to biological resources which are consistent with standards applied for other components of the Grapevine Wind EIS (Grapevine EIS 2010) have been applied where appropriate. Definitions and criteria for the effects analysis are provided below.

### 4.0.1 Standards of Significance

The Proposed Action would have a significant and adverse effect on biological resources if they:

- Adversely affect a listed endangered, threatened, or proposed plant or animal species or designated critical habitat.
- The Proposed Action resulted in a long-term loss of vegetation resulting in the listing or jeopardizing the continued existence of a plant or animal species.
- The Proposed Action would affect the biological viability of a local, regional, or national population of a listed wildlife species or one of concern/interest *leading to a downgrading in its listing*.
- The Proposed Action would violate the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act, or the Migratory Bird Treaty Act, which all protect federally- and state-listed species.
- Substantially interfere with the movement of any native resident or migratory fish or wildlife species for more than one reproductive season.
- Reduce the value of habitat for fish, wildlife, or plants to an unusable level.
- Cause a native fish or wildlife population to drop below self-sustaining levels.
- Adversely and substantially affect important riparian areas, wetlands, or other wildlife habitats.

**Short-term impacts** are those that last through the construction phase of a project, or one or two reproductive cycles, whichever is longer.

**Long-term impacts** are those that last more than two reproductive periods, or as long as the life of the transmission line, and switchyard depending on the organism or habitat involved.

**Direct impacts** are those that occur as a result of construction or operation of the transmission line, and switchyard.

**Indirect impacts** are those that occur as a result of the transmission line and switchyard's presence. These are usually associated with increased human accessibility to a previously inaccessible area.

### 4.1 Special-Status Plants

Based on the information presented, it is determined that the proposed Project will have the following effects on special-status plant species.

*4.1.1 Federal Threatened, Endangered, or Candidate Species*

San Francisco Peaks Groundsel

The proposed Transmission Line will have no effect on San Francisco Peaks groundsel. This plant is an alpine species known only from high elevation habitats of the San Francisco Peaks north of Flagstaff, and has no potential to occur within the Transmission Line. The transmission line does not contain suitable habitat for the species.

*4.1.2 Forest Service Sensitive Species*

Arizona Bugbane

The proposed Transmission Line will have no effect on Arizona bugbane because suitable habitat is not present. Canyons containing high elevation riparian deciduous woodland, which is the species preferred habitat, is not present within the Transmission Line.

Arizona Leatherflower

The proposed Transmission Line will have no effect on Arizona leatherflower. Suitable limestone substrate is not present within the Transmission Line, and the species known distribution does not overlap the Transmission Line. The Transmission Line occurs over basaltic substrates not suitable for the species.

Arizona Sneezeweed

The proposed Transmission Line will have no effect on Arizona sneezeweed because suitable habitat is not present. Pond/wetland habitats required by the species are not present within the Transmission Line.

Arizona Sunflower

The proposed Transmission Line will have no effect on Arizona sunflower because suitable habitat is not present. Dry, sandy soils required by the species do not occur in the Transmission Line and basaltic substrates dominate the Transmission Line.

Bebb's Willow

The proposed Transmission Line will have no effect on Bebb's willow because suitable habitat is not present. No riparian habitats are found within or immediately adjacent to the Transmission Line.

Blumer's Dock

The proposed Transmission Line will have no effect on blumer's dock because suitable habitat is not present. Wetland habitats required by the species are not present within the Transmission Line.

Crenulate Moonwort

The proposed Transmission Line will have no effect on crenulate moonwort. Suitable habitat for the species is not present with the Transmission Line, and known range does not overlap the Transmission Line.

#### Disturbed Rabbitbrush

The proposed Transmission Line will have no effect on disturbed rabbitbrush due to range and habitat unsuitability. Soils in the Transmission Line are generally derived from basalt, which are not suitable for the species.

#### Flagstaff Beardtongue

The proposed Transmission Line may have short-term direct impacts on Flagstaff beardtongue resulting in the loss of individuals during construction, if suitable habitat is available. Soils in the Transmission Line are generally derived from basalt, which are not characterized as suitable for the species, however, locations in the Coconino Forest include sites with similar forest characteristics to those found in portions of the Transmission Line: mixed oak and pinyon-juniper woodlands. The Transmission Line and Evaluation Area do not have evidence of limestone or sandstone outcrops; instead the mesa is built upon a basalt soil foundation. The probability of occurrence is considered extremely low due to the absence of limestone-derived soil. Surveys of potentially suitable habitat along the Transmission Line to identify the species may be warranted. Populations of the species located during pre-construction surveys should be avoided, if possible, or translocated if possible to avoid direct impacts. Indirect impacts to the species may be mitigated through habitat restoration, if necessary, following RMPs identified in the Grapevine EIS (2010). The switchyard does not contain suitable habitat for the species and there will be no effect of the switchyard on the species.

#### Flagstaff Pennyroyal

The proposed Transmission Line will have no effect on Flagstaff pennyroyal due to lack of suitable habitat. Soils in the Transmission Line are generally derived from basalt, which are not suitable for the species and vegetation characteristics associated with other locations where the species has been documented are not present.

#### Rock Fleabane

The proposed Transmission Line will have no effect on rock fleabane. Suitable habitat for rock fleabane is not present within the Transmission Line. The known range occurs outside the Transmission Line and the species has no potential to occur.

#### Rusby's Milk-vetch

The proposed Transmission Line will have no effect on Rusby's milk-vetch due to range, which does not include the Transmission Line or the immediate portion of the Coconino Forest. A very small proportion of suitable suitable habitat (pine forests) and soil (basalt) exist along the Alternative route, however, no suitable habitat exists along the Proposed route. Total available suitable habitat is extremely small (only 16 acres of ponderosa pine habitat will be impacted during construction of the proposed Alternative route).

#### Sunset Crater Beardtongue

The proposed Project will have no effect on sunset crater beardtongue due to range and habitat. Cinder field habitat in which the species grows is absent from the Transmission Line and the species has no potential to occur.

## 4.2 Special-Status Wildlife

Based on the information presented in this wildlife and botanical report, it is determined that the proposed project will have the following effects on special-status wildlife species:

### *4.2.1 Federal Threatened, Endangered, or Candidate Species*

#### Mexican Spotted Owl

The proposed Transmission Line will have no effect on the Mexican spotted owl. Dense, mixed-conifer and pine-oak forest habitats required by the Mexican spotted owl are absent from the Transmission Line, and there have been no observations of the species in the Project or surrounding region. Construction of the Transmission Line will not affect habitat for the species or result in impediment to movement or direct impacts which may affect populations resulting in a downward population trend for the species. The species is unlikely to occur within the Transmission Line due to lack of habitat.

#### Black-footed Ferret

The proposed Transmission Line will have no effect on the black-footed ferret. The black-footed ferret has a very restricted range in Arizona and suitable habitat and prey density along the Transmission Line is absent.

### *4.2.2 Forest Service Sensitive Species*

#### American Peregrine Falcon

The proposed project may result in direct impacts to the American peregrine falcon, but is not likely to result in a downward trend toward federal listing. Peregrine falcons are known to hunt waterfowl concentrated at seasonal wetlands occurring throughout Anderson Mesa. Several of these wetlands are located within the Evaluation Area; however, no wetlands exist within the Transmission Line, and no potential peregrine falcon foraging habitat will be impacted by the proposed action; therefore, no indirect impacts are anticipated. There remains, however, a very low risk for peregrine falcons foraging at these wetlands to collide with the proposed transmission line, which could result in (direct impacts) the fatality of individuals. Following guidance of the Avian Power Line Interaction Committee's (APLIC) Suggested Practices for Avian Protection on Power Lines (2006) will minimize and mitigate risk of potential avian collisions and electrocutions along the proposed transmission line.

#### Bald Eagle

The proposed Project may affect the bald eagle, but is not likely to result in a downward trend toward federal listing. Bald eagles historically nested on the Anderson Mesa including at Mormon Lake and Lake Mary, approximately 3.5 miles to the west and eight miles to the northwest of the Transmission Line, respectively. While eagles are no longer known to nest in these areas, the lakes do support wintering populations. There is no nesting or foraging habitat for bald eagles within the Transmission Line itself, and habitat for the species will not be affected by the proposed action; therefore, no indirect impacts are anticipated. However, individuals may pass through the Transmission Line as transients or during movement between foraging areas, and may even use transmission line poles/towers for perching. As a result, there remains a low risk of collision with or electrocution from the transmission line which may result in direct impacts to individuals. To minimize and mitigate risk of potential avian collisions and

electrocutions along the proposed transmission line, the Suggested Practices for Avian Protection on Power Lines (APLIC 2006) should be followed for transmission line construction.

#### Clark's Grebe

The proposed Project may result in direct impacts to Clark's grebe, but is not likely to result in a downward trend toward federal listing. There is no suitable open water nesting or stopover habitat for Clark's grebe within the Transmission Line, and habitat for the species will not be affected by the proposed action; therefore, no indirect impacts are anticipated. Seasonal wetlands are present within the surrounding region and there is potential for the species to use these wetlands for nesting or as stopover habitat during migration. As a result, there is some potential for individual Clark's grebe to collide with the proposed transmission line. To minimize and mitigate for risk of potential avian collisions and electrocutions along the proposed transmission line, the guidance of the Suggested Practices for Avian Protection on Power Lines (APLIC 2006) should be followed.

#### Ferruginous Hawk

The proposed Project may result in direct impacts to ferruginous hawk, but is not likely to result in a downward trend toward federal listing. There is no potential for ferruginous hawks to nest within within the Transmission Line and the species is rarely recorded as a transient visitor in the region during migration or over-wintering periods. Therefore, the potential for occurrence is extremely low. To minimize and mitigate for risk of potential avian collisions and electrocutions along the proposed transmission line, the guidance of the Suggested Practices for Avian Protection on Power Lines (APLIC 2006) should be followed.

#### Northern Goshawk

The proposed Project will have no effect on northern goshawk. The nearest known goshawk nesting territory is greater than one mile from the Transmission Line. There is no suitable nesting or foraging habitat for the species within the Transmission Line; however, ponderosa pine forests to the southwest likely support resident and transient individuals. No nesting or foraging habitat for northern goshawk will be impacted by the proposed Project.

#### Western Burrowing Owl

The proposed Project will not affect western burrowing owl. No suitable nesting habitat and abundant burrowing, colonial mammals are present along the Transmission Line. Extremely low potential exists for the species to transient through the area.

#### Allen's Lappet-Browed Bat

The proposed Project will not affect Allen's lappet-browed bat, Caves and mines used by the species for roosting are not present within the Transmission Line, therefore no breeding habitat or important potential hibernacula will be affected by the action. The species may pass through the Transmission Line in transit between foraging areas in the surrounding region.

#### Dwarf Shrew

The proposed Project will have no effect on the dwarf shrew. Suitable alpine habitat for this species is not present within the Transmission Line, and the species has a very restricted range in northern Arizona.



#### Greater Western Mastiff Bat

The proposed Project will have no effect on the greater western mastiff bat. Suitable habitat for the species in the form of cliffs for roosting and large ponds for drinking is not present within the Transmission Line. The species may pass through the Transmission Line in transit between wetland foraging areas in the surrounding region; however, habitat for greater western mastiff bat will not be impacted by the proposed Project.

#### Long-Tailed Vole

The proposed Project will have no effect on the long-tailed vole due to the absence of suitable habitat. Mesic forest habitats in which the species occurs are not present within the Transmission Line.

#### Merriam's Shrew

The proposed Project may affect Merriam's shrew resulting in indirect effects through loss of habitat. The Project is not likely to result in direct impacts which would lead toward a downward trend toward federal listing. There is very limited amount of dry forest habitat suitable for the species within the Transmission Line. The Project will remove approximately 16 acres of coniferous forest habitat, potentially used by the species. Because this is such a limited amount of habitat, the Project is not expected to result in loss of species viability. Construction operations may result in the destruction of individual burrows or loss of individuals, however, construction operations will be short-lived and operation of the Transmission Line will have no long-term effect on the species.

#### Navajo Mogollon Vole

The proposed Project may affect the Navajo Mogollon vole resulting in indirect effects through loss of habitat. The Project is not likely to result in direct impacts which would lead toward federal listing. Potential habitat for the species is present within the Transmission Line in the form of ponderosa pine forest and pinyon-juniper woodland. The Project will remove approximately 250 acres of woodland/forest habitat, potentially used by the species. Construction operations may result in the destruction of individual burrows or loss of individuals, however, construction operations will be short-lived and operation of the Transmission Line will have no long-term effect on the species.

#### Pale Townsend's Big-Eared Bat

The proposed Project will have no effect on pale Townsend's big-eared bat. Suitable habitat for the species in the form of caves and mines for roosting and large ponds for drinking is not present within the Transmission Line. The species may pass through the Transmission Line in transit between wetland foraging areas and roost sites in the surrounding region; however, habitat for pale Townsend's big-eared bat will not be impacted by the proposed Project.

#### Spotted Bat

The proposed Project will have no effect on the spotted bat. Suitable habitat for the species in the form of cliffs for roosting and large ponds for drinking is not present within the Transmission Line. The species may pass through the Transmission Line in transit between wetland foraging

areas and roost sites in the surrounding region; however, habitat for the spotted bat will not be impacted by the proposed Project.

Wupatki Arizona Pocket Mouse

The proposed Project will have no effect on the Wupatki Arizona pocket mouse. Desert scrub habitats preferred by the species area not present within the Transmission Line.

Narrow-Headed Gartersnake

The proposed Project will have no effect on the narrow-headed gartersnake. The species inhabits permanently flowing streams which are absent from the Transmission Line.

Northern Leopard Frog

The proposed Project will have no effect on the northern leopard frog. Wetland habitats required by the species are absent from the Transmission Line.

Blue-Black Silverspot Butterfly

The proposed Project will have no effect on the blue-black silverspot butterfly. Suitable wet meadow, marsh, or streamside habitat is not present within the Transmission Line.

Mountain Silverspot Butterfly

The proposed Project will have no effect on the mountain silverspot butterfly. The butterfly is an alpine species with no potential to occur in the Transmission Line.

Spotted Skipperling

The proposed Project will have no effect on the spotted skipperling. Moist woodland openings, meadows, and riparian habitats in which the species occurs are absent from the Transmission Line.

*4.2.3 USFS Management Indicator Species*

Abert Squirrel

The proposed Project will have no effect on Abert squirrel habitat or population trends. Ponderosa pine forests in which the species occurs is present in only very limited amounts; 16 acres of ponderosa pine habitat will be impacted during construction of the proposed Alternative route. Ponderosa pine forests are abundant in the region.

Pygmy Nuthatch

The proposed Project will have no effect on pygmy nuthatch habitat or population trends. The species primary habitat, late-seral ponderosa pine forest, is present within the Transmission Line in very small amounts; only 16 acres of ponderosa pine habitat will be impacted during construction of the proposed Project. Ponderosa pine forests are abundant in the region.

Wild Turkey

The proposed Project will have no effect on wild turkey habitat or population trends. The species primary habitat, mature ponderosa pine forest, is present within the Transmission Line in very small amounts; only 16 acres of ponderosa pine habitat will be impacted during construction of the proposed Project. Ponderosa pine forests are abundant in the region.

### Elk

The proposed Project may have indirect impacts on elk, however, impacts will be small and will not affect overall elk habitat in the Forest or population trends for the species. Elk was selected as a big-game indicator species for early-seral stage ponderosa pine, mixed-conifer and spruce-fir habitat types. There are close to 700,000 acres of the non-Wilderness ponderosa pine cover type (which includes ponderosa pine-gambel oak), and cover type acreages have remained essentially the same since 1989 (USFS 2002). The project will result in the loss of approximately 16 acres of ponderosa pine forest, representing less than 0.01% of estimated ponderosa pine forest habitat. Age class composition of ponderosa pine within the Transmission Line is not specifically understood at this time, however, observations during the site visit indicate only individual trees classed as early seral ponderosa pine may be present within the 16 acres identified as ponderosa pine forest. The loss of individual early seral ponderosa pine within a total 16 acre ponderosa pine forest impact from the Project will not affect elk habitat, habitat use or population trends within the Forest. The species preferred summer habitat, mixed-conifer and spruce-fir forests are absent from the Transmission Line; however, pinyon-juniper woodlands in the Transmission Line likely support wintering elk. While the proposed Project will remove approximately 233 acres of pinyon-juniper woodland; there are roughly 630,000 acres of pinyon-juniper woodland on the Forest (FSVeg/RMRIS database, 6/13/02). This habitat type is abundant in the region and not a unique habitat feature. Construction operations may cause short-term disturbance on elk behavior or movement in the local area. Operation of the Transmission Line is not anticipated to have long-term effects on elk behavior or movement patterns.

### Hairy Woodpecker

The proposed Project will have no effect on the hairy woodpecker. There are no suitable forest habitats for the species within the Transmission Line.

### Red Squirrel

The proposed Project will have no effect on red squirrel. Mixed conifer and spruce fir habitat required by red squirrel is not present within the Transmission Line.

### Red-Naped Sapsucker

The proposed Project will have no effect on the red-naped sapsucker. Aspen forests in which the species occurs is not present within the Transmission Line.

### Mule Deer

The proposed Project may have indirect impacts on mule deer, however, impacts will be small and will not affect overall deer habitat in the Forest or population trends for the species. Mule deer were selected as an indicator species for early-seral stages of aspen and pinyon-juniper woodlands. Aspen forests are absent from the Transmission Line and while the proposed Project will remove approximately 233 acres of pinyon-juniper woodland; there are roughly 630,000 acres of pinyon-juniper woodland on the Forest (FSVeg/RMRIS database, 6/13/02). This habitat type is abundant in the region and not a unique habitat feature. Population trends and habitat viability will not be affected for this species by the Project.

#### Juniper Titmouse

Juniper titmice are indicators for late seral pinyon-juniper, particularly the snag component. The proposed Project may have indirect impacts on juniper titmouse, however, impacts will be small and will not affect overall habitat in the Forest or population trends for the species. While the proposed Project will remove approximately 233 acres of pinyon-juniper woodland; there are roughly 630,000 acres of pinyon-juniper woodland on the Forest (FSVeg/RMRIS database, 6/13/02). This habitat type is abundant in the region and not a unique habitat feature. Age classification of woodlands affected by the Project are not understood at this time, however, it is extremely unlikely that the area contains abundant late-seral populations. Population trends and habitat viability will not be affected for this species by the Project. Construction, depending on timing, may result in the loss of individual nests or the mortality of individuals. Avoidance of direct impacts may be accomplished through restricting clearing operations conducted as part of construction, during the breeding season (Grapevine EIS 2010).

#### Pronghorn Antelope

Antelope are a management indicator species for early and late seral grassland type. The proposed Project may have indirect impacts on antelope, however, impacts will be small and will not affect overall habitat in the Forest or population trends for the species. Open grassland, the species preferred habitat, is the dominant habitat type comprising the Transmission Line and totals approximately 428 acres. Construction may result in short-term impacts to grassland habitats preferred by the species, however, grassland occurs over 151,000 acres within MA10, which includes Anderson Mesa. Temporary construction impacts to grassland may be mitigated through vegetation restoration (see Grapevine EIS 2010). Construction may also result in short-term changes in pronghorn movement or behavior if pronghorn occur in the project area during construction. Operation of the Transmission Line is not anticipated to have an effect on pronghorn populations. Given the small acreage of grassland habitat impacted by the proposed Project, and the fact that this habitat type is abundant throughout the region, the Anderson Mesa pronghorn herd is not likely to be adversely affected by the Project.

#### Lincoln's Sparrow

It is our determination that the proposed Project will have no effect on Lincoln's sparrow. Suitable late-seral, high-elevation riparian habitats are not present within the Transmission Line.

#### Lucy's Warbler

The proposed Transmission Line will have no effect on Lucy's warbler. Late-seral, low-elevation riparian habitats in which the species occurs are not present within the Transmission Line.

#### Yellow-Breasted Chat

The proposed Transmission Line will have no effect on the yellow-breasted chat. Suitable late-seral, low-elevation riparian habitats are not present within the Transmission Line.

#### Macroinvertebrates

The proposed Transmission Line will have no effect on macroinvertebrate populations. Suitable late-seral, riparian habitats required by this group of species are not present within the Transmission Line.

### Cinnamon Teal

The proposed Transmission Line will have no effect on cinnamon teal. There is no suitable open water nesting or stopover habitat for the teal within the Transmission Line, and habitat for the species will not be affected by the proposed action. Seasonal lakes are present within the evaluation area and cinnamon teal are a common breeder on wetlands in this region. It is likely that cinnamon teal use wetlands in the Project vicinity for nesting or as stopover habitat during migration.

#### *4.2.4 Migratory Bird Treaty Act*

Bird species protected under the Migratory Bird Treaty Act (1918) may be affected by the proposed Project both directly and indirectly; however, these effects will not result in a downward trend toward federal listing for any of the species. While construction and maintenance of the transmission line will likely result in disturbance to, and removal of habitat for, some species, particularly those inhabiting grassland and pinyon-juniper woodland habitats within the transmission line corridor, the total area impacted will be relatively small (approximately 678 acres) compared to surrounding similar habitat and construction activities will be short-term. The major habitat types that will be impacted by the Project are abundant throughout the region and are not unique habitat features. Thus, removal of habitat for construction of the transmission line is not expected to have a significant impact on resident and migratory birds in the region. Direct impacts from the Project would result from avian collisions and electrocutions along the proposed transmission line. To minimize and mitigate risk of potential avian collisions and electrocutions along the proposed transmission line, the transmission line should be designed according to the Suggested Practices for Avian Protection on Power Lines (APLIC 2006).

#### *4.2.5 Anderson Mesa Important Bird Areas*

Bird species inhabiting the Anderson Mesa Important Bird Area in which the Transmission Line occurs, may be affected by the proposed Project; however, we believe these effects will not result in a downward trend toward federal listing for any of these species. Anderson Mesa is one of two major waterfowl migration stopover sites in Arizona. While several smaller lakes occur within the Evaluation Area, none occur within the Transmission Line. Larger lakes in the region (Lakes Mary and Mormon Lake), are both over three miles from the Transmission Line. The Transmission Line will be constructed across grasslands and pinyon-juniper woodlands which are important landcover components of the IBA; however, both of these habitat types are abundant throughout the Anderson Mesa and are not unique habitat features to the region. Removal of habitat for construction of the transmission line is not expected to have a significant impact on resident and migratory birds in the region. While avian collision with the proposed transmission line will remain an unavoidable risk, particularly for waterfowl species utilizing wetland areas adjacent to the Transmission Line, implementation of the APLIC standards will serve to minimize this potential threat.

## **5.0 REFERENCES**

Arizona Game and Fish Department (AZGFD). 2002.

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---

- Arizona Game and Fish Department (AZGFD). 2003.
- Arizona Game and Fish Department (AZGFD). 2006. Draft. Arizona's Comprehensive Wildlife Conservation Strategy: 2005-2015. AZGFD, Phoenix, Arizona.
- Arizona Game and Fish Department (AZGFD). 2007a. Elk Management Plan. December 7, 2007. Available at: [http://www.azgfd.gov/pdfs/h\\_f/management/ElkManagementPlanDecember.pdf](http://www.azgfd.gov/pdfs/h_f/management/ElkManagementPlanDecember.pdf)
- Arizona Game and Fish Department (AZGFD). 2007b. Pronghorn Management Plan. December 7, 2007. Available at: [http://www.azgfd.gov/pdfs/h\\_f/management/PronghornManagementPlanDecember.pdf](http://www.azgfd.gov/pdfs/h_f/management/PronghornManagementPlanDecember.pdf)
- Arizona Game and Fish Department (AZGFD). 2008. Game Management Unit 5b. Available at: [http://www.azgfd.gov/h\\_f/hunting\\_units\\_5b.shtml](http://www.azgfd.gov/h_f/hunting_units_5b.shtml)
- Arizona Game and Fish Department (AZGFD). 2009a. Black-Footed Ferret. Available at: [http://www.azgfd.gov/w\\_c/blackfooted\\_ferret.shtml](http://www.azgfd.gov/w_c/blackfooted_ferret.shtml)
- Arizona Game and Fish Department (AZGFD). 2009b. Plant and Animal Abstracts, Distribution Maps, and Illustrations. Compiled and edited by the Heritage Data Management System, AZGFD, Phoenix, Arizona. Available at: [http://www.azgfd.com/w\\_c/edits/hdms\\_abstracts.shtml](http://www.azgfd.com/w_c/edits/hdms_abstracts.shtml)
- Arizona Game and Fish Department (AZGFD). 2009c. Raymond Wildlife Area. Available at: [http://www.gf.state.az.us/outdoor\\_recreation/wildlife\\_area\\_raymond\\_ranch.shtml](http://www.gf.state.az.us/outdoor_recreation/wildlife_area_raymond_ranch.shtml)
- Arizona Game and Fish Department (AZGFD). 2009d. Special Status Species Listed in Ascending Order by Watershed Code, Taxon, and Scientific Name. AZGFD, Heritage Data Management System. Updated June 1, 2009. Available at: [http://www.azgfd.com/w\\_c/edits/documents/ssspecies\\_bywatershed.pdf](http://www.azgfd.com/w_c/edits/documents/ssspecies_bywatershed.pdf)
- Arizona Native Plant Society (AZNPS). 2008. Index of Rare Plants. Tucson, Arizona. Accessed December 2009. Arizona Rare Plants List home page: <http://www.aznps.com/rareplants/>
- Audubon Society (National Audubon Society [Audubon]). 2009. The Important Bird Areas in the United States. Available at: <http://www.audubon.org/bird/iba>
- Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Public Interest Energy Research Program (PIER) Final Project Report CEC-500-2006-022. Edison Electric Institute, APLIC, and the California Energy Commission. Washington D.C. and Sacramento, California.
- Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code § 668-668d. June 8, 1940.
- Bat Conservation International (BCI). 2009. Bat Species: US Bats. BCI, Inc., Austin, Texas. Accessed 2009. Homepage: <http://www.batcon.org> Species Profiles: <http://batcon.org/index.php/education/article-and-information/species-profiles.html>
- Beauvais, G.P. and D.N. Dark-Smiley. 2003. Species Assessment for Dwarf Shrew (*Sorex nanus*) in Wyoming, December 2003. Available at: [http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAssessments/Dwarf%20Shrew%20-%20Final%20\(Dec%202003\).pdf](http://www.uwyo.edu/wynddsupport/docs/Reports/SpeciesAssessments/Dwarf%20Shrew%20-%20Final%20(Dec%202003).pdf)
- Center for Plant Conservation (CPC). 2009. Available at: <http://www.centerforplantconservation.org/directory/directory.asp>

Grapevine Canyon Transmission Line ROW  
Wildlife and Botanical Report

---

- Colorado Division of Wildlife (CDW). 2005. Colorado Sagebrush: A Conservation Assessment and Strategy, September 2005. Accessed December 14, 2009. Available at: <http://wildlife.state.co.us/NR/rdonlyres/B8958A58-0F91-4EB0-9256-F118DF796D3C/0/MerriamsShrew.pdf>
- Corman, T.E. and C. Wise-Gervais, eds. 2005. The Arizona Breeding Bird Atlas. University of New Mexico Press, Albuquerque, New Mexico.
- Encyclopedia of Life (EOL). 2009. An Online Encyclopedia of Life [Web Application]. Available from: <http://www.eol.org>
- Endangered Species Act (ESA). 1973. 16 United States Code § 1531-1544. December 28, 1973.
- Latta, M.J., C.J. Beardmore, and T.E. Corman. 1999. Arizona Partners in Flight Bird Conservation Plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report 142. Arizona Game and Fish Department (AZGFD), Phoenix, Arizona.
- McCarty, K.M. and K.V. Jacobson. 2008. Arizona Bald Eagle Management Program 2008 Summary Report. Nongame and Endangered Wildlife Program Technical Report 252. Arizona Game and Fish Department (AZGFD), Phoenix, Arizona.
- Migratory Bird Treaty Act (MBTA). 1918. 16 United States Code § 703-712. July 13, 1918.
- NatureServe. 2003. Plant Tracking and Watch List, Texas Conservation Data Center. October 2003.
- NatureServe. 2009. NatureServe Explorer: An Online Encyclopedia of Life [Web Application]. NatureServe, Arlington, Virginia. Updated 2009, accessed December 2009. Available at: <http://www.natureserve.org/explorer>
- New Mexico Rare Plant Technical Council (NMRPTC). 1999. New Mexico Rare Plants. Albuquerque, New Mexico. Updated September 4, 2009. New Mexico Rare Plants home page: <http://nmrareplants.unm.edu>
- Sauer, J.R., J.E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966 - 2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center. Laurel, Maryland. <http://www.pwrc.usgs.gov/>
- Sibley, D.A. 2001. The Sibley Guide to Birds. Knopf Publishing, New York.
- Tidhar, D. and A. Chatfield. 2010. Site Characterization Report for the Grapevine Canyon Wind Project, Coconino County, Arizona. Technical report prepared for Grapevine Wind by Western EcoSystems Tec
- US Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP). 2007. NAIP Imagery and Status Maps. <http://www.fsa.usda.gov/FSA/apfoapp?area=home&subject=prog&topic=nai>
- US Environmental Protection Agency (USEPA). 2004. Level III and IV Ecoregions. USEPA, Corvallis, Oregon.
- US Fish and Wildlife Service (USFWS). 2004. Wetlands Geodatabase. National Wetlands Inventory (NWI). Division of Habitat and Resource Conservation. <http://wetlandsfws.er.usgs.gov/nwi/>
- US Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management. Arlington, Virginia. <http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf>



## Grapevine Canyon Transmission Line ROW Wildlife and Botanical Report

---

- US Fish and Wildlife Service (USFWS). 2009. Threatened and Endangered Species. County by County Endangered Species Lists. USFWS, Southwest Region, Arizona Ecological Services. Accessed November 12, 2009. Available online at: <http://www.fws.gov/southwest/es/arizona/Documents/CountyLists/Coconino.pdf>
- US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2007. Region 2 NWI, Southwest Region: Arizona, New Mexico, Texas, and Oklahoma. Accessed 2009. Albuquerque, New Mexico. <http://www.fws.gov/wetlands/data/index.html> and <http://www.fws.gov/southwest/NWI/data> at <http://wetlandsfws.er.usgs.gov/NWI/download.html>
- US Forest Service (USFS). 1987.
- US Forest Service (USFS). 2002. Management Indicator Species Status Report for the Coconino National Forest. Working Draft, July 1, 2002.
- US Forest Service (USFS). 2007. Regional Forester's Sensitive Species List. Threatened, Endangered, and Sensitive Species Program. Available at: <http://www.fs.fed.us/r3/resources/tes/>
- US Forest Service (USFS). 2009. Threatened, Endangered, and Sensitive Species List for the Mormon Lakes and Peaks Ranger Districts. Project Name: Grapevine Canyon Wind Project. September 8, 2009.
- US Geological Survey (USGS) National Elevation Dataset (NED). 2001. Seamless Data Distribution System (Sdds). USGS Headquarters, USGS National Center. Reston, Virginia. <http://seamless.usgs.gov>
- Young, D.P. Jr., D. Tidhar, D. Solick, and K. Bay. 2008. Avian and Bat Studies for the Grapevine Wind Energy Project, Coconino County, Arizona. Draft final report prepared for Grapevine Wind Ranch, LLC, Foresight Wind Energy, Managing Member, San Francisco, California. Prepared by Western EcoSystems Technology, Inc.(WEST), Cheyenne, Wyoming. October 20, 2008.

**APPENDIX A. Western EcoSystems Technology, Inc. correspondence with USFS, AZGFD,  
and USFWS**

**APPENDIX B. Photos taken during Transmission Line visit on November 10 and 12, 2009**





**APPENDIX D.3**

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AVIAN AND BAT STUDIES FOR THE GRAPEVINE CANYON WIND ENERGY PROJECT

Available online at [www.wapa.gov/transmission/grapevine.htm](http://www.wapa.gov/transmission/grapevine.htm)

**Avian and Bat Studies for the  
Grapevine Canyon Wind Energy Project  
Coconino County, Arizona**

**Final Report**



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**July 20, 2009**

## EXECUTIVE SUMMARY

Foresight Flying M, LLC, managed by Foresight Wind Energy, LLC, is evaluating the feasibility of wind energy development in Coconino County, Arizona. The proposed wind-energy facility, the Grapevine Canyon Wind Resource Area (GWRA), is located approximately 40 miles (64 kilometers) southeast of Flagstaff, Arizona on the Flying M Ranch. Objectives of this study were to provide site specific bird and bat resource data that would be useful in evaluating potential impacts from the proposed wind-energy facility and assist in project planning, as well as recommending further monitoring studies and potential mitigation measures, if warranted. The field surveys consisted of fixed-point bird use surveys, raptor nest surveys, acoustic bat surveys, sensitive species surveys, and incidental wildlife observations within the proposed GWRA from June 2007 through July 2008.

A total of 446 twenty-minute fixed-point surveys were conducted to estimate the spatial and temporal use of the site by birds, and in particular, raptors. Surveys were conducted at 24 points located within the GWRA approximately once a month during the summer (June 1 – August 31) and weekly during the fall (September 1-November 15), winter (November 16-February 29), and spring (March 1 – May 31) seasons. During the peak of fall raptor migration (approximately mid-September to mid-October) surveys were conducted twice a week. A total of 55 bird species, representing 4,423 individual birds within 1,155 separate groups, were recorded during the fixed-point bird use surveys at the GWRA, of which 365 individuals were raptors representing 10 unique species.

Bird use, defined as the mean number of individuals per 800-m radius plot per 20-minute survey, of the GWRA was greatest in the winter (13.72 number of birds/plot/20-minute survey), followed by fall (11.60), spring (6.44), and summer (3.78). Waterfowl use was highest in winter (0.41 birds/plot/20-minute survey), compared to other times of the year (summer 0, fall 0.06, and spring 0.06). Shorebird use was highest in fall (0.23 birds/plot/20-minute survey), compared to spring (0.06), the only other season in which this bird type was observed. Raptor use was highest during the fall (1.68 birds/plot/20-minute survey) compared to other times during the year (summer 0.51, winter 0.13, and spring 0.24). Raptors comprised 14.4% of the overall bird use in the fall, 13.6% in the summer, and less than four percent during the winter and spring. Vulture use was highest in summer (0.53 birds/plot/20-minute survey), compared to other times of the year (fall 0.19, winter 0, and spring 0.19). Passerines had the highest use of any bird type during all four seasons. Passerine use was highest in the winter (13.11 birds/plot/20-minute survey), compared to fall (9.07), spring (6.31), and summer (2.53). Horned lark had the highest use by any one species in fall (2.52 birds/plot/20-minute survey), winter (7.35), and spring (2.71), while lark sparrow had the highest use in the summer (0.91). Passerines comprised nearly all of the overall bird use in winter and spring (95.5% and 90.5%, respectively) and comprised more than 66% of use in the summer and winter. Passerines were observed during more than 80% of the surveys in the fall, winter, and spring, and were observed during 66% of summer surveys.

During the fixed-point bird use surveys 818 groups totaling 3,563 individual birds were observed flying. The area between 115 to 443 feet (35 to 135 meters) above ground level was defined as the approximate zone of risk for potential collision with a turbine blade. For all groups combined, 92.9% of birds observed flying were below the zone of risk, 6.1% of birds observed flying were



within the zone of risk, and 0.9% of birds flying were above the zone of risk. Vultures had the highest percentage of flying birds within the zone of risk (52.5%), followed by raptors (13.3%) and passerines (4.5%). Most (80.2%) of flying raptors were observed below the zone of risk, 13.3% were within the zone of risk, and 6.5% were above the zone of risk. Passerines observed flying were primarily (97.8%) flying below the zone of risk. Six species had at least 45 groups observed flying; only turkey vulture was observed flying within the zone of risk during at least 50% of the observations (52.5%).

Mean use was plotted by bird survey point for raptors, passerines, and all birds combined. For the twenty-four survey points, passerine use was highest at point number 9 (36.1 birds per survey) with a wide range at all other points from 1.8 birds per survey to 16.5. Raptors were observed at all points and use varied from 0.32 to 1.84 birds per survey. For all bird species combined, use was highest at point number 9 (38.05 birds per survey) due to the large numbers of passerines, while use at other points ranged from 3.11 to 18.89. Within the GWRA, raptor use appeared to be strongly associated with proximity to prairie dog towns. Raptor use was highest at fixed bird use points 7, 11, and 16, which are either within or adjacent to active prairie dog towns (Figure 12). In general, raptor use was higher in the eastern half of the study area and was elevated near the available prey base found at prairie dog towns. At the GWRA, turbine placement in or immediately adjacent to active prairie dog towns may increase the susceptibility of some raptors (principally red-tailed hawk and golden eagle) to collision with turbines. The aggregation of burrows and prey density near turbines has been shown to be correlated with increased raptor mortality in studies completed at Altamont Pass, California.

A comparison of overall mean raptor use at the GWRA with other wind resource areas that have been studied with similar methods, assists in determining potential impacts from the proposed project. Overall use of the GWRA by raptors standardized to 20-minute surveys for comparison to other studies, was 0.67. Based on studies of 36 other wind resource areas that were studied for three or four seasons, mean overall raptor use typically ranged from 0.09 to 2.34 per 20-minute survey. Comparatively, mean raptor use at the GWRA is within the mid-range of these other studies, or low to moderate. A regression analysis of raptor use and mortality for 12 wind-energy facilities with modern wind turbines, where similar methods were used to estimate raptor use and mortality, found that there was a significant correlation between use and mortality ( $R^2 = 71.7\%$ ). Using this regression to predict raptor collision mortality at the GWRA, based on a mean raptor use of 0.67 birds/20-minute survey, yields an estimated fatality rate of 0.10 raptors/MW/year, or 10 raptor fatalities per year for a 100-MW project. A 90% confidence interval around this estimate is zero to 0.35 raptors/MW/year.

The objective of the acoustic bat surveys was to estimate the seasonal and spatial use of the study area by bats. Three Anabat® II echolocation detectors were used for continuous passive monitoring at ground-based locations between June 26 – November 9, 2007 and April 12 – July 7, 2008. A fourth detector (a.k.a., Hi-Mic) was mounted on a met tower to sample bat activity near rotor height. For the ground-based Anabat units, a total of 4238 bat calls were recorded during 567 bat detector nights in 2007, and a total of 1949 bat calls were recorded during 214 bat detector nights in 2008. Mean bat activity during the 2007 season was 7.47 bat passes per detector night and 9.11 during the 2008 season. Approximately 71% of all recorded passes came from station GV20 during 2008, which was located near water that was likely used by bats for

drinking and foraging. GV20 recorded the highest level of bat activity during 2007; however, GV10 recorded higher levels of activity during 2007 compared with 2008. The ground unit at station GV16 recorded four times as many bat calls as the Hi-Mic unit, indicating higher relative bat activity near the ground than at approximate rotor (blade) height. Bat activity was greatest during late May and mid-June (2008) and between mid-July and mid-August (2007). Most (90%) of the calls were > 35 kHz (e.g., *Myotis* bat species), and the remaining calls were < 35 kHz in frequency (typically larger bodied bats, e.g., big brown bat, hoary bat). Species identification was possible for the hoary bat, which made up 5% of all calls in 2007, and 2% of all calls in 2008. Activity by hoary bats was highest in late August and early October of 2007, and May of 2008, suggesting this species migrates through the study area at these times of year. Big free-tailed bats were only detected between late September and late October of 2007 (1% of all passes), suggesting fall migration of this species through the area. Allen's big-eared bat were detected 4 times in 2007 (in October) and twice in 2008 (once in mid-April and once in mid-June), indicating this species makes infrequent use of the study area, possibly passing through in fall and spring. Spotted bats, which also produce distinctive calls, were not detected.

The mean number of bat passes per detector-night for ground-based locations was compared to existing data at five wind energy facilities where both bat activity and mortality levels have been measured. The level of bat activity documented at the GWRA (approximately 7.4 and 9.1 bats per detector-night for 2007 and 2008 respectively) was much lower than three wind facilities in the eastern U.S., where reported bat mortalities are highest. Bat activity at Grapevine was higher than that recorded at two facilities where subsequent bat mortality was low. Some bat mortality will likely occur in the study area, but the available data suggest mortality rates will be low to medium relative to other studies.

The objective of the raptor nest surveys was to locate raptor nests in the study area that may be subject to disturbance and/or displacement effects from the wind-energy facility construction and/or operation. One active red-tailed hawk nest was located during the aerial survey in Yaeger Canyon just outside the northwest GWRA boundary. Two inactive golden eagle nests were observed during ground raptor nest surveys near the confluence of Grapevine and Diablo Canyons. A ground check of all known raptor nests was conducted on June 6 and 8, 2008 and no nests were found to be active. Raptor nest density in this 67 square mile (173.5 square kilometer) area of the GWRA and the one-mile buffer was low (0.04 nests/square mile). All nests found are located in distinct physiographic portions (canyons) of the GWRA.

The objective of the sensitive species surveys was to determine the presence or absence and spatial distribution of federal and state listed species, species of conservation concern, or other species of interest within the study area and particularly within proposed development corridors. In general, sensitive species use at the GWRA is low. Sensitive species documented at the GWRA during all surveys or incidentally included seven bald eagles, four Cooper's hawks, and two western burrowing owls. Three Gunnison's prairie dog towns were also mapped: two active and one inactive. The Arizona (Sonora) population of bald eagles is characterized by the U.S. Fish and Wildlife Service as a Distinct Population Segment and this population is currently petitioned for listing under the Endangered Species Act. Bald eagles were only observed in the winter and spring, while Cooper's hawks were only observed during the fall and spring. One

western burrowing owl was observed at an inactive prairie dog town during the breeding season and one was observed incidentally; however no nests were discovered during nest searches.

The objective of recording incidental wildlife observations while observers were on site, was to provide occurrence information about wildlife outside the standardized surveys and survey areas, that might be affected by the proposed wind-energy facility. The most abundant bird species recorded was American kestrel (123 observations), followed by lark sparrow (120). Twenty species total were recorded, with a total of 542 individuals in 121 groups. Three species were observed incidentally that were not observed during fixed-point bird use surveys: common nighthawk, great blue heron, and white-faced ibis. The most abundant mammal species recorded as incidental wildlife was pronghorn antelope (301 observations). Other game animals observed included bison (63 observations), elk (58), mule deer (eight) and javelina (two). Nine mammal species were observed, with a total of 470 individuals in 73 groups.

Based on the results of the studies to date, there is no information to suggest that bird and bat mortality at the GWRA would be significantly different than that documented at other wind-energy facilities located in the western US, where collision mortality has been relatively low. Based on other monitoring study results the greatest impacts are most likely to occur on non-raptor species; however, due to low exposure risks and overall low relative abundance of most species, it is unlikely that non-raptor populations will be adversely affected by mortality from the operation of the wind-energy facility. The extent of disturbance or displacement related impacts are difficult to estimate. The density of nesting raptors was not high and is not expected to become high, and no significant displacement impacts are expected on nesting raptors. Passerines breeding in the grassland and pinyon-juniper habitat are likely to be displaced from construction zones during the breeding season but the overall loss of habitat is not expected to be significant and over time will be reduced as construction areas revert to native habitat.

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## **INTRODUCTION**

Foresight Flying M, LLC, managed by Foresight Wind Energy, LLC, is evaluating the feasibility of wind energy development in Coconino County, Arizona. The proposed wind-energy facility, the Grapevine Canyon Wind Resource Area (GWRA), is located approximately 40 miles (mi; 64 kilometers [km]) southeast of Flagstaff, Arizona, on the Flying M Ranch. The current proposal is for a wind-energy facility up to 500MW in size, consisting of between 166 and 333 wind turbines. The study area for the project is approximately 34 square miles (mi<sup>2</sup>; 88 square km [km<sup>2</sup>]) in size and lies east of the Coconino National Forest and Mormon Lake and south of the Interstate 40 (I-40) corridor (Figure 1). The proposed development would be located on private land that is interspersed with public lands administered by the Arizona State Land Department (ASLD). The exact location and size of the project infrastructure will be determined based on factors including wind resource assessment, economics, electricity markets, transmission constraints, power purchase agreements, permitting, and results of site surveys.

This report presents the results of bird and bat surveys that were conducted to evaluate potential impacts from the proposed wind-energy facility. Based on a review of the existing knowledge base regarding wind-energy development throughout the western US, a one-year bird and bat study plan was developed for the GWRA. The study plan was developed with input from the Arizona Game and Fish Department (AZGFD) and the U.S. Fish and Wildlife Service (USFWS) and the expertise and experience of Western EcoSystems Technology, Inc. (WEST) in implementing and conducting similar studies for wind-energy development throughout the United States. Objectives of the study were to provide site specific bird and bat resource and use data that would be useful in evaluating potential impacts from the proposed GWRA, provide information that could be used for project planning and design of the facility to minimize impacts to birds and bats, and recommend further monitoring studies or potential mitigation measures, if warranted.

This report provides the results of the study conducted at the GWRA from June 2007 through July 2008. The GWRA studies consisted of fixed-point bird use surveys, ground and aerial surveys for raptor nests, nocturnal acoustic bat surveys, sensitive species surveys, and incidental wildlife observations. The ability to estimate potential direct impacts to birds and bats at proposed wind-energy facilities is enhanced by operational monitoring data collected at existing wind-energy facilities. For several wind-energy facilities, standardized baseline data on bird use, has been collected followed by standardized post-construction (operational) monitoring, allowing comparisons of bird use to mortality. In addition to site-specific data, this report presents existing information and results of studies conducted at other wind-energy facilities as part of the impact assessment.

## **STUDY AREA**

The proposed wind-energy facility is located within the Pinyon-Juniper Woodland Ecozone of the Colorado Plateau Semi-Desert Province in the northeastern quarter of Arizona. The GWRA falls primarily within pinyon-juniper and desert scrub vegetation types north and east of the Mogollon Rim which delineates the Arizona-New Mexico Mountains Semi-Desert province to

the south. Elevation in the GWRA varies from approximately 5,600 to 6,300 feet (ft; 1,707 to 1,920 meters [m]) above sea level. The proposed wind-energy facility area lies just east of the Coconino National Forest and Mormon Lake area south of the I-40 corridor.

The land within the project is a mix of private and state owned land. Most of the GWRA is undeveloped and grazing is the primary land use. Several water tanks/stock ponds have been developed through the GWRA for livestock. The GWRA is also bisected by several unimproved roads (two-tracks). The proposed GWRA is situated primarily on a flat plateau topographic feature (Figure 1). Along the eastern and northern edge of the GWRA there are distinct canyons or breaks of varying topography and vegetation that drop off in elevation (see Figure 1).

## **METHODS**

The primary objectives of the study were to provide site specific data on bird and bat use of the GWRA that could be helpful in estimating potential impacts from the proposed wind-energy facility and provide data that could be helpful in designing a facility that would minimize risk and impacts to bird and bat resources.

### **Fixed-Point Bird Use Surveys**

The objective of the fixed-point bird use surveys was to estimate the seasonal, spatial, and temporal use of the study area by birds, particularly raptors, defined here as kites, accipiters, buteos, harriers, eagles, falcons, owls, and vultures. Fixed-point surveys (variable circular plots) of twenty-minute duration were conducted using methods described by Reynolds et al. (1980). The points were selected to survey representative habitats and topography of the study area while also providing relatively even coverage with minimal overlap of points. Surveys at each point were 20 minutes (min) long and all birds seen during fixed-point surveys were recorded. Raptors and other large birds, species of concern, and species not previously seen in the study area that were observed between fixed-point surveys were recorded; UTM coordinates from global positioning system (GPS) units also were noted for species of concern.

### ***Bird Use Survey Plots***

Twenty-two points were selected to achieve optimal coverage of the study area and habitats within the study area (Figure 2). The ridgelines along the eastern and northern edge of the GWRA create a distinct physiographic feature that could experience different levels of bird use than the flat top of the mesa of the bulk of the GWRA. With this in mind, the points were established so that observations could be made that included both the areas over the flat mesa top as well as the steep slopes of the mesa (see Figure 2). Each survey plot was an approximate 800-m (~one-half mile) radius circle centered on the point. Surveys were conducted for 20 min at each point, and all species of birds observed during surveys were recorded. All large birds observed perched within or flying over the plot were recorded and mapped. Small birds (e.g., sparrows) within 100 m (~328 ft) of the point were recorded, but not mapped. Observations of birds beyond the plot were recorded, but were not included in the statistical analyses. A unique observation number was assigned to each observation.

The date, start, and end time of the survey period, and weather information such as temperature, wind speed, wind direction, and cloud cover were recorded for each survey. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. The behavior of each bird observed, and the vegetation type in which or over which the bird occurred, were recorded based on the point of first observation. Approximate flight height and flight direction at first observation were recorded to the nearest 5-m (~16 ft) interval. Other information recorded about the observation included whether or not the observation was auditory only and the 10-minute interval of the 20-minute survey in which it was first observed.

Locations of raptors, other large birds, and species of concern seen during fixed-point bird use surveys were recorded on field maps by observation number. Flight paths and perched locations were digitized using ArcGIS 9.2 (ERSI™). Any comments or unusual observations were recorded in the comments section of the data sheet.

### ***Observation Schedule***

Sampling intensity was designed to document bird use and behavior by habitat and season within the study area. Surveys were conducted approximately weekly during 10 weeks of the fall (September 1- November 15) season. During the peak of fall raptor migration (approximately mid-September to mid-October) an additional four surveys were conducted resulting in approximately twice-weekly surveys during this period. During the winter (November 16 – February 29) season and during the spring (March 1 – May 31) season, surveys were completed approximately weekly. During the summer (June 1 – August 31) season two surveys were completed to assess breeding bird activity. To the extent practicable, each station was surveyed about the same number of times each season; however, the schedule varied somewhat in response to adverse weather conditions (e.g., winter snow storms, rain), which caused delays and/or missed surveys. During a given survey day, as many survey stations as possible were visited (generally 10-14), depending on length of daylight period and travel time between points. Surveys were rotated through the survey stations so that all stations were visited approximately the same number of times.

### **Raptor Nest Surveys**

Two survey methods were used for the raptor nest surveys; aerial surveys and ground-based surveys. Surveys for raptor nests were conducted in the GWRA and an approximate one-mile (1.6-km) buffer. Results from the fixed-point surveys, in-transit incidental observations, and habitat reconnaissance surveys were used to help focus the raptor nest surveys in the most likely areas for nesting raptors. The objective of the raptor nest surveys was to locate raptor nests that may be subject to disturbance and/or displacement effects from construction and/or operation of the proposed wind-energy facility.

All raptor nests identified during aerial and ground-based surveys were monitored during the late breeding season (early June) to assess nest success or productivity, to the extent possible. Nests observed incidentally during other surveys at the GWRA were also mapped and included in the raptor nest data set.

### ***Aerial Raptor Nest Survey***

A single aerial raptor nest survey was scheduled after most species of raptor had finished courtship and were incubating eggs or brooding young. The aerial nest survey was conducted by searching habitat suitable for most aboveground nesting species, such as cottonwood, ponderosa pine, tall shrubs, and cliffs or rocky outcrops. The aerial survey effort largely focused on Diablo and Grapevine Canyons. During the survey, A Bell 206 Jet Ranger helicopter was flown at an altitude of tree-top level to approximately 250 ft (76 m) above the ground. If a nest was observed, the helicopter was moved to a position where nest status and species present could be determined. Efforts were made to minimize disturbance to breeding raptors, including keeping the helicopter a maximum distance from the nest at which the species could be identified, with distances varying depending upon nest location and wind conditions. Data recorded for each nest location included species occupying the nest, nest status (inactive, bird incubating, young present, eggs present, adult present, unknown or other), nest substrate (pine, oak, cottonwood, juniper, shrub, rocky outcrop, cliff or power line), number of young present, time and date of observation and the nest location (recorded with a handheld Garmin GPS 76 CSX unit). Nest sites identified during the aerial survey were ground-truthed during the late breeding season to assess productivity.

### ***Ground-Based Raptor Nest Survey***

Ground-based raptor nest surveys consisted of ground searches of selected areas within approximately one mile (1.6 km) of the proposed GWRA which were suspected of containing nests identified during the aerial survey and through land-owner contacts. Data recorded for each nest location included species occupying the nest, nest status (inactive, bird incubating, young present, eggs present, adult present, unknown or other), nest substrate (pine, oak, cottonwood, juniper, shrub, rocky outcrop, cliff or power line), number of young present, time and date of observation and the nest location (recorded with a handheld Garmin GPS 76 CSX unit).

### **Bat Acoustic Surveys**

The objective of the bat use surveys was to estimate the seasonal and spatial use of the GWRA by bats. Bats were surveyed using Anabat<sup>®</sup> II (Anabat) bat detectors (Titley Electronics Pty Ltd., NSW, Australia) coupled with Zero Crossing Analysis Interface Modules (ZCAIM; Titley Electronics Pty Ltd., NSW, Australia). Bat detectors are a recommended method to index and compare habitat use by bats. The use of bat detectors for calculating an index to bat impacts has been used at several wind-energy facilities (Kunz et al. 2007b), and is a primary and economically feasible bat risk assessment tool (Arnett 2007). Bat activity was surveyed using three ground-based detectors and one detector connected to a raised Hi-Mic, that was elevated approximately 40 m above ground level on one of the project met towers.

Anabat detectors record bat echolocation calls with a broadband microphone. The echolocation sounds are then translated into frequencies audible to humans by dividing the frequencies by a predetermined ratio. A division ratio of 16 was used for the study. Bat echolocation detectors also detect other ultrasonic sounds made by insects, raindrops hitting vegetation, and other sources. A sensitivity level of six was used to reduce interference from these other sources of ultrasonic noise. The calls were recorded via the ZCAIM which uses a CompactFlash<sup>™</sup> memory

card with large storage capacity. The Anabat detectors were placed inside plastic weather-tight containers with a hole cut in the side of the container for the microphone to extend through. Microphones were encased in PVC tubing with drain holes that curved vertically outside the container to minimize the potential for water damage due to rain. Anabat units situated on the ground were raised approximately one meter (~3.3 ft) to minimize echo interference and lift the unit above vegetation. For the Hi-Mic Anabat setup, the microphone was attached to a 50 m audio (coaxial) cable and mounted at an elevation of approximately 40 m on a meteorological tower. The microphone was secured in a PVC protective casing and oriented approximately horizontal to minimize the possibility of rain damage. All units were programmed to turn on each night an approximate half-hour before sunset and turn off an approximate half-hour after sunrise.

### **Sensitive Species Surveys**

The objective of the sensitive species surveys was to determine the presence or absence and spatial distribution of federal and state listed species, species of conservation concern, or other species of interest within the study area and particularly within proposed development corridors. Based on information from the Arizona Game and Fish Department (AZGFD 2008a and 2008b) and the U.S. Fish and Wildlife Service (USFWS) (ECOS 2008), several state- and federal-listed species and species of concern, including western burrowing owl (*Athene cunicularia* spp. *hypugaea*), and Gunnison's prairie dog (*Cynomys gunnisoni*), could occur in the project area. Some USFWS Birds of Conservation Concern (USFWS 2002), such as Cooper's hawk (*Accipiter cooperii*), loggerhead shrike (*Lanius ludovicianus*), and bald eagle (*Haliaeetus leucocephalus*) also potentially occur in the project area.

Appropriate habitat for sensitive species was identified and presence/absence surveys were focused in suitable habitat. Ground-based reconnaissance surveys of the GWRA were conducted in areas not routinely visited during bird use surveys to look for prairie dog colonies, burrowing owls, or other species that may not be detected during the bird use surveys. UTM coordinates for all sensitive species observations and prairie dog towns were recorded for mapping.

### **Incidental Wildlife Observations**

The objective of the incidental wildlife observations was to provide use and occurrence information about wildlife outside the standardized survey areas that might be affected by the proposed wind-energy facility. Incidental wildlife observations were made while observers were within the study area conducting the various surveys or traveling between survey points. All sightings of raptors, raptor nests, unusual or unique birds, sensitive species, mammals, reptiles, and amphibians were recorded. These observations were recorded in a similar fashion to those recorded during the standardized surveys discussed above. Information recorded for incidental wildlife observations included the observation number, date, time, species, number of individuals, sex/age class, distance from observer, activity, height above ground (for bird species), habitat, and, for sensitive species, the GPS coordinates.

### **Statistical Analysis**

### ***Quality Assurance and Quality Control***

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following field surveys, observers were responsible for inspecting their data forms for completeness, accuracy, and legibility. A sample of records from the electronic database was compared to the raw data forms and any errors detected were corrected. Irregular codes or data suspected as questionable were discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

### ***Data Compilation and Storage***

A Microsoft® ACCESS database was developed to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined format to facilitate subsequent QA/QC and data analysis. All data forms, field notebooks, and electronic data files were retained for reference.

### ***Bird Diversity and Species Richness***

A list of all bird species observed during all surveys, with the number of observations and the number of groups, including all observations of birds detected regardless of their distance from the observer, was generated for the GWRA. The total number of unique species and the mean number of species observed per survey (i.e., number of species/plot/20-min survey) was calculated to illustrate and compare differences between seasons.

### ***Bird Use, Composition, and Frequency of Occurrence***

Estimates of bird use were calculated as the number of individuals observed per 20-min survey from the standardized fixed-point surveys. For the bird use estimates, only observations of birds detected within 800 m of the survey point were used, standardizing for plot size. Avian use estimates were used to compare differences between bird types, seasons, survey stations, and other wind-energy facilities where similar surveys have been conducted.

The frequency of occurrence by species was calculated as the percent of surveys in which a particular species was observed. Species composition was represented by the mean use for a species divided by the total use for all species. Frequency of occurrence and percent composition provide relative estimates of risk to avian species in the study area. For example, a particular species may have high use estimates for the site based on just a few observations of large flocks, however, the frequency of occurrence will indicate that it occurs during very few of the surveys and therefore, may be less likely affected by a project.

### ***Bird Flight Height and Behavior***

To calculate potential risk to bird species, the first flight height recorded was used to estimate the percentages of birds flying within the likely “zone of risk” for typical turbines at the GWRA. Since the type of turbines that will be used at the GWRA is currently unknown, the likely zone of risk was defined as a flight height of between 35 to 135 m (115 to 443 feet) above ground level (AGL), which is the blade height of typical turbines that could be used at the GWRA.

### ***Bird Exposure Index***

A relative index to collision exposure (R) was calculated for bird species observed during the fixed-point bird use surveys using the following formula:

$$R = A * P_f * P_t$$

Where A equals mean relative use for species *i* (observations within the plot) averaged across all surveys,  $P_f$  equals proportion of all observations of species *i* where activity was recorded as flying (an index to the approximate percentage of time species *i* spends flying during the daylight period), and  $P_t$  equals proportion of all initial flight height observations of species *i* within the likely zone of risk. This index does not account for differences in behavior other than flight heights and percent of birds observed flying.

### ***Spatial Use***

The objective of mapping observed bird locations and flight paths within the GWRA was to look for areas of concentrated use by raptors and other large birds and/or consistent flight patterns within the GWRA. Data were analyzed by comparing use among points or transects and the association of use to topographic features. This information was used to determine if avian use was significantly higher in any portion of the study area which in turn could aid in project planning or design to minimize exposure risk to birds.

### ***Acoustical Bat Surveys***

The units of activity to describe bat use were the number of bat passes or calls (Hayes 1997). A pass or call (terms used synonymously) was defined as a continuous series of at least two call notes produced by an individual bat with no pauses between call notes of more than one second (Gannon et al. 2003; White and Gehrt 2001). The number of bat passes was determined by downloading the data files to a computer and tallying the number of echolocation passes recorded. To standardize the data between Anabat stations, the total number of passes was divided by the number of detector nights.

Bat calls were classified as either high-frequency calls ( $\geq 35$  kHz) that are generally given by small bats (e.g. *Myotis* spp.) or low-frequency ( $< 35$  kHz) that are generally given by larger bats (e.g. silver-haired bat [*Lasionycteris noctivagans*], big brown bat [*Eptesicus fuscus*], Townsend's big-eared bat [*Corynorhinus townsendii*], hoary bat [*Lasiurus cinereus*]). Data determined to be noise (produced by a source other than a bat) or call notes that did not meet the pre-specified pass criteria were removed from the analysis. To establish which species may have produced the high- and low-frequency calls recorded, a list of species expected to occur in the study area was compiled based on published range maps (BCI website 2008; Harvey et al. 1999).

The total number of bat passes per detector night was used as an index for bat use in the GWRA. Bat pass data represented levels of bat activity rather than the numbers of individuals present, because individuals could not be differentiated by their calls. To predict potential for bat mortality (i.e. low, moderate, high potential), the mean number of bat passes per detector night across locations was compared to existing data from wind-energy facilities where both bat activity and mortality levels have been measured.



## RESULTS

Wildlife surveys at the GWRA occurred from June 22, 2007 through July 7, 2008. Excluding bats, 67 animal species were identified: 58 birds and nine mammals.

### Fixed-Point Bird Use Surveys

Fixed-point bird use surveys were conducted from June 22, 2007 through May 29, 2008 within the GWRA. A total of 446 twenty-minute fixed-point surveys were conducted (Table 1).

#### *Bird Diversity and Species Richness*

Fifty-five unique species were observed during the course of all fixed-point bird use surveys at the GWRA, with a mean number of species observed per survey of 2.19 (Table 1). A total of 4,423 individual bird observations within 1,155 separate groups were recorded during the fixed-point surveys (Table 2). Cumulatively, horned lark (*Eremophila alpestris*) composed 34.4% of the observations. Unidentified raven comprised another 10.3% of all observations, while all other species individually comprised less than 5% of the total observations. A total of 365 individual raptors were recorded within the GWRA, representing 10 species (Table 2).

#### *Bird Use, Composition, and Frequency of Occurrence by Season*

Overall bird use in the GWRA was greatest in the winter (13.72 number of birds/20-min survey/plot), followed by fall (11.60), spring (6.44), and summer (3.78) (Table 1).

#### Waterfowl

Waterfowl had the highest use in winter (0.41 birds/plot/20-min survey), compared to other times of the year (summer 0, fall 0.06, and spring 0.06; Table 3). High waterfowl use in winter was due to several large groups of unidentified duck (Table 2) that made up 2.5% of the overall bird use in this season (Table 3). Waterfowl as a whole comprised 3.0% or less of the overall bird use in the seasons in which they were observed. Waterfowl were observed more frequently in the winter (4.3%), compared to spring (2.8%), fall (2.1%) and summer (0%).

#### Shorebirds

Shorebirds had the highest use in fall (0.23 birds/20-min survey), compared to spring (0.06), the only other season in which this bird type was observed (Table 3). Shorebirds as a whole comprised 2.0% or less of the overall bird use for fall and spring. Shorebirds were more frequently observed during the fall (6.0%) followed by spring (4.9%).

#### Raptors

Raptor use at GWRA was highest during the fall (1.68 birds/20-min survey) compared to other times during the year (summer 0.51, winter 0.13, and spring 0.24; Table 3). This was primarily due to high use of the area by unidentified raptors (0.78) and American kestrels (*Falco sparverius*; 0.52) during the fall season. Summer use was primarily due to American kestrel (0.17) and red-tailed hawk (*Buteo jamaicensis*; 0.17), winter use was due to red-tailed hawk (0.05), and spring use was again primarily due to American kestrel (0.10) and red-tailed hawk (0.08). Raptors comprised 14.4% of the overall bird use in the fall, 13.6% in the summer, and

less than four percent during the winter and spring. Raptors were most frequently observed during the fall (63.5% of surveys) and summer (31.6%), and were observed less often during the winter (13.3%) and spring (18.8%).

### Vultures

Use by vultures was due entirely to use by turkey vulture (*Cathartes aura*). Turkey vultures had the highest use in summer (0.53 birds/20-min survey), compared to other times of the year (fall 0.19, winter 0, and spring 0.19; Table 3). Vultures made up 13.9% of the overall bird use in the summer, but less than three percent of the overall bird use in the seasons in which they were observed. Vultures were observed more frequently in the summer (33.2%), compared to fall (13.1%), winter (0%), and spring (11.8%).

### Passerines

Passerines by far had the highest use of any bird type during all four seasons (Table 3). Passerine use was highest in the winter (13.11 birds/plot/20-min survey), followed by fall (9.07), spring (6.31), and summer (2.53). Horned lark had the highest use by any one species in fall (2.52), winter (7.35), and spring (2.71), while lark sparrow (*Chondestes grammacus*) had the highest use in the summer (0.91; Table 3). Passerines comprised nearly all of the overall bird use in winter and spring (95.5% and 90.5%, respectively) and comprised more than 66% of use in the summer and winter. Passerines were observed during more than 80% of the surveys in the fall, winter, and spring, and were observed during 66.1% of summer surveys.

### ***Bird Flight Height and Behavior***

The proportion of observations of a bird species flying within the zone of risk provides a rough estimate of the propensity of that species to fly within the area swept by turbine blades and be exposed to turbines or at risk of collision. For the analysis, a generic zone of risk, 35 to 135 m above ground level, was used to calculate exposure indices. This results in a rotor-swept area of up to 100 m in diameter, which is generally larger than most turbines but provides a conservative measure for estimating collision risk.

Flight height characteristics were estimated for both bird species and types (Tables 4 and 5). During the fixed-point bird use surveys, 818 groups totaling 3,563 individual birds were observed flying (Table 5). Percentages of observations below, within, and above the likely zone of risk were reported. Overall, 6.1% of birds observed flying were recorded within, 92.9% were below, and 0.9% were flying above the zone of risk (Table 5). Most (80.2%) of flying raptors were observed below, 13.3% were within, and 6.5% were above the zone of risk. Vultures had the highest percentage of flying birds within the zone of risk (52.5%), followed by raptors (13.3%) and passerines (4.5%). Raptors had the second highest percentage of birds within the zone of risk, primarily due to 37.5% of eagle and 31.7% of buteo observations recorded at this height. All (100%) of flying waterfowl, shorebirds, doves/pigeons, other birds, and unidentified birds were observed below the zone of risk. Passerines were also observed typically flying below the zone of risk (95.4%; Table 5).

Six species had at least 45 groups observed flying; only turkey vulture was observed flying within the zone of risk during at least 50% of the observations (52.5%; Table 4).

### ***Bird Exposure Index***

A relative exposure index was calculated for each species (Table 4). This index is only based on initial flight height observations and relative abundance and does not account for other possible collision risk factors such as foraging, courtship, or avoidance behavior. Turkey vulture had the highest exposure index (0.13), followed by unidentified swallows (0.12), and unidentified raven (0.10) (Table 4).

### ***Spatial Use***

Mean bird use was plotted by point for all birds and major bird types (Figure 4). For all bird species combined, use was highest at point nine (38.05 birds/20-min survey), while bird use at other points ranged from 2.63 to 18.89. The high mean use at point nine was overwhelmingly due to high passerine use at this point (36.11). Passerine use at the other points ranged from 1.84 to 16.50 birds/20-min survey. Waterfowl use was highest at point 20 at 1.47, and ranged from 0.71 to 0.84 birds/20-min survey for the other two points at which this type was observed. Shorebirds were observed at seven points and use ranged from 1.33 birds/20-min survey at point three to 0.05 at points 1 and 11.

Raptors were observed at all points and use varied widely from 0.32 to 1.84 and was highest at points 11 (1.84), 7 (1.29) and 16 (1.21). Vultures were observed at all but five points and use ranged from 0.47 at point 12 to 0.05 at points 10, 14, and 20. Relatively high raptor use is associated with proximity to prairie dog towns at the GVWRA (Figures 4 & 12). Points 7, 11 and 13 are located within prairie dog towns, while point 16 is located approximately one mile from an active prairie dog town, and point 15 is located approximately 1.5 mile from two active prairie dog towns (Figure 12).

## **Raptor Nest Surveys**

### ***Aerial Raptor Nest Survey***

A two-hour aerial survey for raptor nests was conducted via helicopter on the morning of April 15, 2008. Weather during the survey was clear with 10 mile (16 km) visibility, temperatures averaging 65°F, cloud cover averaging 10%, and wind speeds averaging 19 mph (30 kph). The area surveyed included the GWRA and a one-mile (1.6-km) buffer, comprising a study area of approximately 67 mi<sup>2</sup> (173.5 km<sup>2</sup>) and which contained portions of Grapevine, Yaeger and Diablo Canyons; forested areas; and features likely to provide nesting structures for raptors (Figure 5). One active red-tailed hawk nest was located during the aerial survey in Yaeger Canyon just outside the northwest project area boundary (Table 6; Figure 5). In addition, areas thought to contain golden eagle (*Aquila chrysaetos*) or other raptor nests were identified for further ground-based surveys.

### ***Ground-Based Raptor Surveys***

Portions of the GWRA identified during other surveys as having the potential to support nesting raptors were surveyed on foot on June 6 and 8, 2008. Two inactive golden eagle nests were observed during ground raptor nest surveys near the confluence of Grapevine and Diablo Canyons (Table 6; Figure 5). During the ground survey, no nests were found to be active. It is unclear if the Yaeger Canyon red-tailed hawk nest failed between first sighting on April 15 and June 6, 2008 or young had already fledged and left the nest area. Neither golden eagle nest

appeared to have been used during the 2008 breeding season. Raptor nest density in this 67 mi<sup>2</sup> (173.5 km<sup>2</sup>) (GWRA and the one-mile buffer) was 0.04 nests/mi<sup>2</sup>, which is low compared to most other wind-energy facilities in the western U.S. (Table 7).

### **Bat Acoustic Surveys**

Bat activity was monitored at three ground locations and one Hi-Mic location using four Anabats on a total of 224 nights between June 26 – November 9, 2007 (137 nights), and April 12 – July 7, 2008 (87 nights). The Hi-Mic unit (GV16H) was paired with a ground unit (GV16L) at the same location. Hi-Mic data were analyzed separately from ground-based data because these detectors were sampling different airspace.

The three ground-based Anabat units operated for 64.42% of the sampling period in 2007 and 82.0% of the sampling period in 2008. Ground-based Anabat units recorded 4,237 bat passes on 537 detector-nights, for an average of 7.89 bat passes per detector-night during 2007 and 2008 seasons. Ground-based Anabat units recorded 2,288 bat passes on 325 detector-nights, for an average of 7.04 bat passes per detector-night in 2007, and recorded 1,949 bat passes on 214 detector-nights, for an average of 9.11 bat passes per detector-night in 2008. The Hi-Mic unit operated for 20.3% and 71.0% of the sampling periods in 2007 and 2008 respectively. The Hi-Mic unit recorded 16 bat passes on 62 detector-nights, for an average of 0.26 bat-passes per detector night during the 2008 season (Tables 8a and 8b).

### ***Spatial Variation***

The number of bat passes recorded varied widely among the three ground-based Anabat units during the 2007 and 2008 seasons, with GV20 recording the highest number of bat passes during both seasons (Figure 8a and 8b). Over the course of the 2007 season, GV 10 recorded 8.31 bat passes per detector-night, while GV20 and GV16L recorded a mean of 11.97 and 0.86, respectively. During the 2008 season GV10 recorded a mean of 1.00 bat passes per detector-night, GV20 a mean of 16.70, and GV16L a mean of 5.92 (Table 8b). There were more high-frequency (HF) bat passes per detector-night than low-frequency (LF) at all three ground-based Anabat locations for both 2007 and 2008 (Figures 7a and 7b), except at GV 16L in 2007, which had more low-frequency visits. GV10 recorded significantly higher bat activity during 2007 (839 total bat passes, 8.31 bat passes per detector-night; Figure 8a) than during 2008 (52 total bat passes, 1.00 bat passes per detector-night; Figure 8b).

The Hi-Mic unit (GV16H) recorded far fewer bat passes (2007 mean = 0.04 bat passes per detector night; 2008 mean = 0.26 bat passes per detector night) than the ground unit (GV16L) paired at the same location during both years (Tables 8a and 8b; Figure 7a and 7b). All of the bat passes for both 2007 and 2008 recorded by the Hi-Mic unit were made by low frequency bats.

### ***Temporal Variation***

During 2007 bat activity peaked between July 10 and August 28, and was highest during early to mid-August (Figure 8a). HF activity was highest between July 11 and August 21 (671 HF passes, 70.2% of all HF passes), while LF activity peaked between August 7 and September 12 (289 LF passes, 73.8% of all LF passes), though activity for both high- and low-frequency bats continued to spike into late September. During 2008 activity between April 12 and May 24 was irregular, with nights of relatively high activity interspersed with nights of low activity. Bat activity

increased after May 24, peaked on June 12, and then decreased after June 23 (Figure 8b). The pattern of activity for HF bats was mainly congruent with the overall trend, with the number of HF bat passes per detector-night peaking between May 29 and June 23 (62.2% of all HF passes). Activity by LF bats was low throughout the study period, with most LF bat passes recorded between June 11 and July 1 (42.6% of all LF passes; Figure 8b).

### ***Species Composition***

Species identification for specific passes is possible from Anabat data for the hoary bat, Allen's big-eared bat, spotted bat, and big free-tailed bat; therefore, passes by these species could be separated from passes by other LF or unknown bats. During 2007, hoary bats comprised 5% of total passes detected within the GWRA; during 2008, they comprised less than 2% of total passes. Hoary bat activity was highest at station GV16L in 2007 (0.48 passes per detector-night) and lowest at GV16H, with no passes detected (Figure 9a). In 2008, hoary bat activity was evenly distributed among Anabat stations (Figure 9b). During 2008, the Hi-Mic and ground unit at GV16 each recorded 9 passes by hoary bats during the survey period, but these were not always on the same night. Activity for hoary bats peaked in late August and in early October during 2007 (Figure 10a), and was highest between April 28 and May 20 in 2008 (68.4% of total hoary passes; Figure 10b).

Eighteen big free-tailed bat passes were detected in 2007, comprising 1% of all passes. All passes were detected between September 25 and October 21, with half the passes detected on October 9. Big free-tailed bats were not detected in 2008. Allen's big-eared bats were detected four times in 2007 and twice in 2008. In 2007, calls were detected between October 1 and 18; in 2008 they were detected on April 15 and June 16, 2008. Spotted bats were not detected during either year.

### **Sensitive Species Surveys**

The objective of the sensitive species surveys was to determine the presence or absence and spatial distribution of federal and state listed species, species of conservation concern, or other special status species within the study area and particularly within proposed development corridors. Sensitive species documented at the GWRA during all surveys and as incidental wildlife observations (see Incidental Wildlife Observations section below) were western burrowing owl and Gunnison's prairie dog (Table 9). In addition, two USFWS Birds of Conservation Concern (USFWS 2002), Cooper's hawk and bald eagle, were observed in the GWRA. The Arizona population of bald eagles is recognized as a distinct population segment under ESA guidance and has been petitioned for listing under the ESA (ECOS 2008).

Three prairie dog towns were mapped in the GWRA and 21 observations of Gunnison's prairie dogs were recorded in the two active towns (Table 9; Figure 11). Sensitive species observed at the GWRA included seven bald eagles, four Cooper's hawks, and two western burrowing owls.

## **Incidental Wildlife Observations**

### ***Bird Observations***

The most abundant bird species recorded incidentally was American kestrel (123 observations), followed by lark sparrow (120) (Table 10). Twenty species total were observed, with a total of 542 individuals in 121 groups. Three species were observed incidentally that were not observed during fixed-point bird use surveys: common nighthawk (*Chordeiles minor*), great blue heron (*Ardea herodias*), and white-faced ibis (*Plegadis chihi*; Table 10).

### ***Mammal Observations***

The most abundant mammal recorded was pronghorn antelope (*Antilocapra americana*; 301 observations). Other game animals observed included bison (*Bison bison*; 63 observations), elk (*Cervus elaphus*; 58), mule deer (*Odocoileus hemionus*; 8) and javelina (*Tayassu tajacu*; 2). Nine mammal species were observed, with a total of 470 individuals in 73 groups (Table 10).

## **DISCUSSION AND IMPACT ASSESSMENT**

### **Bird Impacts**

The primary objectives of the study were to provide site specific data on bird and bat use of the GWRA that could be helpful in estimating potential impacts from the proposed wind-energy facility and in project planning to minimize risk and potential impacts to bird and bat resources. The proposed GWRA is situated primarily on a flat plateau topographic feature, with the primary land use being rangeland for livestock grazing. Along the eastern and a portion of the northern edge of the GWRA there are distinct canyons or “breaks” of varying topography and vegetation that drop off in elevation (see Figure 1). Also, a number of water developments for livestock operations and prairie dog colonies occur on site. These areas create distinct physiographic features that could influence wildlife use in the study area and therefore provide variable spatial density or abundance of birds and bats across the study area. The surveys were designed with this in mind so that observations could be made that included areas over the flat mesa top where turbine construction would be most likely, as well as the variable habitat features (see Figure 2).

### ***Direct Effects***

The most probable impact to birds from wind projects is direct mortality or injury due to collisions with turbines or guy wires of meteorological (met) towers. Collisions may occur with resident birds foraging and flying within the project area or with migrant birds seasonally moving through the area.

Substantial data on bird mortality at wind-energy facilities are available from studies in California and throughout the west and Midwest. Of 841 bird fatalities reported from California studies (>70% from Altamont Pass Wind Resource Area in California), 39% were diurnal raptors, 19% were passerines (excluding house sparrows [*Passer domesticus*] and European starlings [*Sturnus vulgaris*]), and 12% were owls. Non-protected birds, including house sparrows, European starlings, and rock doves (*Columba livia*), comprised 15% of the fatalities.

Other bird types generally made up less than 10% of the fatalities (Erickson et al. 2002b). During 12 fatality monitoring studies conducted outside of California, diurnal raptor fatalities comprised 2% of the fatalities and raptor mortality averaged 0.03/turbine/year. Passerines (excluding house sparrows and European starlings) were the most common collision victims, comprising 82% of the 225 fatalities documented. For all bird species combined, estimates of the number of bird fatalities per turbine per year from individual studies ranged from zero at the Searsburg, Vermont (Kerlinger 1997) and Algona, Iowa facilities (Demastes and Trainer 2000) to 7.7 at the Buffalo Mountain, Tennessee facility (Nicholson 2003). Using mortality data from the last 10 years from wind projects throughout the entire United States, the average number of bird collision fatalities is 3.1 per megawatt per year or 2.3 per turbine per year (NWCC 2004).

#### Raptor Use and Exposure Risk

The annual mean raptor use at the GWRA was compared with other wind-energy facilities that implemented similar protocols and had data for three or four seasons. Similar studies were conducted at 36 other wind resource areas proposed for wind-energy facility construction. The annual mean raptor use at these wind-energy facilities ranged from 0.09 birds/20-min survey at San Geronio in California to 2.34 birds/20-min survey at High Winds, California (Figure 10). Mean raptor use at the GWRA was 0.67 birds/20-min survey which is in the mid-range of all the sites studies (Figure 10).

Although high numbers of raptor fatalities have been documented at some wind-energy facilities (e.g., Altamont Pass), a review of studies at wind-energy facilities across the United States reported that only 3.2% of casualties were raptors (Erickson et al. 2001a). Indeed, although raptors occur in most areas with the potential for wind-energy development, individual species appear to differ from one another in their susceptibility to collision (NRC 2007). Results from Altamont in California suggest that mortality for some species is not related to abundance (Orloff and Flannery 1992). American kestrels, red-tailed hawks, and golden eagles were killed more often, and turkey vultures were killed less often than predicted based on abundance estimates. A recent report from the Buffalo Gap wind-energy facility in Texas, however, suggests that turkey vultures, may show higher susceptible to collision at larger wind turbines than previously believed for smaller turbines (Tierney 2007). Also, reports from the High Winds wind-energy facility in California document high American kestrel mortality. Relative use by this species at High Winds is six times that at the Altamont (Kerlinger 2005). It is likely that many factors, in addition to abundance, are important in predicting raptor mortality.

Exposure indices may provide some insight into what species might be the most likely turbine casualties based on site specific data on abundance and flight behavior. The index considers relative probability of exposure based on abundance, proportion of activity recorded as flying, and observed flight height of each species. The analysis is based on observations of birds made during the studies and does not take into consideration varying ability among species to detect and avoid turbines, habitat selection, or other factors that may influence exposure to turbines such as breeding or hunting behavior. The actual risk may be lower or higher than indicated by these data. Based on this analysis, turkey vulture had the highest relative exposure index among raptors followed by red-tailed hawk at GWRA. While turkey vulture and red-tailed hawk casualties have been recorded at wind projects, they are generally not found in proportion to relative abundance. For example, at Altamont, red-tailed hawk casualties were found more often,



and turkey vultures less often than predicted based on abundance (Orloff and Flannery 1992). Altamont contains approximately 5,400 turbines, most of which are small, older, lattice tower turbines, which are not necessarily representative of new wind facilities. The latest raptor fatality estimates at Altamont, based on searches using 30-90 day search intervals, indicate that annual mortality averages 1.5 to 2.2 raptor fatalities/MW, when adjusted for searcher efficiency and scavenging bias (Smallwood and Thelander 2004). This estimate is generally higher than estimates of raptor mortality at modern wind farms (Erickson et al. 2001, NWCC 2004).

Based on species composition of the most common raptor fatalities at other western wind-energy facilities, species composition of raptors observed at the GWRA during surveys, and considering the exposure indices calculated, the diurnal raptors at the GWRA most likely at risk of turbine collision would be red-tailed hawk, American kestrel, and golden eagle. Small numbers of fatalities of other raptors, including other falcons, accipiters, harriers, and eagles may also occur over the life of the wind-energy facility, but are expected to be rare. Based on the seasonal use estimates, it is also expected that risk to raptors would be unequal across seasons with the lowest risk in the winter, when very few raptors were observed, and highest during the fall season, likely due to migrants passing through the area.

A regression analysis of raptor use and mortality for 12 new-generation wind-energy facilities, where similar methods were used to estimate raptor use and mortality, found that there was a significant correlation between use and mortality ( $R^2 = 71.7\%$ ; Figure 13). In general, raptor fatalities at other western wind-energy facilities have been relatively low, between 0 and 0.14 raptors/MW/year, however, the High Winds and Diablo Winds (a portion of Altamont) projects in California had high raptor use and provided data for a larger regression analysis (Figure 14). Using this regression to predict raptor collision mortality at the GWRA, based on an adjusted mean raptor use of 0.67 birds/20-min survey, yields an estimated fatality rate of 0.10 raptors/MW/year, or 10 raptor fatalities per year for a 100-MW wind-energy facility. A 90% prediction interval around this estimate is zero to 0.35 raptors/MW/year for the GWRA.

Within the GWRA, raptor use appeared to be strongly associated with proximity to prairie dog towns. Raptor use was highest at fixed bird use points 7, 11, and 16, which are either within or adjacent to active prairie dog towns (Figure 12). In general, raptor use was higher in the eastern half of the study area and was elevated near the available prey base found at prairie dog towns. Studies indicate that raptor mortality at wind-energy facilities (especially Altamont Pass) may be in part due to behavioral differences between species, increasing the susceptibility of some for collision with turbines. Orloff and Flannery (1992, 1996) suggested that high golden eagle mortality at APWRA was in part due to the apparently high densities of ground squirrels (*Spermophilus beecheyi*) in the area (Thelander and Smallwood 2007). Continued research at the site revealed that the degree of aggregation of pocket gopher (*Thomomys bottae*) burrows around the turbines was positively correlated to red-tailed hawk fatality rates (Smallwood et al. 2001, Thelander et al. 2003, Thelander and Smallwood 2007). In addition, features providing cover for cottontails (*Sylvilagus auduboni*) appeared to be associated with areas where golden eagles were killed. At the GWRA, turbine placement in or immediately adjacent to active prairie dog towns may increase the susceptibility of some raptors (principally red-tailed hawk and golden eagle) to collision with turbines.

### Non-raptor Use and Exposure Risk

Of the non-raptor avian groups, passerines have been the most abundant avian fatality at newer generation wind facilities, often comprising more than 80% of the avian fatalities (Erickson et al. 2001). Both migrant and resident passerine fatalities have been observed. Based on species and date information, in some studies up to 70% of fatalities found were believed to be migrants (Howe et al. 2002); however, the estimates are highly variable and range from 0 to 70%. In general, the number of migrant fatalities is higher in wind projects in the eastern United States (see Erickson et al. 2002b). The overall national average for passerine fatalities at wind projects has been approximately 2.2 birds/turbine/year (Erickson et al. 2002b).

Exposure indices of non-raptors indicate that unidentified swallow, raven, and pinyon jay (*Gymnorhinus cyanocephalus*) are most likely to be exposed to potential collision with wind turbines at the GWRA. Despite relatively high use and exposure, common ravens are rarely reported as fatalities according to monitoring studies at other wind-energy facilities (Erickson et al. 2001a; 2002b). At the Tehachapi Pass wind-energy facility in California, common ravens were found to be the most common large bird in the wind resource area, yet no fatalities for this species were documented during intensive studies (Anderson et al. 1996). Most non-raptors had relatively low exposure indices due to the majority of individuals flying below the zone of risk.

Predicting numbers of fatalities is difficult in large part due to the lack of monitoring studies in the desert southwest and similar environments as the GWRA. However, due to generally low impacts for western wind projects and the low exposure risks at GWRA, it is unlikely that non-raptor populations will be adversely affected by direct mortality from the operation of the wind-energy facility and any impacts would be on individuals and not species.

### ***Indirect Effects***

The extent of disturbance or displacement related impacts are difficult to estimate for the GWRA. Passerines breeding in the grassland and pinyon-juniper habitat are likely to be displaced from construction zones during the breeding season but the overall loss of habitat is not expected to be significant and over time will be reduced as construction areas revert to native habitat. Results from studies at the Stateline wind-energy facility in Oregon and Washington (Erickson et al. 2004) and the Combine Hills facility in Oregon (Young et al. 2005) suggest a relatively small-scale impact of wind-energy facilities on grassland steppe nesting passerines. Transect surveys conducted prior to and after construction of the facilities indicated that grassland passerine use was significantly reduced within approximately 164 ft (50 m) of turbine strings; areas further away from turbine strings did not have reduced bird use. The reduced use was attributed to temporary and permanent habitat loss/disturbance near the turbines. While it is likely that similar impacts would occur at GWRA, the species subject to these impacts are typically common in grassland and pinyon-juniper habitats and the impacts are not expected to be significant.

### Raptor Nesting Disturbance

Some resources are considered more sensitive to indirect impacts such as disturbance or displacement, including nesting raptor and sensitive species. Indirect effects caused by disturbance-type impacts, such as construction activity near an active nest or primary foraging

area, have the potential to impact raptor species. Birds displaced from the wind-energy facility might move to areas with fewer disturbances, but lower quality habitat, with an overall effect of reducing breeding success. There have been few studies on raptor displacement at wind-energy facilities, and most of these have suggested indirect effects to be negligible or immeasurable (Howell and Noone 1992; Johnson et al. 2000b; Johnson et al. 2003; Madders and Whitfield 2006). Information concerning potential nesting displacement on specific species is limited; however, a Swainson's hawk was reported to have nested within 0.25 mile (0.8 km) of the turbine string at a wind-energy facility in Oregon, suggesting little disturbance to this species (Johnson et al. 2003). In addition, at Foote Creek Rim Wind-Energy Facility in southern Wyoming, one pair of red-tailed hawks nested within 0.3 mile of the turbine strings, and seven red-tailed hawk, one great horned owl, and one golden eagle nests located within one mile of the wind-energy facility successfully fledged young (Johnson et al. 2000b). The golden eagle pair successfully nested 0.5 miles from the wind-energy facility in three different years after the site became operational. Studies at the Stateline wind-energy facility in Oregon and Washington have not shown any measurable short-term effects to nesting raptors (Erickson et al. 2004).

In contrast to these studies, one study at the Buffalo Ridge wind-energy facility in Minnesota found evidence of harriers avoiding turbines on both a small scale (< 100 m from turbines) and larger scale in the year following construction (Johnson et al. 2000a) as well as lower raptor densities near turbines compared to densities in similar habitat away from turbines (Usgaard et al. 1997). Raptor nest density on 101 mi<sup>2</sup> (262 km<sup>2</sup>) of land surrounding one project within the Buffalo Ridge wind resource area 0.15 per mi<sup>2</sup>, yet no nests were present in the 12 mi<sup>2</sup> (31 km<sup>2</sup>) wind-project itself, even though similar habitat was present (Usgaard et al. 1997). No red-tailed hawks or golden eagles are known to nest within the Altamont facility in California, suggesting that the large numbers of turbines or high human presence within that area may discourage nesting by raptors or that collision mortality prevents nesting in the Altamont.

During the 2008 raptor nesting season, one active and two inactive raptor nests were located in or within one mile of the GWRA (nest density of 0.04/mi<sup>2</sup>), and nests are located in distinct physiographic portions (canyons) of the project area where project facilities will not be constructed. During sensitive species surveys and incidental observations, two burrowing owls were observed in the study area, but nesting could not be confirmed by this species. In general, due to the low density of nesting raptors, any disturbance or displacement related impacts are not expected to be significant and there is limited potential for nesting displacement of raptors at the GWRA. Observation of a no-disturbance buffer around known nests when siting turbines would further minimize potential for impact.

## **Bat Impacts**

### ***Potential Impacts***

Assessing the potential impacts of wind energy development to bats at the GWRA is complicated by the current lack of understanding of why bats collide with wind turbines (Kunz et al. 2007a), combined with the inherent difficulties of monitoring elusive, night-flying animals (O'Shea et al. 2003). To date, monitoring studies of wind-energy facilities suggest that: (a) migratory tree-roosting species (eastern red bats [*Lasiurus borealis*], hoary bats, and silver-haired bats) comprise almost 75% of reported bats killed (Kunz et al. 2007b); (b) the majority of collisions

occur during the post-breeding dispersal or fall migration season (roughly August and September; Gruver 2002; Johnson et al. 2003); and (c) the highest reported fatalities occur at wind facilities located along forested ridge tops in the eastern U.S. (Kunz et al. 2007a), although recent studies in agricultural regions of Iowa and Alberta, Canada, report relatively high fatalities as well (Baerwald 2006; Jain 2005).

Some studies of wind projects have recorded both Anabat detections per night and bat mortality (Table 11). The number of bat calls per night as determined from bat detectors shows a rough correlation with bat mortality, but may be misleading because effort, timing of sampling, species recorded, and detector settings (equipment and locations) vary among studies. While it likely that relative abundance may influence bat mortality, the best predictor of potential impacts appears to be other regional wind projects that have been monitored. For example, impacts to bats at projects in the Pacific Northwest have all ranged from approximately 0.8 to 2.4 bats per MW per year (Arnett et al. 2008). While more variable, projects in the eastern U.S. have all shown higher impacts to bats and the continental-wide trend appears to be increasing bat mortality from west to east (Arnett et al. 2008). Thus, our best available estimate of mortality levels at a proposed wind project involves evaluation of on-site bat acoustic data in terms of activity levels, seasonal variation, species composition, topographic features of the project area, and regional monitoring studies.

### ***Activity***

Bat activity within the GWRA (2007 mean = 7.47 bat passes per detector-night; 2008 mean = 9.11) was relatively high compared to that observed at facilities in Minnesota and Wyoming, where bat collision mortality was low, but it was much lower than activity recorded at sites in West Virginia and Tennessee, where bat mortality rates were high (Table 11). Thus, based on the presumed relationship between pre-construction bat activity and post-construction fatalities, it is expected that bat mortality at GWRA would be greater than the 2.2 bat fatalities/turbine/year reported at Buffalo Ridge, Minnesota, but much lower than the 20.8 fatalities/turbine/year reported at Buffalo Mountain, Tennessee. While there are no known studies of bat mortality at wind projects in the desert southwest, other western projects including those in California have generally shown lower impacts. The average bat mortality over three projects in Oregon and Washington is 1.57 bats/turbine/year (Young and Erickson 2003). Under the assumption that western projects would be more representative, then it is expected that mortality at GWRA would be less than 2 bat fatalities/turbine/year.

### ***Spatial Variation***

Bat activity was much greater at station GV20 than at the other Anabat stations during both years (Figure 3). This unit was located near a stock pond, which likely attracted bats as a source of drinking water and insects for foraging. Elevated bat use at GV20 relative to other sampled sites reflects site-specific factors. The other stations were located in dry, open areas that were likely less attractive to bats. At station GV16, the ground unit recorded four times as many bat passes as the Hi-Mic unit during 2007 and 2008 seasons, indicating far less bat activity towards the rotor-swept zone at this site.

The proposed wind-energy facility is not located near any large, known bat colonies or other features that are likely to attract large numbers of bats. However, the GWRA is bordered by two

canyons (Grapevine and Yaeger canyons) which may harbor roost sites. The site lacks large tracts of forest cover, but does have pinyon-juniper habitat which also likely harbor roost sites for some species. In general, while bat use is likely to be ubiquitous over the whole site, there are some features which likely concentrate bat use and this was evident from the Anabat surveys. Despite these patterns, overall use averaged across all sampling was not extraordinarily high suggesting that exposure risk would change dramatically across the study area.

### ***Temporal Variation***

The number of bat calls detected per night at the GWRA peaked in late-May/mid-June and late July/mid August. Fatality studies of bats at other wind-energy facilities in the U.S. have shown a peak in mortality in August and September, and generally lower mortality earlier in the summer (see Johnson 2005). While the survey effort varies among the different studies, the studies that combine Anabat surveys and fatality surveys show a general association between the timing of increased bat call rates and timing of mortality, with both call rates and mortality peaking during the fall (Kunz et al. 2007a). While the temporal variation in bat numbers at GWRA does not necessarily reflect common trends in the U.S., it is not expected that risk to fall migrant bats would be less. Similar trends to all other wind projects monitored in the U.S. are expected with peak mortality occurring to long-distant migrant tree bats in August and September.

### ***Species Composition***

Of the 18 species of bat likely to occur in the study area, five are known fatalities at wind-energy facilities (Table 12). Acoustic bat surveys were largely unable to determine bat species present in the study area (see below), but they were able to distinguish high-frequency from low-frequency species.

High-frequency bat passes were recorded much more often (90.2% of all bat passes) than low-frequency passes at the ground stations, indicating higher relative abundance of species such as western red bat, western pipistrelle and *Myotis* sp. at these locations. The Hi-Mic station only recorded low-frequency passes. Many of the low-frequency species likely to be present at the GWRA (e.g., hoary bat [*Lasiurus cinereus*], silver-haired bat [*Lasionycteris noctivagans*], Brazilian free-tailed bat [*Tadarida brasiliensis*]) tend to forage at higher altitudes than most high-frequency species due to their wing morphology and echolocation call structure (Norberg and Rayner 1987). Therefore, low-frequency bat activity could potentially be under-represented if relying solely on data from ground-based detectors. However, the similar number of low-frequency bat passes recorded at the ground and Hi-Mic units at GV16 in 2008 suggests under-representation was not an issue in this study.

Hoary bats comprised 5% of total passes detected within the GWRA in 2007, and less than 2% of total passes in 2008. Activity by hoary bats appeared to peak in late August and early October in 2007, and in May of 2008, suggesting that fall and spring migration of this species through the area occurs at these times of year. The two peaks of activity in the fall may reflect migration of males and females (with juveniles) at different times of year, as has been observed in Alberta (E. Baerwald, pers comm.). Detection of hoary bats in June and July of both years suggest a small resident population as well which may be resident in the coniferous forest areas west of the GWRA. Allen's big-eared bat [*Idionycteris phyllotis*], spotted bat [*Euderma maculatum*], and big free-tailed bat [*Nyctinomops macrotis*] also produce distinctive calls that are readily identified

using Anabat. Big free-tailed bats were only detected between late September and late October of 2007, suggesting this species passes through the area at this time of year. Allen's big-eared bat was detected four times in October of 2007 and on two occasions (mid-April and mid-June) in 2008, suggesting infrequent use of the project area by this species, and possible fall and spring migration through the area. Spotted bats were not detected, suggesting these species do not make use of the area.

### **Sensitive Species Use and Exposure Risk**

Few federal and state species of concern were recorded during surveys at the GWRA including Cooper's hawk, western burrowing owl, bald eagle, and black-tailed prairie dog. Use of sensitive species at the GWRA is very low. Bald eagles were only observed in the winter and spring while Cooper's hawks were only observed during the fall and spring. The Arizona (Sonora) population of bald eagles is recognized as a distinct population segment and this population is currently petitioned for listing under the Endangered Species Act (ECOS 2008). Bald eagles are likely to infrequently transient over the GWRA. Two active Gunnison's prairie dog towns were mapped at the GWRA, along with one inactive town (Figure 9). One western burrowing owl was observed at an inactive prairie dog town during the breeding season and one individual was observed as an incidental species; however no nests were discovered during foot searches of prairie dog towns. The potential exists for burrowing owls to nest within the GWRA, particularly within prairie dog burrows. Western burrowing owls are a federally-listed species of concern and are protected by the Migratory Bird Treaty Act. Primary threats across North American range, including Mexico, are habitat loss and fragmentation primarily due to intensive agricultural and urban land conversion, and habitat degradation due to control and extermination of colonial burrowing mammals (Sheffield 1997). Avoidance of prairie dog town destruction is recommended to reduce the potential for impacts to Gunnison prairie dog populations and potentially nesting burrowing owls at the GWRA.

## REFERENCES

- Anderson, R.L., J. Tom, N. Neumann, and J.A. Cleckler. 1996. Avian Monitoring and Risk Assessment at Tehachapi Pass Wind Resource Area, California. California Energy Commission. Sacramento, California. 40 pp.
- Arizona Game and Fish Department (AZGFD). 2008a. Special Status Species. AZGFD, Heritage Data Management System. [http://www.azgfd.gov/w\\_c/edits/documents/ssspecies\\_bytaxon\\_001.pdf](http://www.azgfd.gov/w_c/edits/documents/ssspecies_bytaxon_001.pdf)
- Arizona Game and Fish Department (AZGFD). 2008b. Status Definitions. [http://www.azgfd.gov/w\\_c/edits/hdms\\_status\\_definitions.shtml](http://www.azgfd.gov/w_c/edits/hdms_status_definitions.shtml)
- Arnett, E.B. 2007. Written Statement to Oversight Hearing on “Gone with the Wind: Impacts of Wind Turbines on Birds and Bats” before the Subcommittee of Fisheries, Wildlife and Oceans US House of Representatives Committee on Natural Resources. May 2007.
- Arnett, E.B., W.P. Erickson, J. Kerns, and J. Horn. 2005. Relationships between Bats and Wind Turbines in Pennsylvania and West Virginia: An Assessment of Fatality Search Protocols, Patterns of Fatality, and Behavioral Interactions with Wind Turbines. Prepared for the Bats and Wind Energy Cooperative. March 2005.
- Arnett, E.B., W. K. Brown, W.P. Erickson, J.K. Fiedler, B.L. Hamilton, T.H. Henry, A.Jain, G.D. Johnson, R.R. Koford, C. P. Nicholson, T. J. O’connell, M.D. Piorkowski, and R.D. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. *J. Wildl. Manage.* 72:61–78; 2008.
- Baerwald, E. 2006. Bat Fatalities in Southern Alberta. Presented at the Wildlife Research Meeting VI, San Antonio, Texas. National Wind Coordinating Collaborative. November 2006.
- Bat Conservation International, (BCI). 2008. Species Profiles. BCI, Inc., Austin, Texas. Accessed June 2008. <http://www.batcon.org/SPprofiles/index.asp>
- Bonneville Power Administration (BPA). 1995. Proposed Columbia Wind Farm #1. Joint NEPA/SEPA Final Environmental Impact Statement. DOE/EIS-0206. Proposed by the Conservation and Renewable Energy System. Lead Agencies: Bonneville Power Administration and Klickitat County, Washington. September 1995.
- Cooper, B.A., R.J. Blaha, T.J. Mabee, and J.H. Plissner. 2004. A Radar Study of Nocturnal Bird Migration at the Proposed Cotterel Mountain Wind Energy Facility, Idaho, Fall 2003. Technical report prepared for Windland, Inc., Boise, Idaho, by ABR, Inc., Forest Grove, Oregon. January 2004.



- Demastes, J.W. and J.M. Trainer. 2000. Avian Risk, Fatality, and Disturbance at the IDWGP Wind Farm, Algona, Iowa. Final Report Submitted by the University of Northern Iowa, Cedar Falls, Iowa. 21 pp.
- Environmental Conservation Online System (ECOS). 2008. US Fish and Wildlife Service (USFWS) Threatened and Endangered Species System (TESS). USFWS Endangered Species Program Homepage: <http://www.fws.gov/endangered/> ECOS: [http://ecos.fws.gov/tess\\_public](http://ecos.fws.gov/tess_public)
- Erickson, W.P., J. Jeffrey, K. Kronner, and K. Bay. 2004. Stateline Wind Project Wildlife Monitoring Final Report: July 2001 - December 2003. Prepared for FPL Energy, Stateline Technical Advisory Committee, and the Oregon Energy Facility Siting Council, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Walla Walla, Washington, and Northwest Wildlife Consultants (NWC), Pendleton, Oregon. December 2004.
- Erickson, W.P., J.D. Jeffrey, and V.K. Poulton. 2008. Avian and Bat Monitoring: Year 1 Report. Puget Sound Energy Wild Horse Wind Project, Kittitas County, Washington. Prepared for Puget Sound Energy, Ellensburg, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 2008.
- Erickson, W., J. Jeffrey, D. Young, K. Bay, R. Good, K. Sernka, and K. Kronner. 2003a. Wildlife Baseline Study for the Kittitas Valley Wind Project: Summary of Results from 2002 Wildlife Surveys. Final Report February 2002– November 2002. Prepared for Zilkha Renewable Energy, Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. January 2003.
- Erickson, W.P., G.D. Johnson, M.D. Strickland, K. Kronner, P.S. Becker, and S. Orloff. 1999. Baseline Avian Use and Behavior at the CARES Wind Plant Site, Klickitat County, Washington. NREL/SR-500-26902. Final report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and IBIS Environmental Services, San Rafael, California.
- Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, Jr. , K.J. Sernka, and R.E. Good. 2001a. Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Bird Collision Mortality in the United States. National Wind Coordinating Committee (NWCC) Publication and Resource Document. Prepared for the NWCC by WEST, Inc., Cheyenne, Wyoming. August 2001.
- Erickson, W., G. Johnson, K. Bay, and K. Kronner. 2002a. Ecological Baseline Study for the Zintel Canyon Wind Project. Final Report April 2001 – June 2002. Technical report prepared for Energy Northwest. Prepared for Energy Northwest by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. June 2002.
- Erickson, W., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002b. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor

- Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared for Bonneville Power Administration, Portland, Oregon by WEST, Inc., Cheyenne, Wyoming. December 2002.
- Erickson, W., E. Lack, M. Bourassa, K. Sernka, and K. Kronner. 2001b. Wildlife Baseline Study for the Nine Canyon Wind Project, Final Report May 2000-October 2001 Technical report prepared for Energy Northwest, Richland, Washington.
- Erickson, W., D. Young, G. Johnson, J. Jeffrey, K. Bay, R. Good, and H. Sawyer. 2003b. Wildlife Baseline Study for the Wild Horse Wind Project. Summary of Results from 2002-2003 Wildlife Surveys May 10, 2002- May 22, 2003. Draft report prepared for Zilkha Renewable Energy, Portland, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. November 2003.
- Fiedler, J.K. 2004. Assessment of Bat Mortality and Activity at Buffalo Mountain Windfarm, Eastern Tennessee. M.S. Thesis. University of Tennessee, Knoxville, Tennessee.
- Gannon, W.L., R.E. Sherwin, and S. Haymond. 2003. On the Importance of Articulating Assumptions When Conducting Acoustic Studies of Habitat Use by Bats. Wildlife Society Bulletin 31: 45-61.
- Gruver, J.C. 2002. Assessment of Bat Community Structure and Roosting Habitat Preferences for the Hoary Bat (*Lasiurus cinereus*) near Foote Creek Rim, Wyoming. M.S. Thesis. University of Wyoming, Laramie, Wyoming.
- Harvey, M.J., J.S. Altenbach, and T.L. Best. 1999. Bats of the United States. Arkansas Game & Fish Commission and US Fish and Wildlife Service, Arkansas.
- Hayes, J.P. 1997. Temporal Variation in Activity of Bats and the Design of Echolocation-Monitoring Studies. Journal of Mammalogy 78: 514-524.
- Howe, R.W., W. Evans, and A.T. Wolf. 2002. Effects of wind turbines on birds and bats in Northeastern Wisconsin. Technical report submitted to Wisconsin Public Service Corporation and Madison Gas and Electric Company.
- Howell, J.A. and J. Noone. 1992. Examination of Avian Use and Mortality at a U.S. Windpower Wind Energy Development Site, Montezuma Hills, Solano County, California. Final Report to Solano County Department of Environmental Management, Fairfield, California. 41pp.
- Jain, A. 2005. Bird and Bat Behavior and Mortality at a Northern Iowa Windfarm. M.S. Thesis. Iowa State University, Ames, Iowa.
- Jeffrey, J.D., W.P. Erickson, K.J. Bay, V.K. Poulton, W.L. Tidhar, and J.E. Baker. 2008. Wildlife Baseline Studies for the Golden Hills Wind Resource Area, Sherman County, Oregon. Final Report May 2006 – October 2007. Prepared for BP Alternative Energy North America Inc., Houston, Texas, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

- Johnson, G.D. 2004. Analysis of Potential Wildlife and Habitat Impacts from the Klondike II Project, Sherman County, Oregon. Technical report prepared by WEST, Inc., for CH2M HILL and PPM Energy.
- Johnson, G.D. 2005. A Review of Bat Mortality at Wind-Energy Developments in the United States. *Bat Research News* 46(2): 45-49.
- Johnson, G.D., W.P. Erickson, K. Bay, and K. Kronner. 2002. Baseline Ecological Studies for the Klondike Wind Project, Sherman County, Oregon. Final report prepared for Northwestern Wind Power, Goldendale, Washington, by Western EcoSystems Technology, Inc. (WEST) Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon. May 29, 2002.
- Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2000a. Avian Monitoring Studies at the Buffalo Ridge Wind Resource Area, Minnesota Wind Resource Area: Results of a 4-Year Study. Final report prepared for Northern States Power Company, Minneapolis, Minnesota, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. September 22, 2000. 212 pp. <http://www.west-inc.com>
- Johnson, G.D., W.P. Erickson, J. White, and R. McKinney. 2003b. Avian and Bat Mortality During the First Year of Operation at the Klondike Phase I Wind Project, Sherman County, Oregon. Technical report prepared for Northwestern Wind Power, Goldendale, Washington, by WEST, Inc., Cheyenne, Wyoming. March 2003. <http://www.west-inc.com>
- Johnson, G., J. Jeffrey, J. Baker, and K. Bay. 2007. Baseline Avian Studies for the Windy Flats Wind Energy Project, Klickitat County, Washington. Prepared for Windy Point Partners, LLC., by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. May 29, 2007.
- Johnson, G.D., M.K. Perlik, W.P. Erickson, and M.D. Strickland. 2005. Bat Activity, Composition and Collision Mortality at a Large Wind Plant in Minnesota. *Wildlife Society Bulletin* 32(4): 1278-1288.
- Johnson, G.D., D.P. Young, Jr., W.P. Erickson, C.E. Derby, M.D. Strickland, and R.E. Good. 2000b. Wildlife Monitoring Studies, SeaWest Windpower Plant, Carbon County, Wyoming, 1995-1999. Final report prepared for SeaWest Energy Corporation, San Diego, California, and the Bureau of Land Management, Rawlins, Wyoming, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 9, 2000. <http://www.west-inc.com>
- Kerlinger, P. 1997. A Study of Avian Fatalities at the Green Mountain Power Corporation's Searsburg, Vermont Windpower Facility - 1997. Prepared for Vermont Department of Public Service, Green Mountain Power Corporation, National Renewable Energy Laboratory and Vermont Environmental Research Associates. 12 pp.
- Kerlinger, P. 2005. Summary of Bird Studies and Collision Rates at Wind Power Projects.

- Kerlinger, P., L. Culp, and R. Curry. 2005. Post-Construction Avian Monitoring Study for the High Winds Wind Power Project, Solano County, California. Year One Report. Prepared for High Winds, LLC and FPL Energy.
- Kerlinger, P., R. Curry, L. Culp, A. Jain, C. Wilkerson, B. Fischer, and A. Hasch. 2006. Post-Construction Avian and Bat Fatality Monitoring for the High Winds Wind Power Project, Solano County, California. Prepared for High Winds LLC, FPL Energy by Curry and Kerlinger, LLC. April 2006.
- Kerlinger, P., R. Curry, and R. Ryder. 2000. Ponnequin Wind Energy Project: Reference Site Avian Study, January 1, 1998 - December 31, 1998. NREL/SR-500-27546.
- Koford, R., A. Jain, G. Zenner, and A. Hancock. 2005. Avian Mortality Associated with the Top of Iowa Wind Farm. Progress Report, Calendar Year 2004. February 2005. Iowa Cooperative Fish and Wildlife Research Unit, Iowa State University. Ames, Iowa. 12 pp. [http://www.horizonwind.com/images\\_projects/what\\_were\\_doing/TOI\\_Avian\\_Annual\\_Intrim\\_Report\\_2004\\_020205.pdf](http://www.horizonwind.com/images_projects/what_were_doing/TOI_Avian_Annual_Intrim_Report_2004_020205.pdf)
- Kunz, T.H., E.B. Arnett, B.M. Cooper, W.P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin, M.D. Strickland, R.W. Thresher, and M.D. Tuttle. 2007a. Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses. *Frontiers in Ecology and the Environment* 5(6): 315-324.
- Kunz, T.H., E.B. Arnett, B.M. Cooper, W.P. Erickson, R.P. Larkin, T. Mabee, M.L. Morrison, M.D. Strickland, and J.M. Szewczak. 2007b. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. *Journal of Wildlife Management* 71(8): 2449-2486.
- Mabee, T.J., B.A. Cooper, C.M. Grinnell, and J.B. Barna. 2005. Baseline Avian Use at the Proposed Klondike III Wind Power Project, Oregon, Winter 2004 - Spring 2005. Final Report. Prepared for David Evans and Associates Inc., Portland Oregon, by ABR, Inc. Environmental Research and Services, Forest Grove, Oregon. June 2005.
- Madders, M. and D.P. Whitfield. 2006. Upland Raptors and the Assessment of Wind Farm Impacts. *Ibis* 148: 43-56.
- National Research Council (NRC). 2007. Environmental Impacts of Wind-Energy Projects. National Academies Press. Washington, D.C.
- National Wind Coordinating Committee (NWCC). 2004. Wind Turbine Interactions with Birds and Bats: A Summary of Research Results and Remaining Questions. Fact Sheet, Second Edition. November 2004.
- Nicholson, C.P. 2003. Buffalo Mountain Windfarm Bird and Bat Mortality Monitoring Report: October 2001 - September 2002. Tennessee Valley Authority, Knoxville, Tennessee. February 2003.

- Norberg, U.M. and J.M.V. Rayner. 1987. Ecological Morphology and Flight in Bats (Mammalia; Chiroptera): Wing Adaptations, Flight Performance, Foraging Strategy and Echolocation. *Philosophical Transactions of the Royal Society of London* 316: 335-427.
- Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). 2004. Ecological Baseline Studies for the Roosevelt Wind Project, Klickitat County, Washington. Final Report. Prepared by NWC, Pendleton, Oregon, and WEST, Inc., Cheyenne, Wyoming. September 2004
- Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). 2005a. Ecological Baseline Studies and Wildlife Impact Assessment for the White Creek Wind Power Project, Klickitat County, Washington. Prepared for Last Mile Electric Cooperative, Goldendale, Washington, by Northwest Wildlife Consultants, Inc., Goldendale, Washington, and Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. January 12, 2005.
- Northwest Wildlife Consultants, Inc. (NWC) and Western Ecosystems Technology, Inc. (WEST). 2005b. Wildlife Baseline Study for the Leaning Juniper Wind Power Project, Gilliam County, Oregon. Prepared for PPM Energy, Portland, Oregon and CH2M HILL, Portland, Oregon by NWC, Pendleton, Oregon, and WEST, Inc., Cheyenne, Wyoming. November 3, 2005.
- Northwest Wildlife Consultants, Inc. (NWC) and Western EcoSystems Technology, Inc. (WEST). 2007. Avian and Bat Monitoring Report for the Klondike II Wind Power Project. Sherman County, Oregon. Prepared for PPM Energy, Portland, Oregon. Managed and conducted by NWC, Pendleton, Oregon. Analysis conducted by WEST, Cheyenne, Wyoming. July 17, 2007.
- O'Shea, T.J., M.A. Bogan, and L.E. Ellison. 2003. Monitoring Trends in Bat Populations of the U.S. And Territories: Status of the Science and Recommendations for the Future. *Wildlife Society Bulletin* 31: 16-29.
- Orloff, S. and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final Report P700-92-001 to Alameda, Costra Costa, and Solano Counties, and the California Energy Commission, Sacramento, California, by Biosystems Analysis, Inc., Tiburon, California. March 1992.
- Reynolds, R.T., J.M. Scott, and R.A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. *Condor* 82(3): 309-313.
- Sheffield, S.R. 1997. Current Status, Distribution, and Conservation of the Burrowing Owl (*Speotyto cunicularia*) in Midwestern and Western North America. In *Biology and Conservation of Owls of the Northern Hemisphere*. USDA Forest Service. General Technical Report NC-190. PP. 399-408.
- Smallwood, K.S. and C.G. Thelander. 2004. Developing Methods to Reduce Bird Fatalities in the Altamont Wind Resource Area. Final report prepared by BioResource Consultants for

- the California Energy Commission, Public Interest Energy Research-Environmental Area, under Contract No. 500-01-019 (L. Spiegel, Project Manager).
- Tierney, R. 2007. Buffalo Gap I Wind Farm Avian Mortality Study, February 2006 - January 2007, Final Survey Report. Prepared for AES Seawest, Inc., by TRC.
- URS Corporation and Western EcoSystems Technology, Inc. (WEST). 2001. Avian Baseline Study for the Stateline Project, Vansycle Ridge, Oregon and Washington. Technical report prepared for ESI Vansycle Partners, L.P.
- URS Corporation, Western EcoSystems Technology, Inc. (WEST), and Northwest Wildlife Consultants, Inc. (NWC). 2001. Avian Baseline Study for the Stateline Project. Prepared for FPL Energy Vansycle, LLC, Juno Beach, Florida.
- US Fish and Wildlife Service (USFWS). 2002. Birds of Conservation Concern 2002. Division of Migratory Bird Management. Arlington, Virginia. 99 pp.
- Usgaard, R.E., D.E. Naugle, R.G. Osborn, and K.F. Higgins. 1997. Effects of Wind Turbines on Nesting Raptors at Buffalo Ridge in Southwestern Minnesota. Proceedings of the South Dakota Academy of Science 76: 113-117.
- Western Ecosystems Technology, Inc. (WEST). 2005a. Ecological Baseline Study at the Elkhorn Wind Power Project. Exhibit A. Final report prepared for Zilkha Renewable Energy, LLC., Portland, Oregon, by WEST, Cheyenne, Wyoming. June 2005.
- Western EcoSystems Technology, Inc. (WEST). 2005b. Ecological Baseline Study for the Proposed Reardon Wind Project, Lincoln County, Washington. Draft Final Report. Prepared for Energy Northwest, Richland, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. June 2005.
- Western EcoSystems Technology, Inc. (WEST). 2005c. Wildlife and Habitat Baseline Study for the Proposed Biglow Canyon Wind Power Project, Sherman County, Oregon. March 2004 - August 2005. Prepared for Orion Energy LLC., Oakland, California. October, 2005. WEST. Cheyenne, Wyoming.
- Western EcoSystems Technology, Inc. (WEST). 2006a. Diablo Winds Wildlife Monitoring Progress Report, March 2005 - February 2006. Technical report submitted to FPL Energy and Alameda County California. WEST. Cheyenne, Wyoming.
- Western EcoSystems Technology, Inc. (WEST). 2006b. Wildlife Baseline Study for the North Valley County Wind Project: Summary of Results from 2006 Wildlife Surveys. Prepared for POWER Engineers, Boise, Idaho, and Wind Hunter, LLC., Grapevine, Texas. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. December 8, 2006.
- Western EcoSystems Technology, Inc. (WEST). 2007. Wildlife and Habitat Baseline Study for the Vantage Wind Power Project, Kittitas County, Washington. Draft report prepared for

- Invenergy by Western EcoSystems Technology, Inc. (WEST), Cheyenne Wyoming and Walla Walla, Washington. June 2007.
- Western EcoSystems Technology, Inc. (WEST), EDAW, Inc., and Bloom Biological, Inc. 2007. Baseline Avian Use and Risk Assessment for the Homestead Wind Energy Project, Kern County, California. 2005 – 2006. Prepared for Horizon Wind Energy by Western EcoSystems Technology, Inc. (WEST), EDAW, Inc., San Diego, California, and Bloom Biological, Inc., Santa Anna, California. April 19, 2007.
- Western EcoSystems Technology, Inc. (WEST) and Northwest Wildlife Consultants, Inc. (NWC). 2002. Baseline Avian Studies for the Proposed Maiden Wind Farm, Yakima and Benton Counties, Washington. Final Report, April 2001-April 2002. Prepared for Bonneville Power Administration, Portland, Oregon, by WEST, Cheyenne, Wyoming, and NWC, Inc., Pendleton, Oregon. November 20, 2002. WEST. Cheyenne, Wyoming. <http://www.west-inc.com>
- Western EcoSystems Technology, Inc. (WEST) and the Colorado Plateau Research Station (CPRS). 2006. Avian Studies for the Proposed Sunshine Wind Park, Coconino County, Arizona. Prepared for Sunshine Arizona Wind Energy, LLC., Flagstaff, Arizona, by WEST, Cheyenne, Wyoming, and the CPRS, Northern Arizona University, Flagstaff, Arizona. May 2006.
- White, E.P. and S.D. Gehrt. 2001. Effects of Recording Media on Echolocation Data from Broadband Bat Detectors. *Wildlife Society Bulletin* 29: 974-978.
- Woodward-Clyde International-Americas, (WCIA) and Western EcoSystems Technology, Inc. (WEST). 1997. Avian Baseline Study for the Vansycle Ridge Project - Vansycle Ridge, Oregon and Wildlife Mortality Studies, Vansycle Wind Project, Washington. Prepared for Esi Vansycle Partners, L.P., North Palm Beach, Florida.
- Young, D.P., Jr. and W.P. Erickson. 2003a. Cumulative Impacts Analysis for Avian and Other Wildlife Resources from Proposed Wind Projects in Kittitas County, Washington. Final Report to Kittitas County and Energy Facilities Site Evaluation Council, State of Washington. Prepared by Western EcoSystems Technology, Inc.(WEST), Cheyenne, Wyoming.
- Young, D. P. Jr., W.P. Erickson, K.J. Bay, J.D. Jeffrey, B.G. Lack, R.E. Good, and H.H. Sawyer. 2003b. Baseline Avian Studies for the Proposed Hopkins Ridge Wind Project, Columbia County, Washington. Final Report, March 2002 - March 2003. Prepared for RES North America, LLC., Portland, Oregon, by Western EcoSystems Technology, Inc.(WEST), Cheyenne, Wyoming. April 30, 2003.
- Young, D. P. Jr., W.P. Erickson, K.J. Bay, J.D. Jeffrey, B.G. Lack, and H.H. Sawyer. 2003c. Baseline Avian Studies for the Proposed Desert Claim Wind Power Project, Kittitas County, Washington. Final Report. Prepared for Desert Claim Wind Power, LLC, Ellensburg, Washington, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 2003.



- Young, D. P. Jr., W.P. Erickson, J.D. Jeffrey, K. Bay, R.E. Good, and E.G. Lack. 2003d. Avian and Sensitive Species Baseline Study Plan and Final Report. Eurus Combine Hills Turbine Ranch, Umatilla County, Oregon. Technical report prepared for Eurus Energy America Corporation, San Diego, California and Aeropower Services, Inc., Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. March 10, 2003.
- Young, D.P., Jr., W.P. Erickson, J.D. Jeffrey, K. Bay, and M. Bourassa. 2005. Eurus Combine Hills Turbine Ranch. Phase 1 Post Construction Wildlife Monitoring Final Report February 2004 February 2005. Technical report for Eurus Energy America Corporation and the Combine Hills Technical Advisory Committee, Umatilla County, Oregon. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, and Northwest Wildlife Consultants, Inc. (NWC), Pendleton, Oregon.
- Young, D.P. Jr., W.P. Erickson, J.D. Jeffrey, and V.K. Poulton. 2007a. Puget Sound Energy, Hopkins Ridge Wind Project Phase 1, Post-Construction Avian and Bat Monitoring, First Annual Report, January - December 2006. Technical report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming, for Puget Sound Energy.
- Young, D.P. Jr., G.D. Johnson, V.K. Poulton, and K. Bay. 2007b. Ecological Baseline Studies for the Hatchet Ridge Wind Energy Project, Shasta County, California. Prepared for Hatchet Ridge Wind, LLC, Portland, Oregon by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. August 31, 2007.
- Young, D.P. Jr., V.K. Poulton, and K. Bay. 2007c. Ecological Baseline Studies Report. Proposed Dry Lake Wind Project, Navajo County, Arizona. Prepared for PPM Energy, Portland, Oregon, by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. July 1, 2007.

**Table 1. Summary of bird use, species richness, and sample size by season and overall during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29,2008.**

<b>Season</b>	<b># of Visits</b>	<b>Mean Use</b>	<b># Species /Survey</b>	<b># Species</b>	<b># Surveys Conducted</b>
Summer	2	3.78	1.88	19	42
Fall	7	11.60	2.68	35	169
Winter	4	13.72	2.10	21	91
Spring	6	6.97	2.11	40	144
<b>Overall</b>	<b>19</b>	<b>8.37</b>	<b>2.19</b>	<b>55</b>	<b>446</b>

**Table 2. Total number of groups and individuals for each bird type and species by season and overall during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# Grps	# obs	# grps	# obs	# grps	# obs
<b>Waterfowl</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>10</b>	<b>6</b>	<b>39</b>	<b>4</b>	<b>9</b>	<b>14</b>	<b>58</b>
bufflehead	<i>Bucephala albeola</i>	0	0	0	0	0	0	3	7	3	7
mallard	<i>Anas platyrhynchos</i>	0	0	0	0	1	4	0	0	1	4
redhead	<i>Aythya americana</i>	0	0	0	0	1	2	1	2	2	4
unidentified duck		0	0	4	10	4	33	0	0	8	43
<b>Shorebirds</b>		<b>0</b>	<b>0</b>	<b>12</b>	<b>38</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>9</b>	<b>19</b>	<b>47</b>
killdeer	<i>Charadrius vociferus</i>	0	0	5	10	0	0	7	9	12	19
unidentified dowitcher		0	0	5	25	0	0	0	0	5	25
unidentified yellowlegs		0	0	2	3	0	0	0	0	2	3
<b>Raptors</b>		<b>16</b>	<b>21</b>	<b>174</b>	<b>285</b>	<b>13</b>	<b>13</b>	<b>37</b>	<b>46</b>	<b>240</b>	<b>365</b>
<u>Accipiters</u>		0	0	3	3	0	0	1	1	4	4
Cooper's hawk	<i>Accipiter cooperii</i>	0	0	2	2	0	0	1	1	3	3
sharp-shinned hawk	<i>Accipter striatus</i>	0	0	1	1	0	0	0	0	1	1
<u>Buteos</u>		5	7	23	23	6	6	12	16	46	52
red-tailed hawk	<i>Buteo jamaicensis</i>	5	7	23	23	6	6	12	16	46	52
<u>Northern Harrier</u>		0	0	6	6	1	1	1	1	8	8
northern harrier	<i>Circus cyaneus</i>	0	0	6	6	1	1	1	1	8	8
<u>Eagles</u>		2	2	4	4	2	2	5	8	13	16
bald eagle	<i>Haliaeetus leucocephalus</i>	0	0	0	0	1	1	1	1	2	2
golden eagle	<i>Aquila chrysaetos</i>	2	2	4	4	1	1	1	1	8	8
unidentified eagle		0	0	0	0	0	0	3	6	3	6
<u>Falcons</u>		5	7	66	98	3	3	16	18	90	126
American kestrel	<i>Falco sparverius</i>	5	7	56	87	2	2	13	14	76	110
merlin	<i>Falco columbarius</i>	0	0	1	1	0	0	0	0	1	1
prairie falcon	<i>Falco mexicanus</i>	0	0	2	2	0	0	2	2	4	4

**Table 2. Total number of groups and individuals for each bird type and species by season and overall during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# Grps	# obs	# grps	# obs	# grps	# obs
unidentified falcon		0	0	7	8	1	1	1	2	9	11
<i>Owls</i>		0	0	0	0	0	0	1	1	1	1
western burrowing owl	<i>Athene cunicularia hypugaea</i>	0	0	0	0	0	0	1	1	1	1
<i>Other Raptors</i>		4	5	72	151	1	1	1	1	78	158
unidentified hawk		0	0	15	18	1	1	1	1	17	20
unidentified raptor		4	5	57	133	0	0	0	0	61	138
<b>Vultures</b>		<b>21</b>	<b>26</b>	<b>24</b>	<b>32</b>	<b>0</b>	<b>0</b>	<b>23</b>	<b>38</b>	<b>68</b>	<b>96</b>
turkey vulture	<i>Cathartes aura</i>	21	26	24	32	0	0	23	38	68	96
<b>Doves/Pigeons</b>		<b>5</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>6</b>	<b>12</b>
mourning dove	<i>Zenaida macroura</i>	3	5	0	0	0	0	1	3	4	8
unidentified dove		2	4	0	0	0	0	0	0	2	4
<b>Passerines</b>		<b>54</b>	<b>106</b>	<b>263</b>	<b>1,558</b>	<b>193</b>	<b>1,169</b>	<b>262</b>	<b>929</b>	<b>772</b>	<b>3,762</b>
American robin	<i>Turdus migratorius</i>	1	1	5	22	0	0	0	0	6	23
black-throated sparrow	<i>Amphispiza bilineata</i>	1	1	0	0	0	0	2	19	3	20
bronzed cowbird	<i>Molothrus aeneus</i>	0	0	0	0	0	0	1	2	1	2
brown-headed cowbird	<i>Molothrus ater</i>	0	0	0	0	0	0	1	1	1	1
canyon wren	<i>Catherpes mexicanus</i>	0	0	0	0	0	0	1	1	1	1
Cassin's finch	<i>Carpodacus purpureus</i>	0	0	0	0	1	1	1	1	2	2
common grackle	<i>Quiscalus quiscula</i>	0	0	0	0	0	0	2	3	2	3
common raven	<i>Corvus corax</i>	6	8	0	0	0	0	0	0	6	8
common yellowthroat	<i>Geothlypis trichas</i>	0	0	2	2	0	0	0	0	2	2
dark-eyed junco	<i>Junco hyemalis</i>	0	0	4	23	28	144	1	2	33	169
gray vireo	<i>Vireo vicinior</i>	0	0	0	0	0	0	1	3	1	3
horned lark	<i>Eremophila alpestris</i>	9	18	41	463	29	649	53	390	132	1,520
house finch	<i>Carpodacus mexicanus</i>	1	1	8	112	1	1	0	0	10	114
Juniper titmouse	<i>Baeolophus ridgwayi</i>	0	0	2	2	1	1	3	5	6	8

**Table 2. Total number of groups and individuals for each bird type and species by season and overall during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# Grps	# obs	# grps	# obs	# grps	# obs
lark sparrow	<i>Chondestes grammacus</i>	8	37	0	0	0	0	9	53	17	90
loggerhead shrike	<i>Lanius ludovicianus</i>	3	4	16	17	1	2	9	9	29	32
mountain bluebird	<i>Sialia currucoides</i>	1	4	37	194	27	104	4	6	69	308
northern mockingbird	<i>Mimus polyglottos</i>	10	11	0	0	0	0	33	59	43	70
pinyon jay	<i>Gymnorhinus cyanocephalus</i>	2	4	10	127	4	34	10	31	26	196
rock wren	<i>Salpinctes obsoletus</i>	1	1	3	4	0	0	1	1	5	6
Say's phoebe	<i>Sayornis saya</i>	4	5	0	0	0	0	4	5	8	10
Scott's oriole	<i>Icterus parisorum</i>	0	0	0	0	0	0	1	2	1	2
Steller's jay	<i>Cyanocitta stelleri</i>	0	0	1	1	0	0	0	0	1	1
tufted titmouse	<i>Baeolophus bicolor</i>	1	5	0	0	0	0	0	0	1	5
unidentified finch		0	0	18	122	0	0	2	21	20	143
unidentified flycatcher		0	0	16	28	0	0	1	2	17	30
unidentified jay		1	1	0	0	0	0	0	0	1	1
unidentified kingbird		0	0	2	10	0	0	6	7	8	17
unidentified meadowlark		0	0	0	0	0	0	3	5	3	5
unidentified passerine		2	2	0	0	0	0	0	0	2	2
unidentified raven		0	0	57	147	80	112	96	189	233	448
unidentified sparrow		0	0	3	48	0	0	3	14	6	62
unidentified swallow		3	3	12	92	0	0	9	80	24	175
unidentified vireo		0	0	1	1	0	0	0	0	1	1
unidentified wren		0	0	3	3	0	0	0	0	3	3
western bluebird	<i>Sialia mexicana</i>	0	0	7	63	15	101	0	0	22	164
western flycatcher	<i>Empidonax difficilis</i>	0	0	6	15	0	0	0	0	6	15
western meadowlark	<i>Sturnella neglecta</i>	0	0	5	29	5	19	2	2	12	50
western scrub-jay	<i>Aphelocoma californica</i>	0	0	0	0	1	1	0	0	1	1
western tanager	<i>Piranga ludoviciana</i>	0	0	0	0	0	0	1	1	1	1

**Table 2. Total number of groups and individuals for each bird type and species by season and overall during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Type	Scientific Name	Summer		Fall		Winter		Spring		Total	
		# grps	# obs	# grps	# obs	# Grps	# obs	# grps	# obs	# grps	# obs
white-crowned sparrow	<i>Zonotrichia leucophrys</i>	0	0	3	8	0	0	2	15	5	23
yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	0	0	1	25	0	0	0	0	1	25
<b>Other Birds</b>		<b>0</b>	<b>0</b>	<b>16</b>	<b>20</b>	<b>7</b>	<b>7</b>	<b>10</b>	<b>11</b>	<b>33</b>	<b>38</b>
broad-tailed hummingbird	<i>Selasphorus platycercus</i>	0	0	0	0	0	0	6	7	6	7
downy woodpecker	<i>Picoides pubescens</i>	0	0	1	2	0	0	0	0	1	2
greater roadrunner	<i>Geococcyx californianus</i>	0	0	0	0	1	1	0	0	1	1
northern flicker	<i>Colaptes auratus</i>	0	0	13	16	6	6	3	3	22	25
unidentified hummingbird		0	0	0	0	0	0	1	1	1	1
unidentified woodpecker		0	0	2	2	0	0	0	0	2	2
<b>Unidentified Birds</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>
unidentified bird		0	0	3	45	0	0	0	0	3	45
<b>Overall</b>		<b>96</b>	<b>162</b>	<b>496</b>	<b>1,988</b>	<b>219</b>	<b>1,228</b>	<b>344</b>	<b>1,045</b>	<b>1,155</b>	<b>4,423</b>

<sup>a</sup> All individuals included even those outside the half-mile (800-m) radius plot.

**Table 3. Mean bird use (number/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Types	Use				% Composition				% Frequency			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
<b>Waterfowl</b>	<b>0</b>	<b>0.06</b>	<b>0.41</b>	<b>0.06</b>	<b>0</b>	<b>0.5</b>	<b>3.0</b>	<b>0.9</b>	<b>0</b>	<b>2.1</b>	<b>4.3</b>	<b>2.8</b>
bufflehead	0	0	0	0.05	0	0	0	0.7	0	0	0	2.1
mallard	0	0	0.04	0	0	0	0.3	0	0	0	1.0	0
redhead	0	0	0.02	0.01	0	0	0.2	0.2	0	0	1.0	0.7
unidentified duck	0	0.06	0.35	0	0	0.5	2.5	0	0	2.1	4.3	0
<b>Shorebirds</b>	<b>0</b>	<b>0.23</b>	<b>0</b>	<b>0.06</b>	<b>0</b>	<b>2.0</b>	<b>0</b>	<b>0.9</b>	<b>0</b>	<b>6.0</b>	<b>0</b>	<b>4.9</b>
killdeer	0	0.06	0	0.06	0	0.5	0	0.9	0	3.0	0	4.9
unidentified dowitcher	0	0.15	0	0	0	1.3	0	0	0	3.0	0	0
unidentified yellowlegs	0	0.02	0	0	0	0.2	0	0	0	1.2	0	0
<b>Raptors</b>	<b>0.51</b>	<b>1.68</b>	<b>0.13</b>	<b>0.24</b>	<b>13.6</b>	<b>14.4</b>	<b>1.0</b>	<b>3.5</b>	<b>31.6</b>	<b>63.5</b>	<b>13.3</b>	<b>18.8</b>
<i>Accipiters</i>	0	0.02	0	0.01	0	0.2	0	0.1	0	1.8	0	0.7
Cooper's hawk	0	0.01	0	0.01	0	0.1	0	0.1	0	1.2	0	0.7
sharp-shinned hawk	0	0.01	0	0	0	0.1	0	0	0	0.6	0	0
<i>Buteos</i>	0.17	0.13	0.05	0.08	4.6	1.2	0.4	1.2	9.8	11.6	5.5	6.9
red-tailed hawk	0.17	0.13	0.05	0.08	4.6	1.2	0.4	1.2	9.8	11.6	5.5	6.9
<i>Northern Harrier</i>	0	0.04	0.01	0.01	0	0.3	0.1	0.1	0	3.6	1.1	0.7
northern harrier	0	0.04	0.01	0.01	0	0.3	0.1	0.1	0	3.6	1.1	0.7
<i>Eagles</i>	0.05	0.02	0.02	0.01	1.2	0.2	0.2	0.2	2.3	2.4	2.2	1.4
bald eagle	0	0	0.01	0.01	0	0	0.1	0.1	0	0	1.0	0.7
golden eagle	0.05	0.02	0.01	0.01	1.2	0.2	0.1	0.1	2.3	2.4	1.2	0.7
unidentified eagle	0	0	0	0	0	0	0	0	0	0	0	0
<i>Falcons</i>	0.17	0.58	0.03	0.13	4.5	5.0	0.2	1.8	12.0	30.7	3.3	9.7
American kestrel	0.17	0.52	0.02	0.10	4.5	4.4	0.2	1.4	12.0	26.5	2.2	8.3
merlin	0	0.01	0	0	0	0.1	0	0	0	0.6	0	0
prairie falcon	0	0.01	0	0.01	0	0.1	0	0.2	0	1.2	0	1.4
unidentified falcon	0	0.05	0.01	0.01	0	0.4	0.1	0.2	0	3.0	1.0	0.7
<i>Owls</i>	0	0	0	0.01	0	0	0	0.1	0	0	0	0.7
burrowing owl	0	0	0	0.01	0	0	0	0.1	0	0	0	0.7



**Table 3. Mean bird use (number/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Types	Use				% Composition				% Frequency			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
<i>Other Raptors</i>	0.13	0.88	0.01	0	3.3	7.6	0.1	0	10.0	33.1	1.2	0
unidentified hawk	0	0.11	0.01	0	0	0.9	0.1	0	0	7.7	1.2	0
unidentified raptor	0.13	0.78	0	0	3.3	6.7	0	0	10.0	25.4	0	0
<b>Vultures</b>	<b>0.53</b>	<b>0.19</b>	<b>0</b>	<b>0.19</b>	<b>13.9</b>	<b>1.6</b>	<b>0</b>	<b>2.8</b>	<b>33.2</b>	<b>13.1</b>	<b>0</b>	<b>11.8</b>
turkey vulture	0.53	0.19	0	0.19	13.9	1.6	0	2.8	33.2	13.1	0	11.8
<b>Doves/Pigeons</b>	<b>0.21</b>	<b>0</b>	<b>0</b>	<b>0.02</b>	<b>5.7</b>	<b>0</b>	<b>0</b>	<b>0.3</b>	<b>11.8</b>	<b>0</b>	<b>0</b>	<b>0.7</b>
mourning dove	0.11	0	0	0.02	3.0	0	0	0.3	6.8	0	0	0.7
unidentified dove	0.10	0	0	0	2.6	0	0	0	5.0	0	0	0
<b>Passerines</b>	<b>2.53</b>	<b>9.07</b>	<b>13.11</b>	<b>6.31</b>	<b>66.9</b>	<b>78.2</b>	<b>95.5</b>	<b>90.5</b>	<b>66.1</b>	<b>80.2</b>	<b>93.6</b>	<b>87.5</b>
American robin	0.03	0.13	0	0	0.7	1.1	0	0	2.5	2.4	0	0
black-throated sparrow	0.02	0	0	0.13	0.6	0	0	1.9	2.3	0	0	1.4
bronzed cowbird	0	0	0	0.01	0	0	0	0.2	0	0	0	0.7
brown-headed cowbird	0	0	0	0.01	0	0	0	0.1	0	0	0	0.7
canyon wren	0	0	0	0.01	0	0	0	0.1	0	0	0	0.7
Cassin's finch	0	0	0.01	0.01	0	0	0.1	0.1	0	0	1.0	0.7
common grackle	0	0	0	0.02	0	0	0	0.3	0	0	0	1.4
common raven	0.18	0	0	0	4.8	0	0	0	13.6	0	0	0
common yellowthroat	0	0.01	0	0	0	0.1	0	0	0	1.2	0	0
dark-eyed junco	0	0.14	1.61	0.01	0	1.2	11.7	0.2	0	2.4	31.0	0.7
gray vireo	0	0	0	0.02	0	0	0	0.3	0	0	0	0.7
horned lark	0.41	2.52	7.35	2.71	10.8	21.7	53.5	38.9	11.4	24.0	29.6	35.4
house finch	0.03	0.68	0.01	0	0.7	5.8	0.1	0	2.5	4.8	1.0	0
Juniper titmouse	0	0.01	0.01	0.03	0	0.1	0.1	0.5	0	1.2	1.0	1.4
lark sparrow	0.91	0	0	0.37	24.1	0	0	5.3	19.1	0	0	6.3
loggerhead shrike	0.10	0.10	0.02	0.06	2.6	0.9	0.2	0.9	7.3	8.7	1.0	6.3
mountain bluebird	0.10	1.17	1.17	0.04	2.6	10.1	8.5	0.6	2.5	20.8	26.1	2.8
northern mockingbird	0.25	0	0	0.41	6.6	0	0	5.9	13.6	0	0	20.1
pinon jay	0.10	0.76	0.38	0.22	2.6	6.5	2.8	3.1	5.0	6.0	4.3	6.9

**Table 3. Mean bird use (number/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Types	Use				% Composition				% Frequency			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
rock wren	0.02	0.02	0	0.01	0.6	0.2	0	0.1	2.3	1.8	0	0.7
Say's phoebe	0.13	0	0	0.03	3.3	0	0	0.5	10.0	0	0	2.8
Scott's oriole	0	0	0	0.01	0	0	0	0.2	0	0	0	0.7
Steller's jay	0	0.01	0	0	0	0.1	0	0	0	0.6	0	0
tufted titmouse	0.11	0	0	0	3.0	0	0	0	2.3	0	0	0
unidentified finch	0	0.71	0	0.15	0	6.1	0	2.1	0	10.5	0	1.4
unidentified flycatcher	0	0.17	0	0.01	0	1.4	0	0.2	0	8.4	0	0.7
unidentified jay	0.03	0	0	0	0.7	0	0	0	2.5	0	0	0
unidentified kingbird	0	0.06	0	0.05	0	0.5	0	0.7	0	1.2	0	4.2
unidentified meadowlark	0	0	0	0.03	0	0	0	0.5	0	0	0	2.1
unidentified passerine	0.05	0	0	0	1.2	0	0	0	4.5	0	0	0
unidentified raven	0	0.88	1.22	1.17	0	7.5	8.9	16.7	0	28.6	67.4	52.8
unidentified sparrow	0	0.30	0	0.10	0	2.6	0	1.4	0	1.8	0	2.1
unidentified swallow	0.08	0.55	0	0.56	2.0	4.7	0	8.0	7.5	7.1	0	6.3
unidentified vireo	0	0.01	0	0	0	0.1	0	0	0	0.6	0	0
unidentified wren	0	0.02	0	0	0	0.2	0	0	0	1.8	0	0
western bluebird	0	0.38	1.09	0	0	3.3	7.9	0	0	4.2	13.8	0
western flycatcher	0	0.09	0	0	0	0.8	0	0	0	3.6	0	0
western meadowlark	0	0.17	0.22	0.01	0	1.5	1.6	0.2	0	3.0	5.5	1.4
western scrub-jay	0	0	0.01	0	0	0	0.1	0	0	0	1.0	0
western tanager	0	0	0	0.01	0	0	0	0.1	0	0	0	0.7
white-crowned sparrow	0	0.05	0	0.10	0	0.4	0	1.5	0	1.8	0	1.4
yellow-headed blackbird	0	0.15	0	0	0	1.3	0	0	0	0.6	0	0
<b>Other Birds</b>	<b>0</b>	<b>0.11</b>	<b>0.08</b>	<b>0.08</b>	<b>0</b>	<b>1.0</b>	<b>0.6</b>	<b>1.1</b>	<b>0</b>	<b>9.3</b>	<b>7.7</b>	<b>6.3</b>
broad-tailed hummingbird	0	0	0	0.05	0	0	0	0.7	0	0	0	4.2
downy woodpecker	0	0.01	0	0	0	0.1	0	0	0	0.6	0	0
greater roadrunner	0	0	0.01	0	0	0	0.1	0	0	0	1.0	0
northern flicker	0	0.09	0.07	0.02	0	0.8	0.5	0.3	0	7.5	6.6	2.1

**Table 3. Mean bird use (number/plot/20-min survey), percent of total composition (%), and frequency of occurrence (%) for each bird type and species by season during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Species/Types	Use				% Composition				% Frequency			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
unidentified hummingbird	0	0	0	0.01	0	0	0	0.1	0	0	0	0.7
unidentified woodpecker	0	0.01	0	0	0	0.1	0	0	0	1.2	0	0
<b>Unidentified Birds</b>	<b>0</b>	<b>0.27</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2.3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1.8</b>	<b>0</b>	<b>0</b>
unidentified bird	0	0.27	0	0	0	2.3	0	0	0	1.8	0	0
<b>Overall</b>	<b>3.78</b>	<b>11.60</b>	<b>13.72</b>	<b>6.97</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>				

**Table 4. Relative exposure index and flight characteristics by species during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

<b>Species</b>	<b># Groups Flying</b>	<b>Overall Mean Use</b>	<b>% Flying</b>	<b>% Flying Initially in ZOR<sup>a</sup></b>	<b>Exposure Index</b>	<b>% Within ZOR at any time</b>
turkey vulture	60	0.25	97.6	52.5	0.13	77.5
unidentified swallow	23	0.34	90.9	39.6	0.12	42.8
unidentified raven	167	0.79	85.4	15.4	0.10	29.2
pinyon jay	19	0.35	86.7	11.2	0.03	11.2
red-tailed hawk	37	0.12	87.2	31.7	0.03	51.2
unidentified raptor	45	0.23	82.6	13.2	0.03	16.7
golden eagle	7	0.02	87.5	42.9	0.01	42.9
unidentified hawk	15	0.03	94.7	22.2	0.01	27.8
American kestrel	55	0.21	76.4	3.6	0.01	8.3
unidentified falcon	9	0.02	100.0	9.1	<0.01	27.3
horned lark	82	2.78	76.2	0	0	0
mountain bluebird	47	0.53	90.9	0	0	0
lark sparrow	10	0.36	76.7	0	0	0
dark-eyed junco	28	0.29	94.7	0	0	0
western bluebird	19	0.27	92.1	0	0	0
unidentified finch	14	0.23	93.0	0	0	0
northern mockingbird	18	0.20	58.6	0	0	0
house finch	7	0.18	63.2	0	0	0
unidentified sparrow	6	0.11	100.0	0	0	0
western meadowlark	7	0.08	90.0	0	0	0
loggerhead shrike	14	0.07	53.1	0	0	0
unidentified duck	5	0.07	79.1	0	0	0
unidentified bird	2	0.07	97.8	0	0	0
common raven	6	0.05	100.0	0	0	37.5
black-throated sparrow	3	0.05	100.0	0	0	0
unidentified flycatcher	13	0.05	76.7	0	0	0
white-crowned sparrow	5	0.05	100.0	0	0	0
Say's phoebe	5	0.04	70.0	0	0	0

<sup>a</sup>ZOR=likely zone of risk or 115-443 ft (35-135 m) above ground level.

**Table 5. Flight height characteristics by bird type during the fixed-point bird use surveys in the GWRA, June 22, 2007 - May 29, 2008.**

Type	# Obs Flying	# Groups Flying	Mean Flight Height	% Obs Flying	% within Flight Height Categories		
					0-115 ft (0-35 m)	115-443 ft (35-135 m)	> 443 ft (135 m)
Waterfowl	9	43	1.11	74.1	100.0	0	0
Shorebirds	8	21	0.75	44.7	100.0	0	0
Raptors	186	293	28.54	83.0	80.2	13.3	6.5
<i>Accipiters</i>	4	4	11.25	100.0	100.0	0	0
<i>Buteos</i>	37	41	51.19	87.2	51.2	31.7	17.1
<i>Northern Harrier</i>	8	8	6.25	100.0	100.0	0	0
<i>Eagles</i>	8	8	69.50	80.0	50.0	37.5	12.5
<i>Falcons</i>	69	100	13.00	79.4	94.0	4.0	2.0
<i>Owls</i>	0	0	0	0	0	0	0
<i>Other Raptors</i>	60	132	31.12	84.1	78.8	14.4	6.8
Vultures	60	80	70.88	97.6	33.8	52.5	13.8
Doves/Pigeons	5	9	1.00	75.0	100.0	0	0
Passerines	528	3048	8.23	81.5	95.4	4.5	0.1
Other Birds	20	25	1.95	65.8	100.0	0	0
Unidentified Birds	2	44	10.00	97.8	100.0	0	0
<b>Overall</b>	<b>818</b>	<b>3563</b>	<b>17.10</b>	<b>81.5</b>	<b>92.9</b>	<b>6.1</b>	<b>0.9</b>

**Table 6. Summary of nesting raptor species, number of raptor nests observed, and nesting density for all raptor nest surveys at the GWRA, April 15 and June 8, 2008.**

<b>Species</b>	<b># of Nests</b>	<b>Density (# nests/mi.<sup>2</sup>)</b>
golden eagle	2	0.03
red-tailed hawk	1	0.01
<b>Total # Nests</b>	<b>3</b>	<b>0.04</b>
<b>Total # Active Nests</b>	<b>1</b>	<b>0.01</b>

Only includes nests within the boundaries of the areas searched at the GWRA. Area of the GWRA is 42,880 acres, or 67 mi<sup>2</sup> (173.5 km<sup>2</sup>).

**Table 7. Estimated raptor nest densities for the GWRA and from other existing and proposed wind-energy facilities located primarily in agricultural landscapes.**

Facility Site	Raptor Nest Density (#/mi <sup>2</sup> )							
	All Raptors	SWHA <sup>a</sup>	RTHA <sup>b</sup>	FEHA <sup>c</sup>	GOEA <sup>d</sup>	PRFA <sup>e</sup>	GHOW <sup>f</sup>	SSHA <sup>g</sup>
Grapevine, Arizona†	0.04	0	0.01	0	0.03	0	0	0
Biglow, Oregon <sup>1</sup>	0.15	0.04	0.08	0	0	0	0.02	0
Klondike III, Oregon <sup>2</sup>	0.16	0.04	0.08	0	0	0	0.04	0
Leaning Juniper, Oregon <sup>3</sup>	0.41	0.18	0.16	0.03	0	0.02	0.02	0
Stateline, Oregon-Washington <sup>4</sup>	0.21	0.03	0.08	0.03	0	0	0.07	0
Nine Canyon, Washington <sup>5</sup>	0.03	0	0	0	0	0	0	0
Zintel Canyon, Washington <sup>6</sup>	0.08	0.04	0.02	0.02	0	0	0	0
Buffalo Ridge, Minnesota <sup>7</sup>	0.15	0.07	0.06	0.01	0	0	0.02	0
Klickitat County, Washington <sup>8</sup>	0.12	0	0.09	0	0	0.01	0.03	0
Combine Hills, Oregon <sup>9</sup>	0.24	0.06	0.11	0.01	0	0	0	0
Columbia Hills, Washington <sup>10</sup>	0.3	0.04	0.18	0	0.02	0.02	0.02	0.02
Ponnequin, Colorado <sup>11</sup>	0.06	0.06	0	0	0	0	0	0
Hopkins Ridge, Washington <sup>12</sup>	0.43	0.01	0.27	0.01	0	0	0.08	0
Maiden, Washington <sup>13</sup>	0.18	0.05	0.04	0.03	0	0.03	0.02	0
Wild Horse, Washington <sup>14</sup>	0.16	0.12	0	0	0	0.02	0.02	0
Kittitas Valley, Washington <sup>15</sup>	0.09	0.09	0	0	0	0	0	0
Desert Claim, Washington <sup>16</sup>	0.34	0.23	0	0	0	0	0.04	0
<b>Average</b>	<b>0.19</b>	<b>0.06</b>	<b>0.07</b>	<b>0.01</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>0.02</b>	<b>&lt;0.01</b>

†Area of GWRA is 42,880 acres, or 67 mi<sup>2</sup> (173.5 km<sup>2</sup>).

<sup>a</sup> Swainson's hawk (*Buteo swainsoni*); <sup>b</sup> red-tailed hawk (*Buteo jamaicensis*); <sup>c</sup> ferruginous hawk (*Buteo regalis*); <sup>d</sup> golden eagle (*Aquila chrysaetos*); <sup>e</sup> prairie falcon (*Falco mexicanus*); <sup>f</sup> great-horned owl (*Bubo virginianus*); <sup>g</sup> sharp-shinned hawk (*Accipiter striatus*).

<sup>1</sup> WEST 2005c; <sup>2</sup> Mabee et al. 2005; <sup>3</sup> NWC and WEST 2005b; <sup>4</sup> URS and WEST 2001; <sup>5</sup> Erickson et al. 2001b; <sup>6</sup> Erickson et al. 2002a; <sup>7</sup> Johnson et al. 2000a; <sup>8</sup> Erickson et al. 1999; <sup>9</sup> Young et al. 2003c; <sup>10</sup> BPA 1995; <sup>11</sup> Kerlinger et al. 2000; <sup>12</sup> Young et al. 2003a; <sup>13</sup> WEST and NWC 2002; <sup>14</sup> Erickson et al. 2003b; <sup>15</sup> Erickson et al. 2003a; <sup>16</sup> Young et al. 2003b



**Table 8a. Results of bat acoustic surveys conducted at Grapevine WRA, June 26 – November 9, 2007.**

<b>Anabat Location</b>	<b># of HF Bat Passes</b>	<b># of LF Bat Passes*</b>	<b>Total Bat Passes</b>	<b># of unknown</b>	<b>Detector-Nights</b>	<b>Bat Passes/Night</b>
GV10	734	105	839	300	101	8.31
GV20	956	397	1353	596	113	11.97
GV16L	4	92	96	77	111	0.86
<b>TOTAL</b>	<b>1694</b>	<b>594</b>	<b>2288</b>	<b>973</b>	<b>325</b>	<b>6.44*</b>
GV16H**	0	1	1	0	28	0.04

\*mean of ratios

\*\* Data for the Hi-Mic unit (GC16H) are not included in the totals.

**Table 8b. Results of bat acoustic surveys conducted at Grapevine WRA, April 12 – July 7, 2008.**

<b>Anabat Location</b>	<b># of HF Bat Passes</b>	<b># of LF Bat Passes*</b>	<b># of Hoary Bat Passes</b>	<b>Total Bat Passes</b>	<b>Detector-Nights</b>	<b>Bat Passes/Night</b>
GV10	29	23	7	52	52	1.00
GV20	1,363	90	13	1,453	87	16.70
GV16L	381	63	9	444	75	5.92
<b>Total</b>	<b>1,773</b>	<b>176</b>	<b>29*</b>	<b>1,949</b>	<b>214</b>	<b>8.85</b>
GV16H**	0	16	9	16	62	0.26

\*Passes by hoary bats are included in low-frequency numbers.

\*\* Data for the Hi-Mic unit (GV16H) are not included in the totals.

**Table 9. State and federal special/sensitive status species observed at the GWRA.**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Federal Status</b>	<b>State Status</b>	<b>Occurrence within study area</b>
<b>Birds</b>				
bald eagle	<i>Haliaeetus leucocephalus</i>	DPS	WSC	Two observations of one individual in pinion juniper zones during fixed-point bird use surveys; five observations as incidental wildlife species.
western burrowing owl	<i>Athene cunicularia hypugaea</i>	SC	SC	One observation at documented prairie dog town; one observation during fixed-point bird use surveys.
Cooper's hawk	<i>Accipiter cooperii</i>		WSC	Three observations in the fall and spring; one observation as an incidental wildlife species.
<b>Bird Subtotal</b>				<b>3 species; 13 observations</b>
<b>Mammals</b>				
Gunnison's prairie dog	<i>Cynomys gunnisoni</i>	SC	WSC	Three prairie dog towns present within the GWRA, including two active towns.

Status Codes: SC = Species of Concern, DPS = USFWS Distinct Population Segment, WSC = Wildlife of Special Concern in Arizona (AZGFD 2008b).

**Table 10. Incidental wildlife observed while conducting all surveys at the GWRA, June 22, 2007 – July 7, 2008.**

<b>Species</b>		<b>#grps</b>	<b>#obs</b>
American kestrel	<i>Falco sparverius</i>	35	123
lark sparrow	<i>Chondestes grammacus</i>	1	120
unidentified raptor		3	100
pinyon jay	<i>Gymnorhinus cyanocephalus</i>	1	75
red-tailed hawk	<i>Buteo jamaicensis</i>	30	30
golden eagle	<i>Aquila chrysaetos</i>	13	14
turkey vulture	<i>Cathartes aura</i>	6	13
unidentified duck		2	11
loggerhead shrike	<i>Lanius ludovicianus</i>	5	9
mountain bluebird	<i>Sialia currucoides</i>	1	9
killdeer	<i>Charadrius vociferus</i>	3	8
greater roadrunner	<i>Geococcyx californianus</i>	5	5
bald eagle	<i>Haliaeetus leucocephalus</i>	2	5
northern harrier	<i>Circus cyaneus</i>	3	3
great blue heron	<i>Ardea herodias</i>	1	3
unidentified wren		1	3
prairie falcon	<i>Falco mexicanus</i>	2	2
sharp-shinned hawk	<i>Accipiter striatus</i>	2	2
common nighthawk	<i>Chordeiles minor</i>	1	2
common raven	<i>Corvus corax</i>	1	2
western burrowing owl	<i>Athene cunicularia hypugaea</i>	1	1
Cooper's hawk	<i>Accipiter cooperii</i>	1	1
white-faced ibis	<i>Plegadis chihi</i>	1	1
<b>Bird Subtotal</b>		<b>121</b>	<b>542</b>
pronghorn antelope	<i>Antilocapra americana</i>	32	301
bison	<i>Bison bison</i>	2	63
elk	<i>Cervus elaphus</i>	10	58
black-tailed prairie dog	<i>Cynomys ludovicianus</i>	11	21
coyote	<i>Canis latrans</i>	10	11
mule deer	<i>Odocoileus hemionus</i>	3	8
bobcat	<i>Lynx rufus</i>	2	2
javelina	<i>Tayassu tajacu</i>	1	2
badger	<i>Taxidea taxus</i>	1	1
<b>Mammal Subtotal</b>		<b>73</b>	<b>470</b>
<b>Total</b>		<b>194</b>	<b>1012</b>

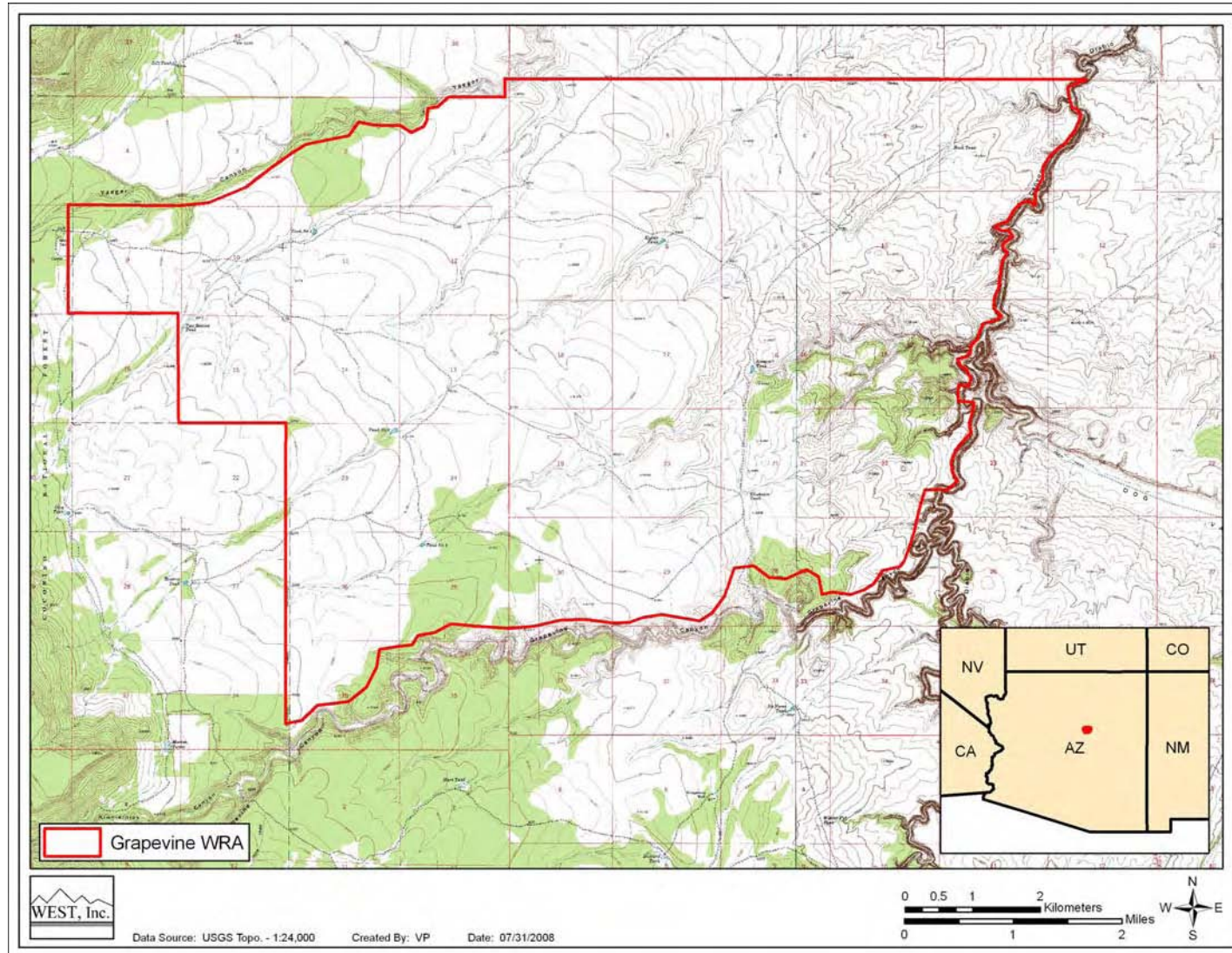
**Table 11. Wind-energy facilities in the U.S. with both pre-construction Anabat sampling data and post-construction mortality data for bat species (adapted from Kunz et al. 2007b).**

<b>Wind-Energy Facility</b>	<b>Activity (#/detector night)</b>	<b>Mortality (bats/turbine/year)</b>	<b>Reference</b>
Grapevine, AZ	9.11	-	This study
Footo Creek Rim, WY	2.2	1.3	Gruver 2002
Buffalo Ridge, MN	2.1	2.2	Johnson et al. 2005
Buffalo Mountain, TN	23.7	20.8	Fiedler 2004
Top of Iowa, IA	34.9	10.2	Koford et al. 2005
Mountaineer, WV	38.3	38.0	Arnett et al. 2005

**Table 12. Bat species determined from range-maps (Harvey et al. 1999; BCI website) as likely to occur within the GWRA, sorted by call frequency.**

High-frequency ( $\geq 35$ kHz)		Low frequency ( $< 35$ kHz)	
western red bat	<i>Lasiurus blossevillii</i>	pallid bat	<i>Antrozous pallidus</i>
California bat	<i>Myotis californicus</i>	Townsend's big-eared bat	<i>Corynorhinus townsendii</i>
western small-footed bat	<i>Myotis ciliolabrum</i>	big brown bat <sup>†</sup>	<i>Eptesicus fuscus</i>
western long-eared bat	<i>Myotis evotis</i>	spotted bat	<i>Euderma maculatum</i>
little brown bat <sup>†</sup>	<i>Myotis lucifugus</i>	Allen's big-eared bat	<i>Idionycteris phyllotis</i>
long-legged bat	<i>Myotis volans</i>	silver-haired bat* <sup>†</sup>	<i>Lasionycteris noctivagans</i>
Yuma bat	<i>Myotis yumanensis</i>	hoary bat* <sup>†</sup>	<i>Lasiurus cinereus</i>
western pipistrelle	<i>Parastrellus hesperus</i>	fringed bat	<i>Myotis thysanodes</i>
		big free-tailed bat	<i>Nyctinomops macrotis</i>
		Brazilian free-tailed bat <sup>†</sup>	<i>Tadarida brasiliensis</i>

\*long-distance migrant; †species known to have been killed at wind-energy facilities



**Figure 1. Location and overview of the Grapevine Wind Resource Area (GWRA).**



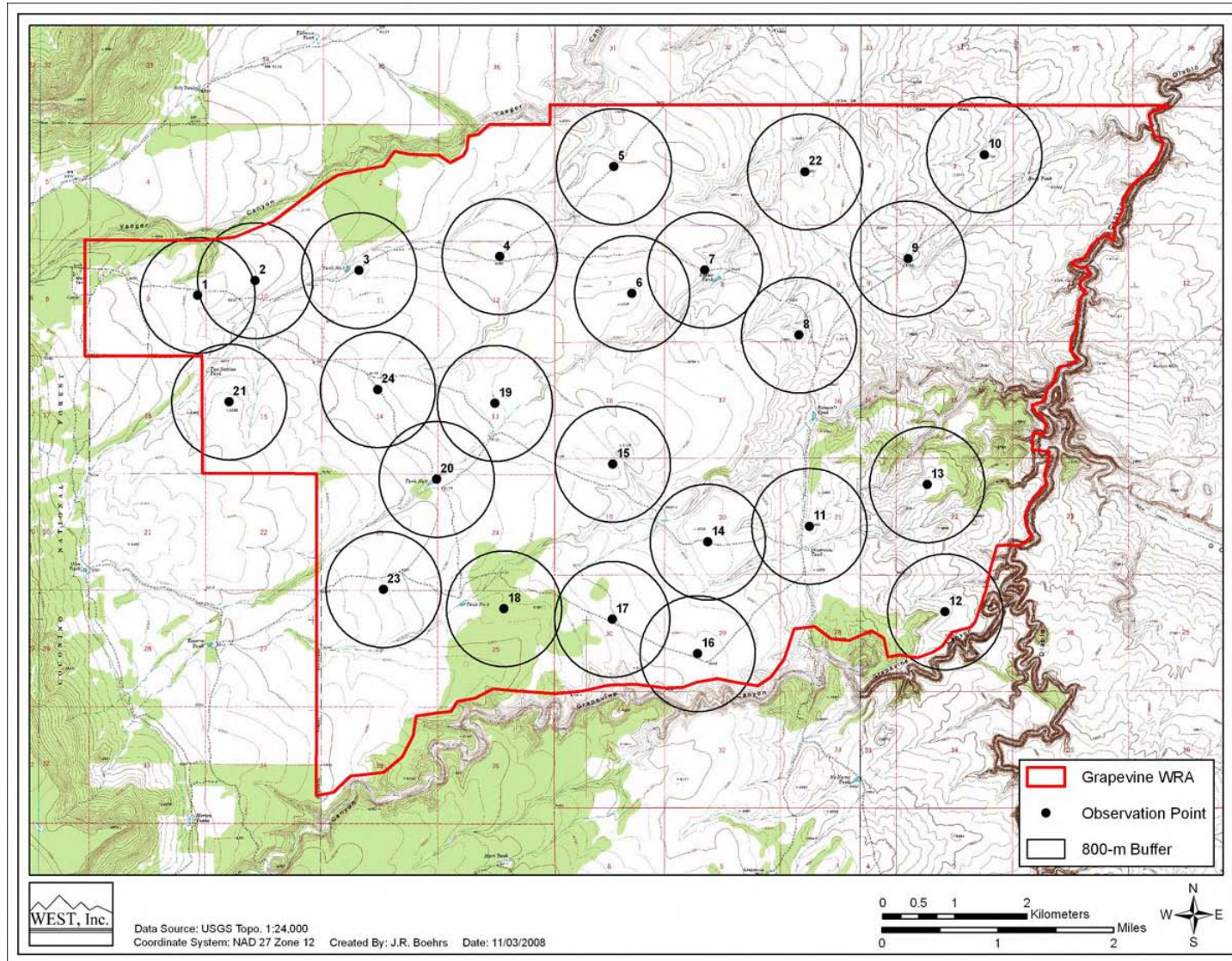
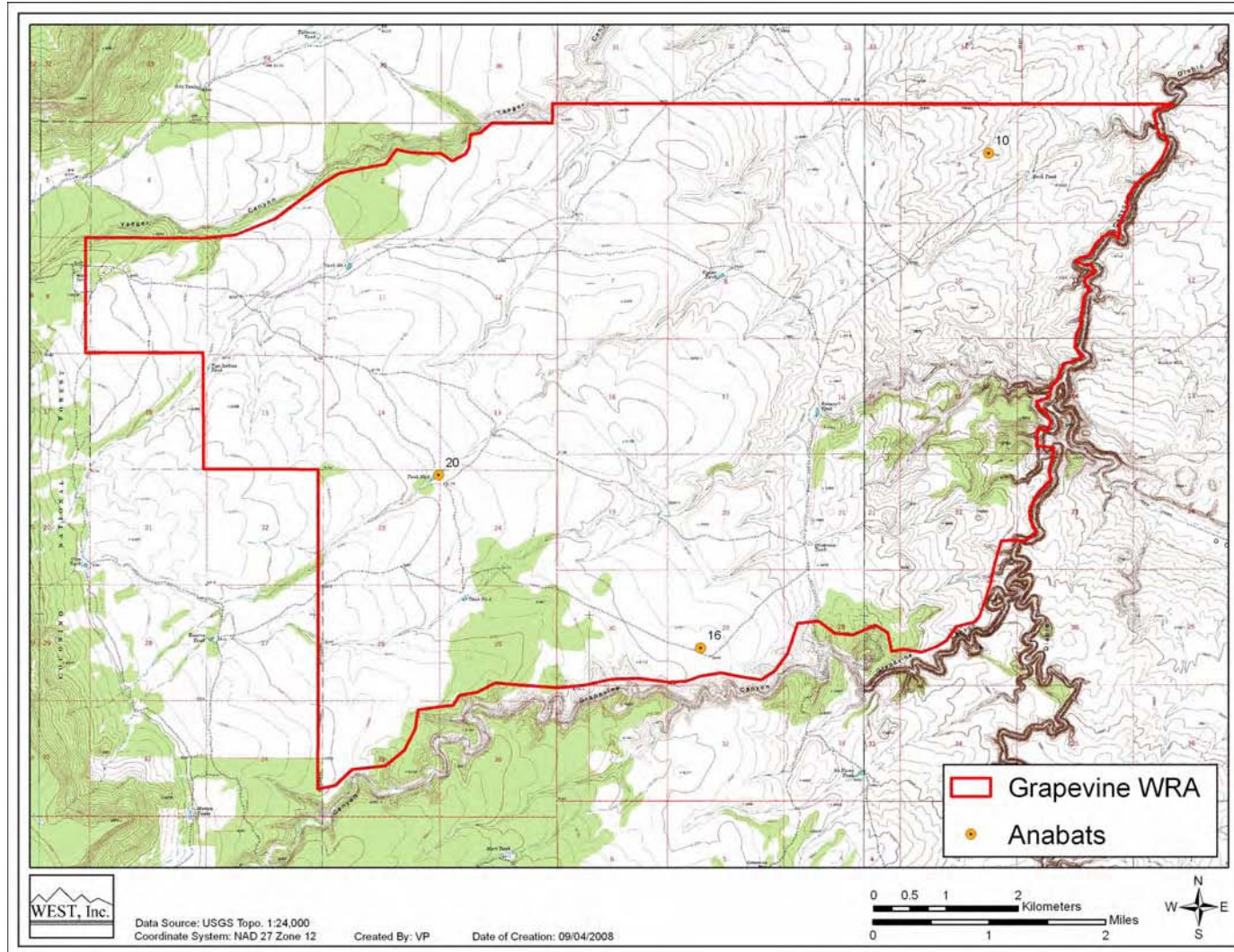


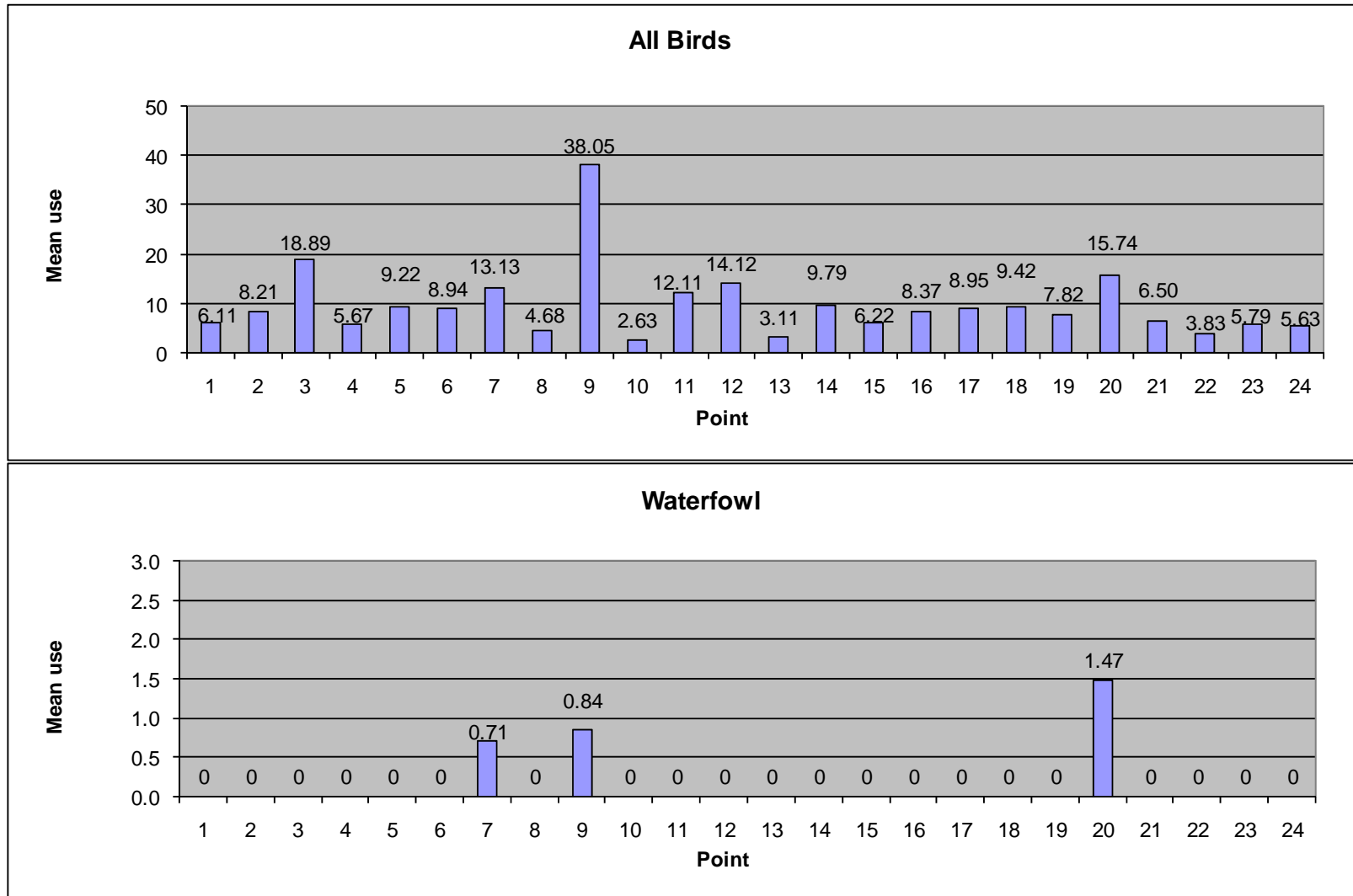
Figure 2. Fixed-point bird use survey plots at the GWRA.





**Figure 3. Anabat locations at the GWRA. Four Anabat II detectors were deployed with two stations located at Point 16: one was elevated at the top of the met tower (16 High) and the second was located at ground level (16 Low)**





**Figure 4. Mean use (birds/20-min survey) at each fixed-point for the GWRA, June 22, 2007 - May 29, 2008, for all birds and major bird types.**

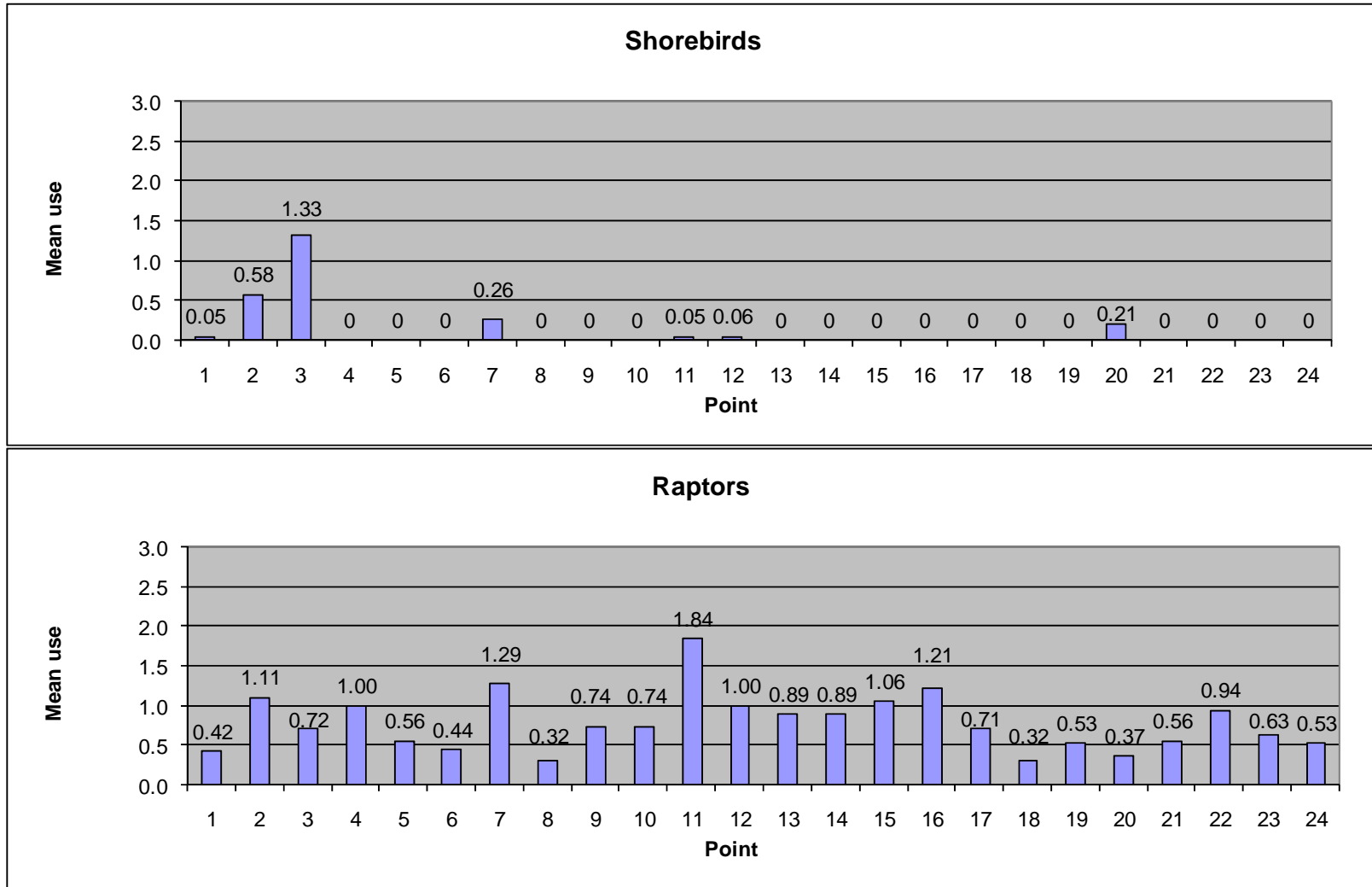
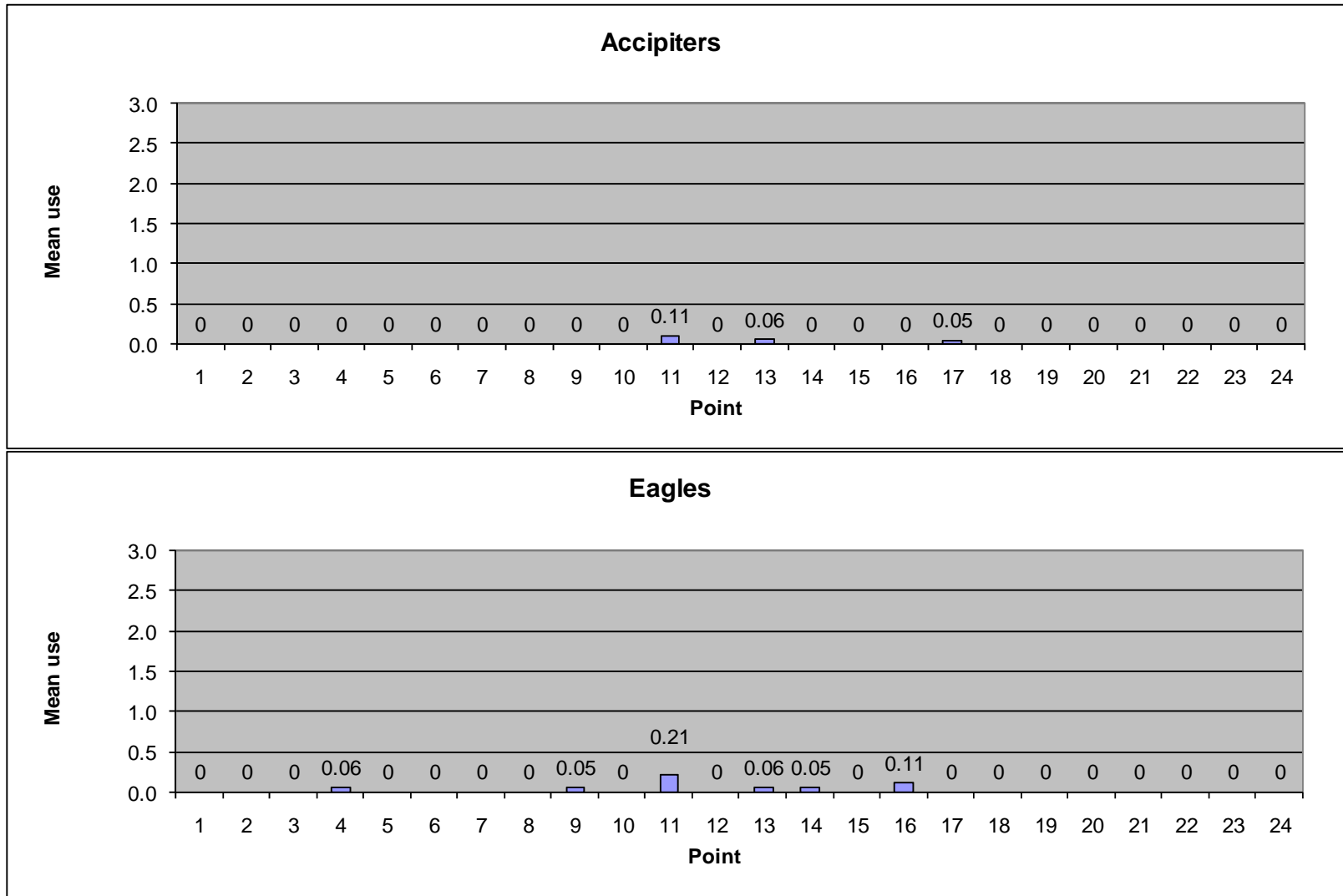


Figure 4 (continued). Mean use (birds/20-min survey) at each fixed-point for the GWRA, June 22, 2007 - May 29, 2008, for all birds and major bird types.



**Figure 4 (continued).** Mean use (birds/20-min survey) at each fixed-point for the GWRA, June 22, 2007 - May 29, 2008, for all birds and major bird types.

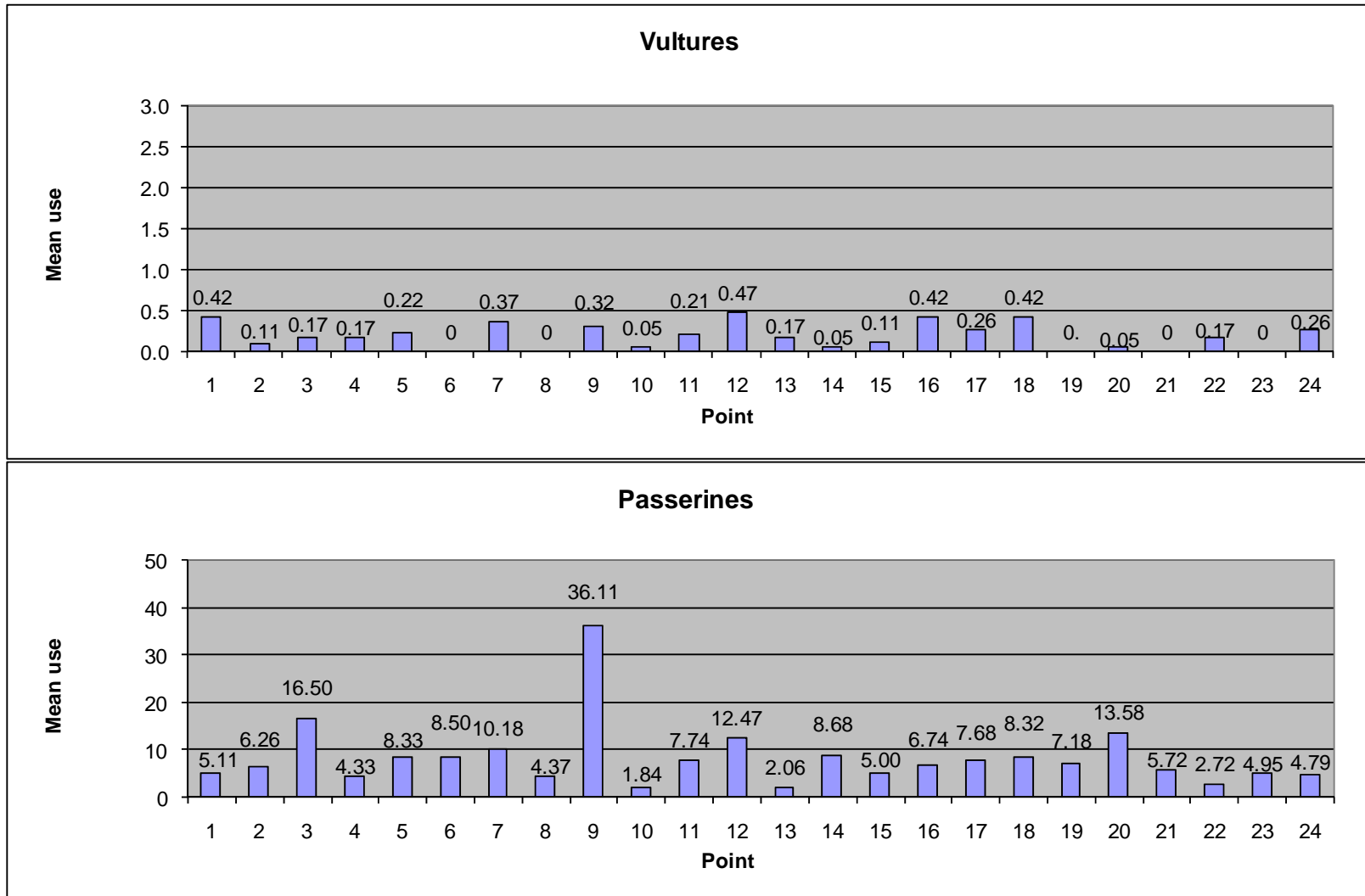
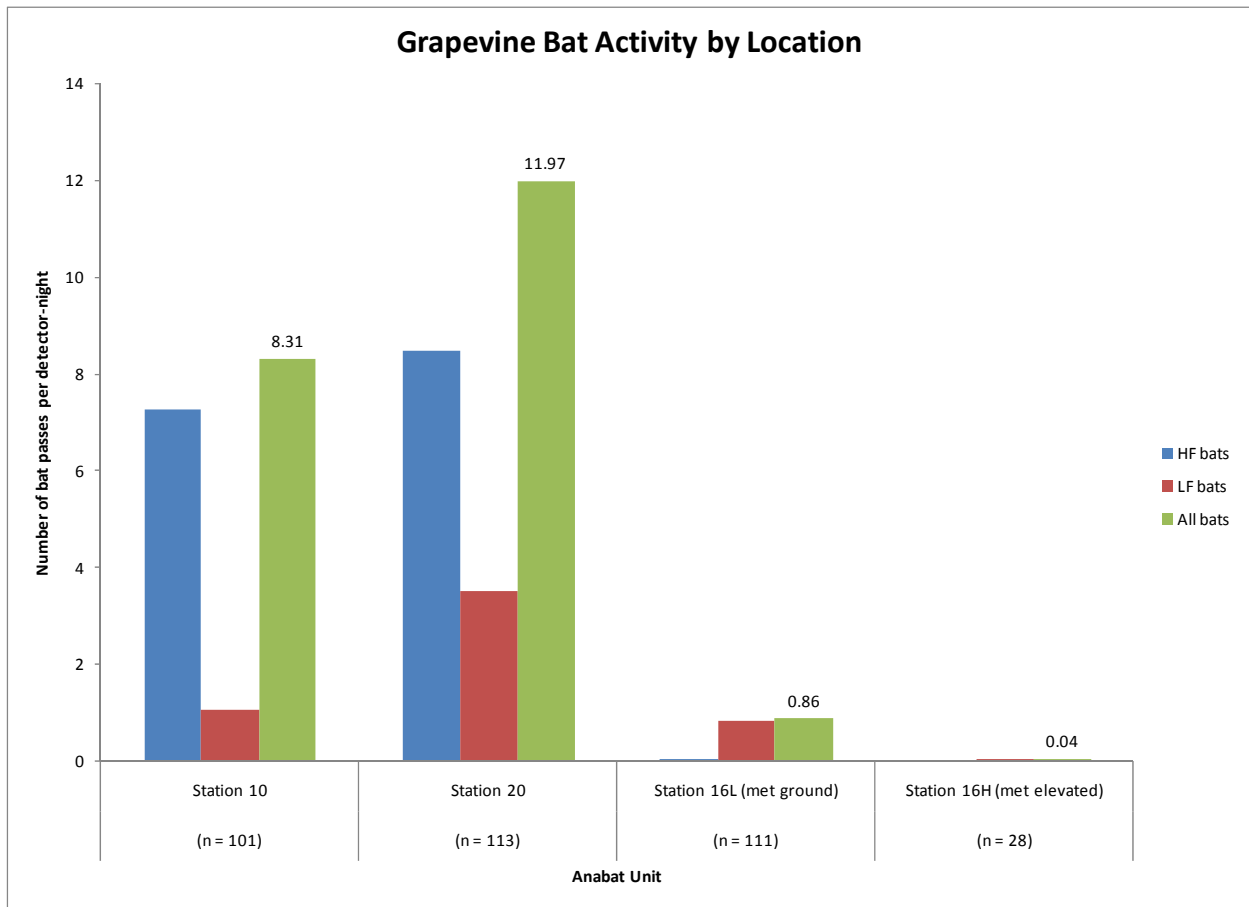


Figure 4 (continued). Mean use (birds/20-min survey) at each fixed-point for the GWRA, June 22, 2007 - May 29, 2008, for all birds and major bird types.

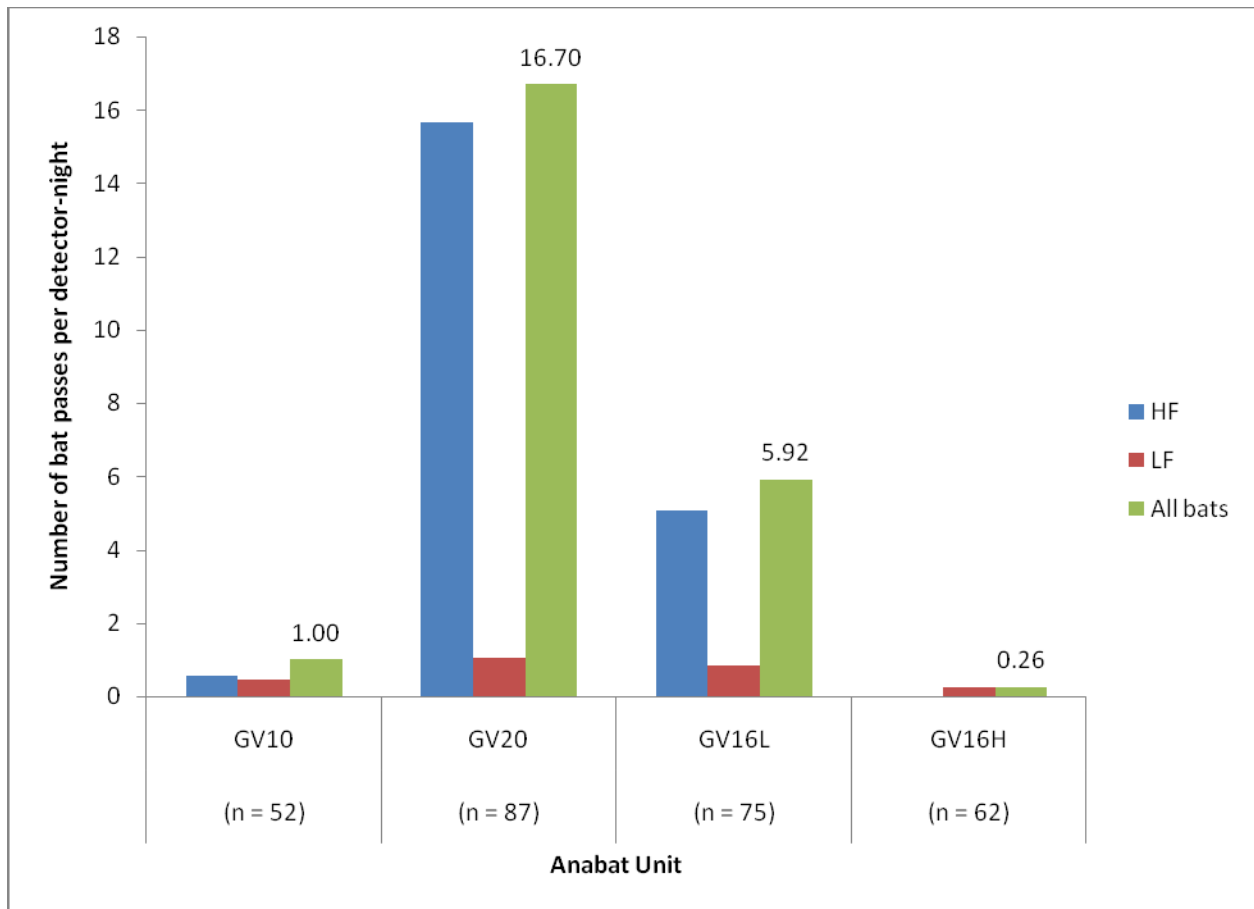
**Figure 5. Raptor nests and locations at the GWRA.**

**Figure 6. Raptor nest survey effort and nests at the GWRA.**

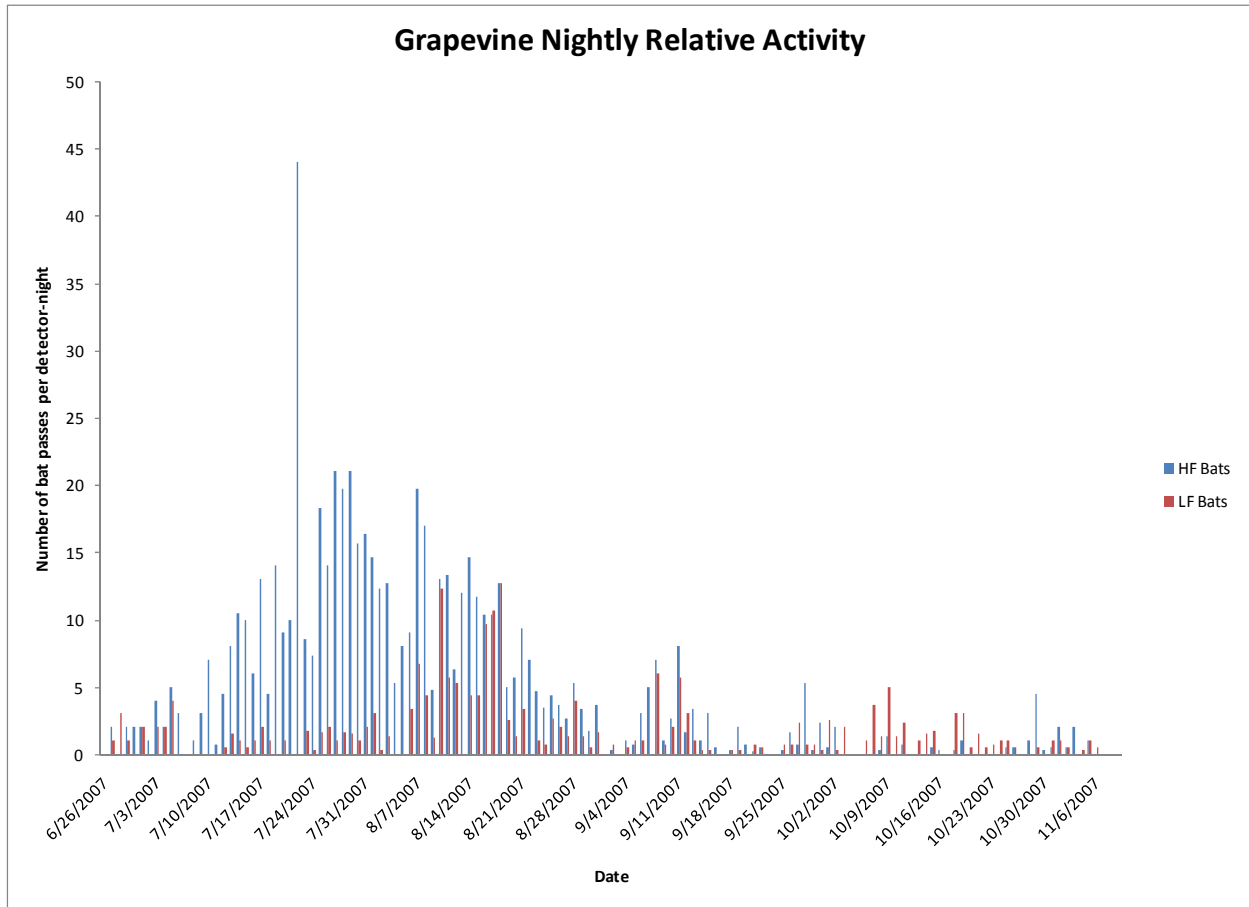


**Figure 7a. Bat activity recorded at Anabat stations at the GWRA, 2007. HF = high frequency bat passes; LF = low-frequency bat passes.**

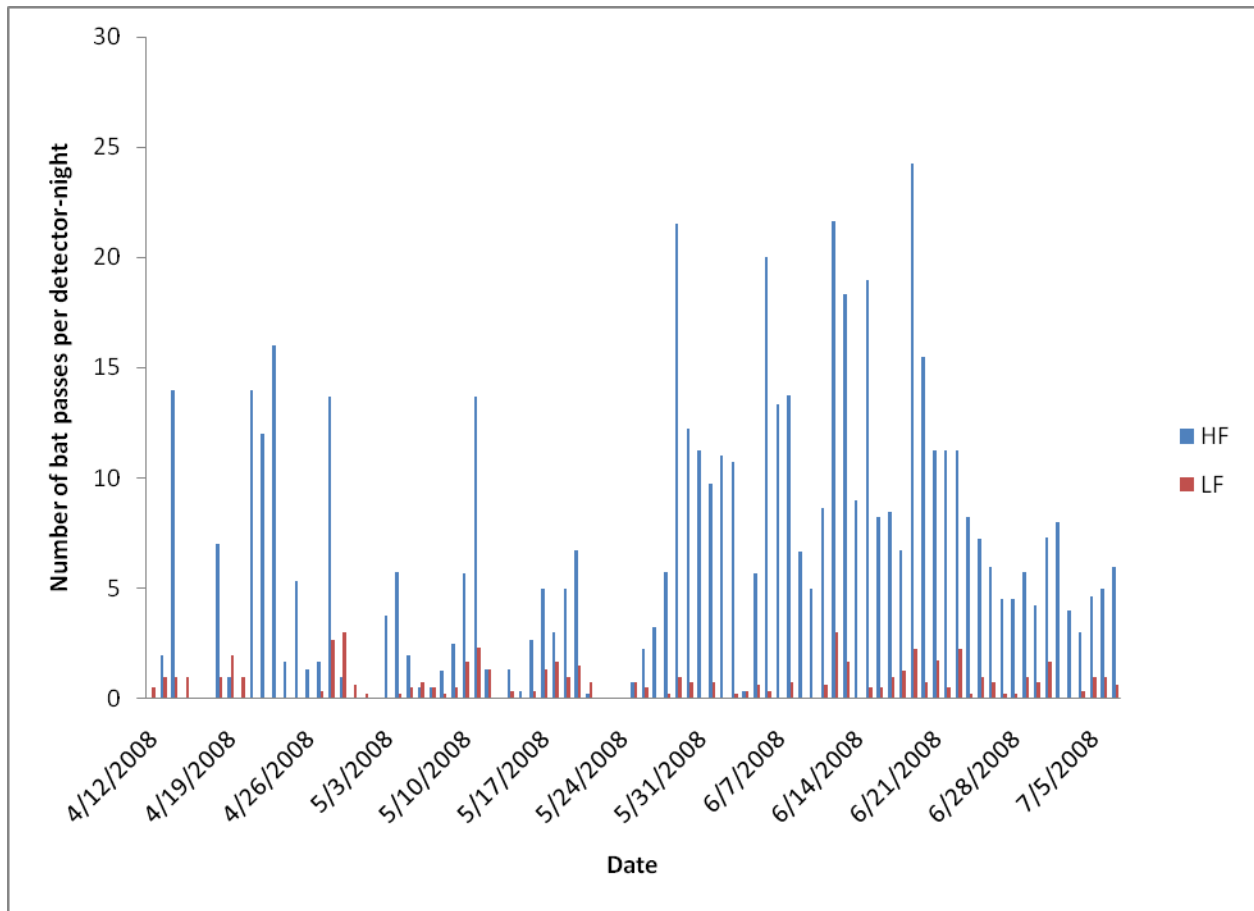




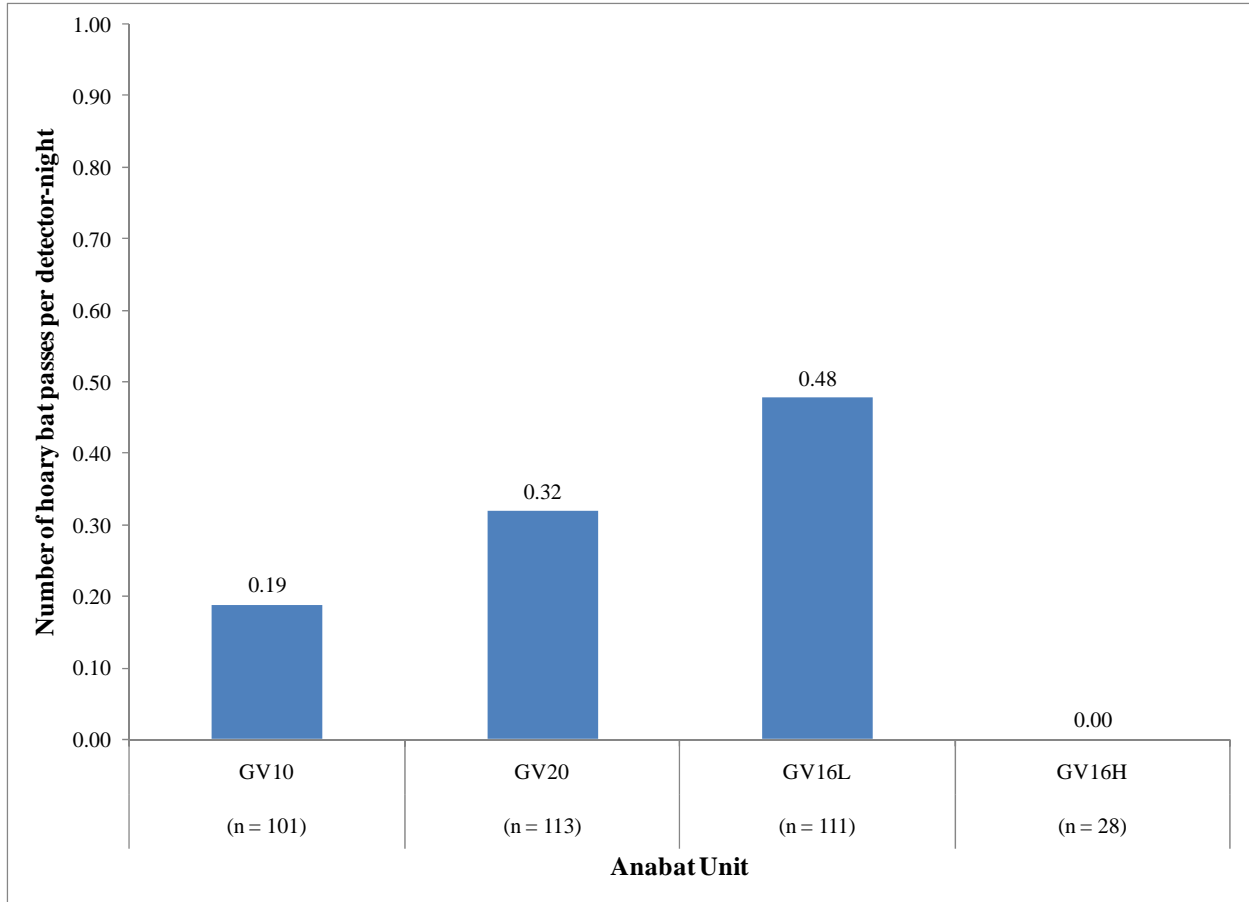
**Figure 7b. Bat activity recorded at Anabat stations at the GWRA, 2008. HF = high frequency bat passes; LF = low-frequency bat passes.**



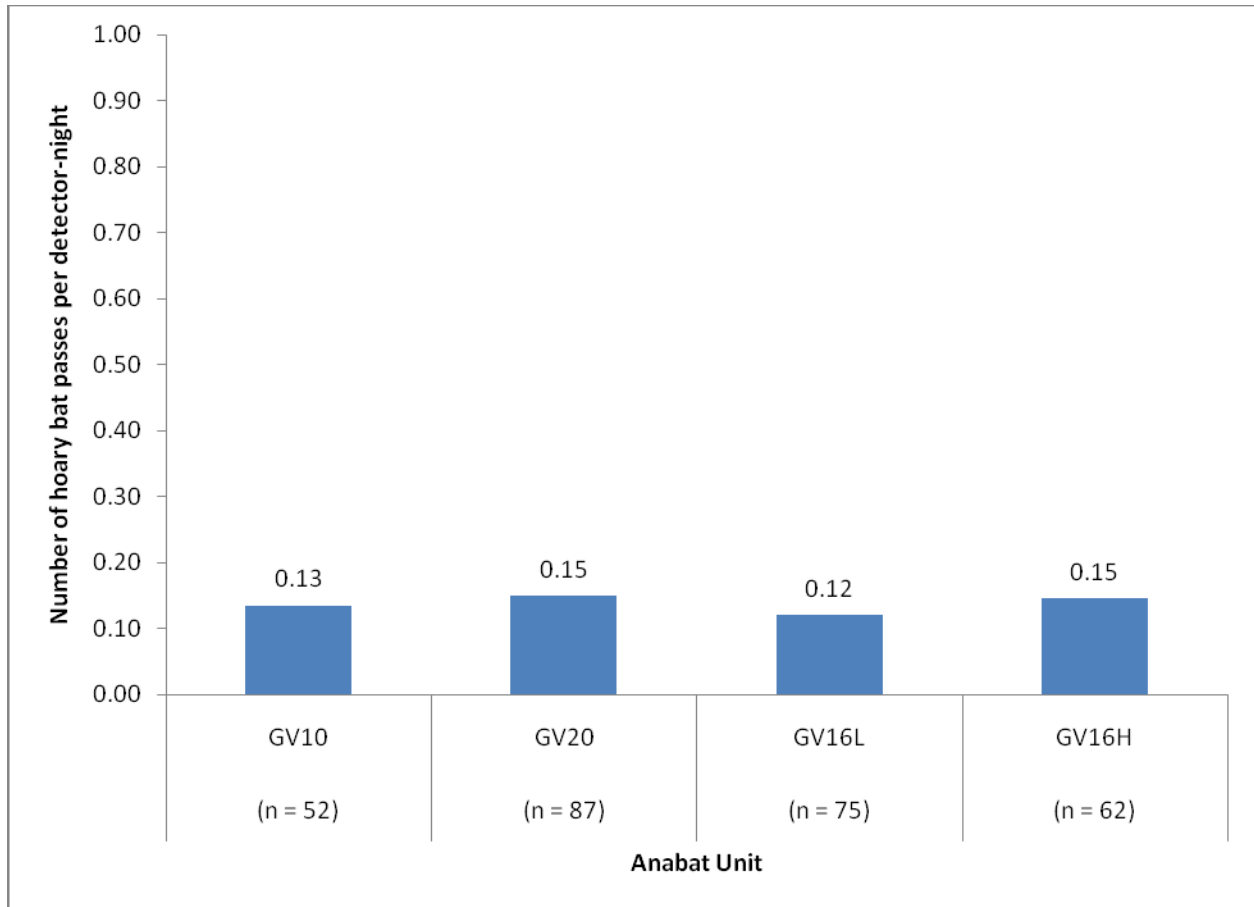
**Figure 8a. Nightly bat activity at GWRA as recorded by Anabat detector, 2007. HF = high frequency bat passes; LF = low-frequency bat passes.**



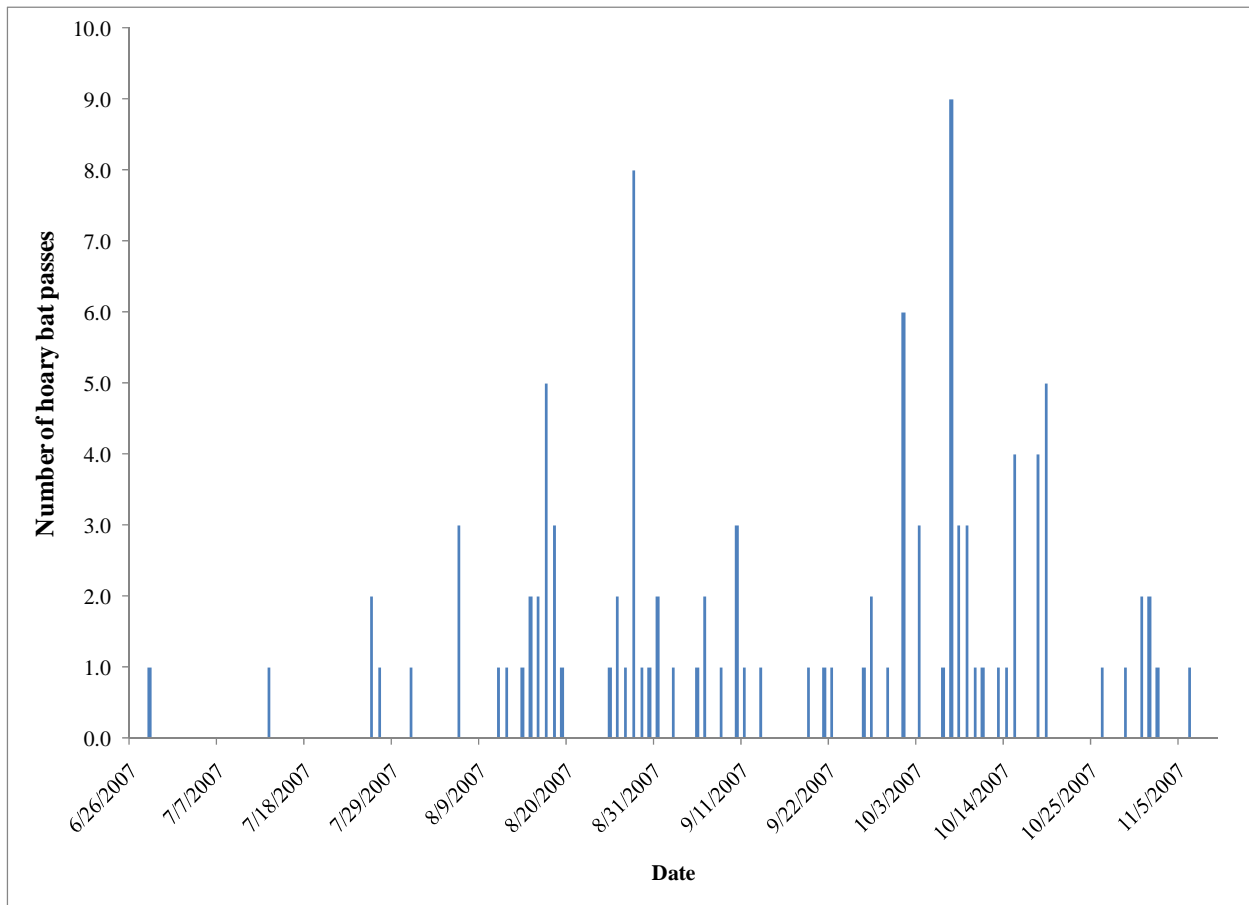
**Figure 8b. Nightly bat activity at GWRA as recorded by Anabat detectors, 2008. HF = high frequency bat passes; LF = low-frequency bat passes.**



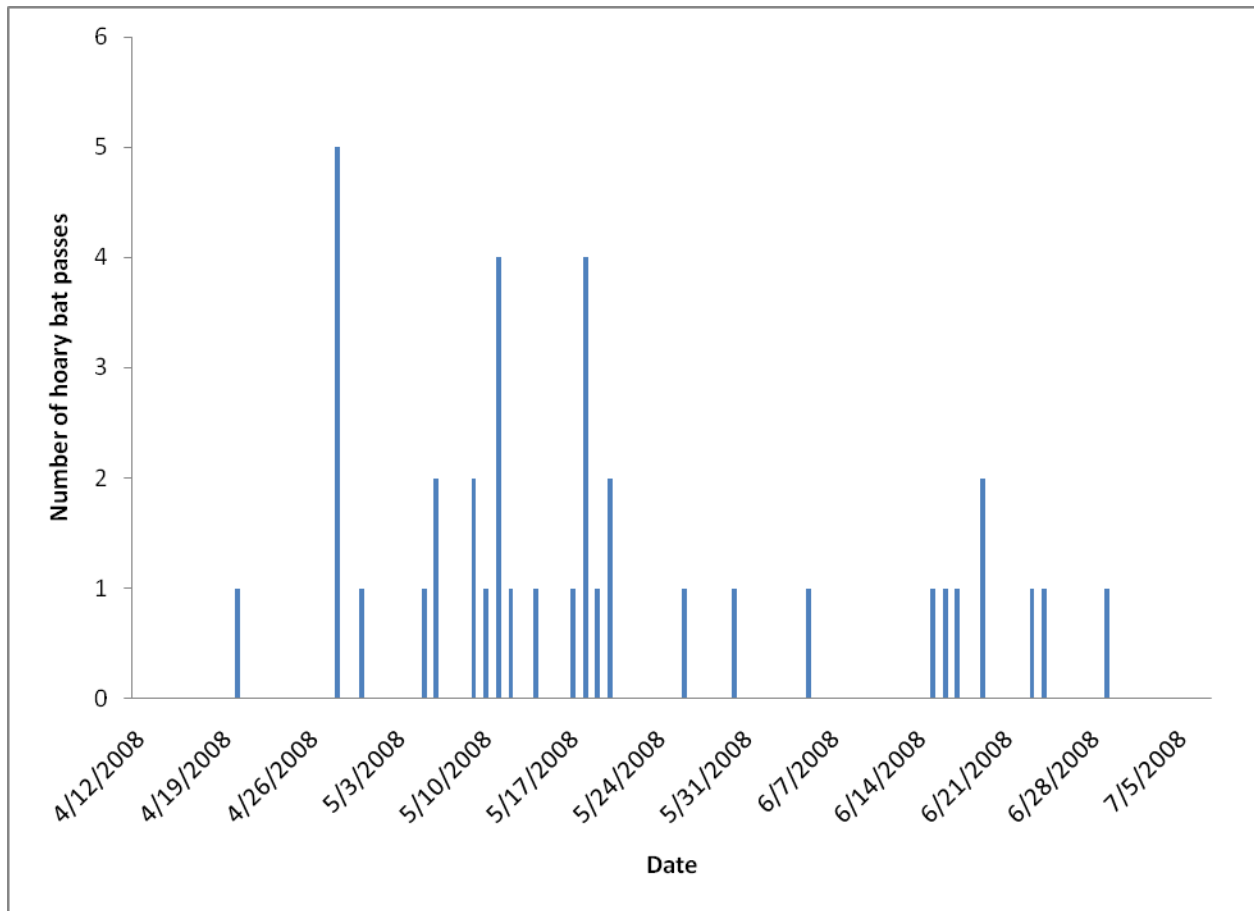
**Figure 9a. Hoary bat activity by location as recorded by Anabat detectors at the GWRA, 2007.**



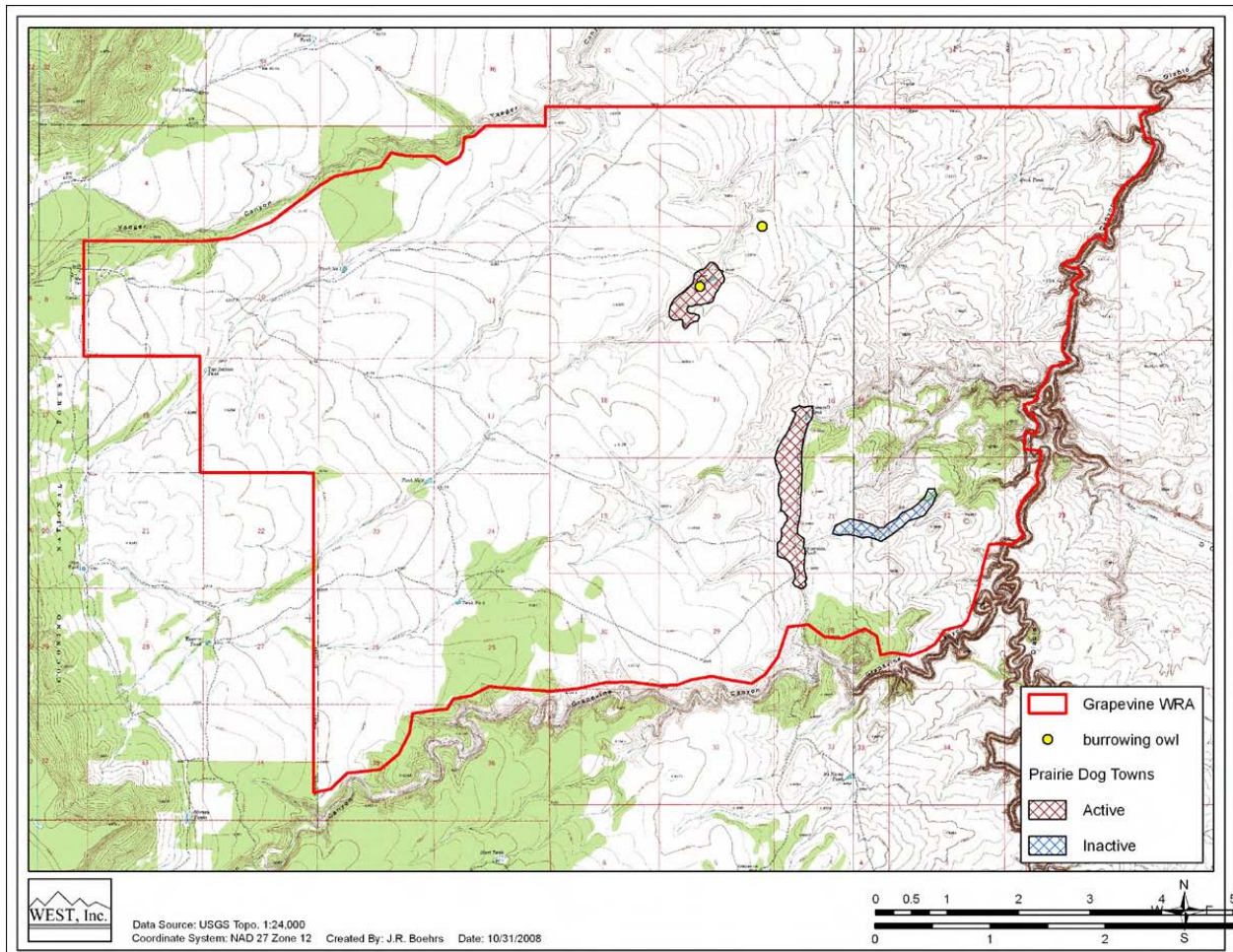
**Figure 9b. Hoary bat activity by location as recorded by Anabat detectors at the GWRA, 2008.**



**Figure 10a. Nightly hoary bat activity as recorded by Anabat detectors at the GWRA, 2007.**

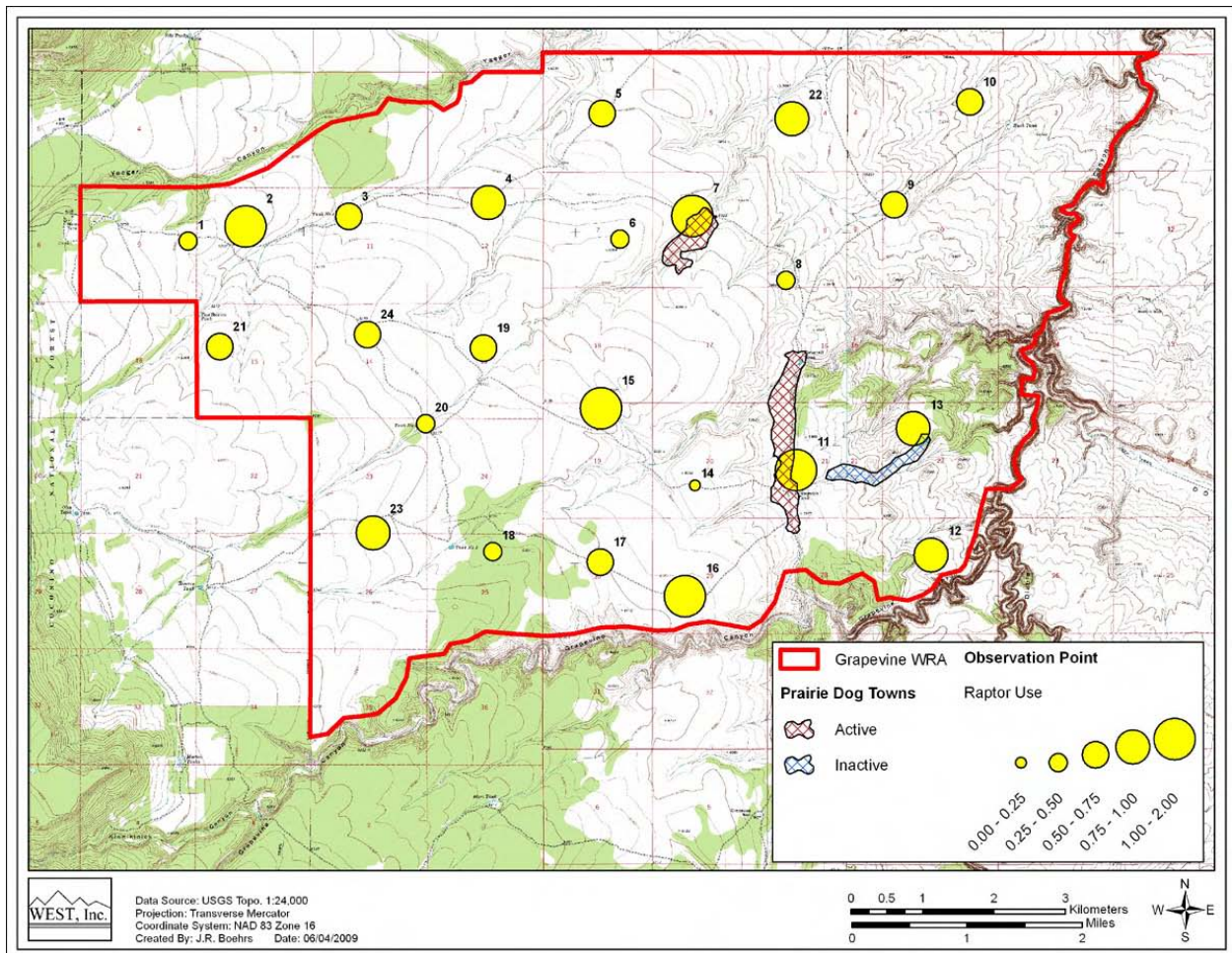


**Figure 10b. Nightly hoary bat activity as recorded by Anabat detectors at the GWRA, 2008.**

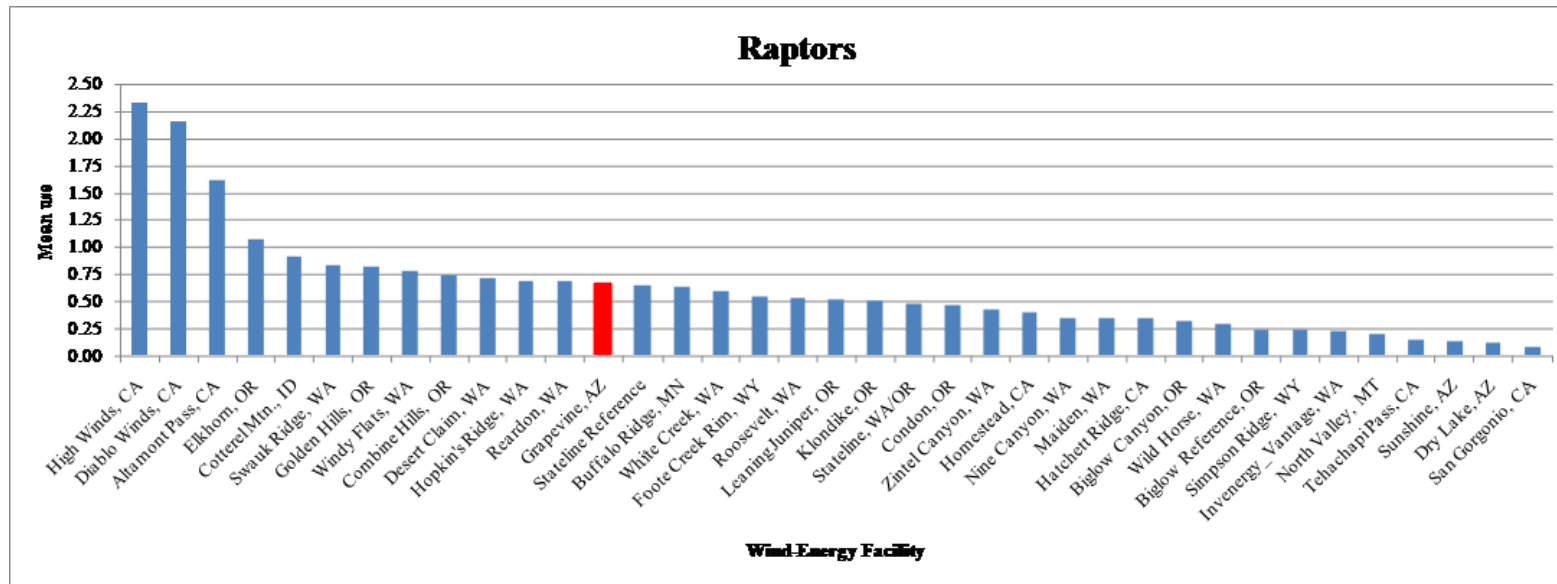


**Figure 11. Sensitive species locations at the GWRA.**





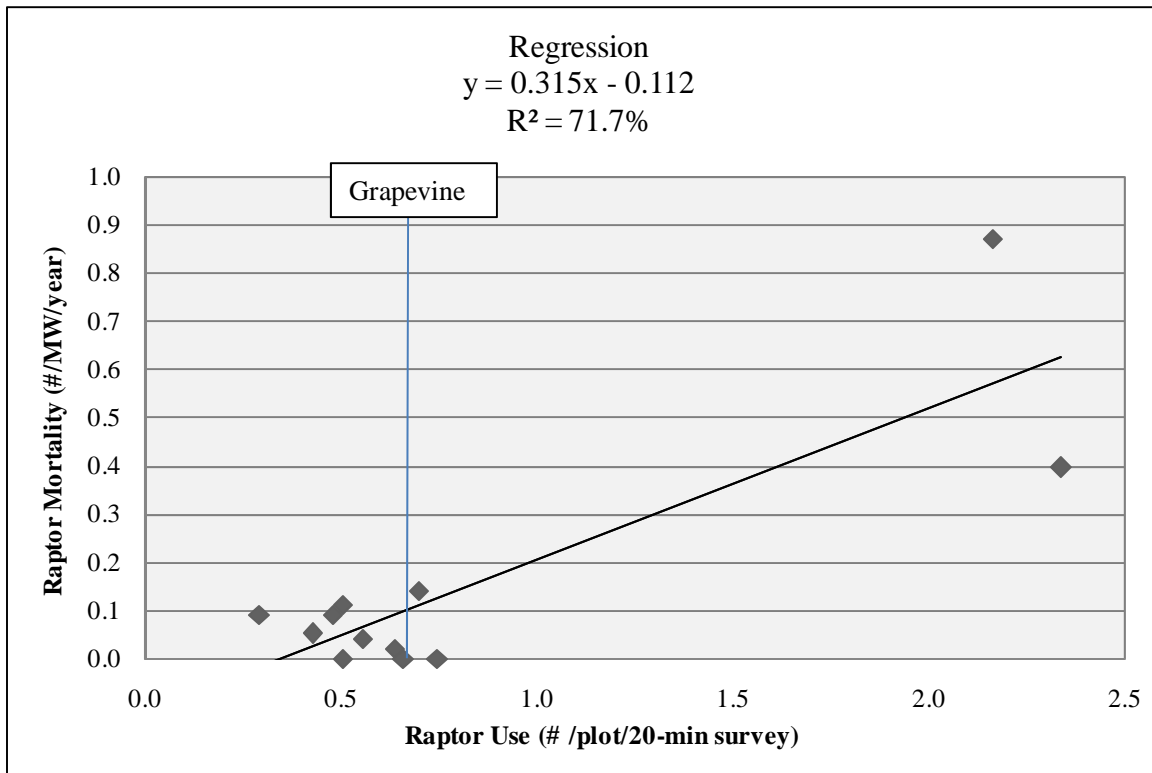
**Figure 11. Raptor use in relation to prairie dog towns at the GWRA.**



**Figure 13. Comparison of overall raptor use between the GWRA and other US wind-energy facilities.**

Data from the following sources:

Grapevine, AZ	This study.				
High Winds, CA	Kerlinger et al. 2005	Stateline Reference	URS et al. 2001	Maiden, WA	Erickson et al. 2002b
Diablo Winds, CA	WEST 2006a	Buffalo Ridge, MN	Erickson et al. 2002b	Hatchett Ridge, CA	Young et al. 2007b
Altamont Pass, CA	Erickson et al. 2002b	White Creek, WA	NWC and WEST 2005a	Biglow Canyon, OR	WEST 2005c
Elkhorn, OR	WEST 2005a	Footee Creek Rim, WY	Erickson et al. 2002b	Wild Horse, WA	Erickson et al. 2003b
Cotterel Mtn., ID	Cooper et al. 2004	Roosevelt, WA	NWC and WEST 2004	Biglow Reference, OR	WEST 2005c
Swauk Ridge, WA	Erickson et al. 2003a	Leaning Juniper, OR	NWC and WEST 2005b	Simpson Ridge, WY	Johnson et al. 2000b
Golden Hills, OR	Jeffrey et al. 2008	Klondike, OR	Johnson et al. 2002	Invenergy_Vantage, WA	WEST 2007
Windy Flats, WA	Johnson et al. 2007	Stateline, WA/OR	Erickson et al. 2002b	North Valley, MT	WEST 2006b
Combine Hills, OR	Young et al. 2003c	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Erickson et al. 2002b
Desert Claim, WA	Young et al. 2003b	Zintel Canyon, WA	Erickson et al. 2002a	Sunshine, AZ	WEST and the CPRS 2006
Hopkin's Ridge, WA	Young et al. 2003a	Homestead, CA	WEST et al. 2007	Dry Lake, AZ	Young et al. 2007c
Reardon, WA	WEST 2005b	Nine Canyon, WA	Erickson et al. 2001b	San Geronio, CA	Erickson et al. 2002b



Overall Raptor Use 0.67  
 Predicted Fatality Rate 0.10/MW/year  
 90.0% Prediction Interval (0, 0.35/MW/year)

**Figure 14. Regression analysis comparing raptor use estimations versus estimated raptor mortality.**

Data from the following sources:

Study and Location	Raptor Use	Source	Raptor Mortality	Source
Buffalo Ridge, MN	0.64	Erickson et al. 2002b	0.02	Erickson et al. 2002b
Combine Hills, OR	0.75	Young et al. 2003c	0.00	Young et al. 2005
Diablo Winds, CA	2.161	WEST 2006a	0.87	WEST 2006a
Foote Creek Rim, WY	0.55	Erickson et al. 2002b	0.04	Erickson et al. 2002b
High Winds, CA	2.34	Kerlinger et al. 2005	0.39	Kerlinger et al. 2006
Hopkins Ridge	0.70	Young et al. 2003a	0.14	Young et al. 2007a
Klondike II, OR	0.50	Johnson 2004	0.11	NWC and WEST 2007
Klondike, OR	0.50	Johnson et al. 2002	0.00	Johnson et al. 2003
Stateline, WA/OR	0.48	Erickson et al. 2002b	0.09	Erickson et al. 2002b
Vansycle, OR	0.66	WCIA and WEST 1997	0.00	Erickson et al. 2002b
Wild Horse, WA	0.29	Erickson et al. 2003b	0.09	Erickson et al. 2008
Zintel, WA	0.43	Erickson et al. 2002a	0.05	Erickson et al. 2002b

## **APPENDIX E**

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### Appendix E.1 Photographic Simulations

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**APPENDIX E.1**

**PHOTOGRAPHIC SIMULATIONS**

Photographic Simulation – Proposed 500 MW Wind Park KOP 1 ..... E-1  
Photographic Simulation – Initial 250 MW Wind Park KOP 1 ..... E-2  
Photographic Simulation – Proposed 500 MW Wind Park KOP 2 ..... E-3  
Photographic Simulation – Proposed 500 MW Wind Park KOP 3 ..... E-4  
Photographic Simulation – Initial 250 MW Wind Park KOP 3 ..... E-5  
Photographic Simulation – Proposed 500 MW Wind Park KOP 4 ..... E-6  
Photographic Simulation – Proposed 500 MW Wind Park KOP 5 ..... E-7  
Photographic Simulation – Initial 250 MW Wind Park KOP 5 ..... E-8  
Photographic Simulation – Proposed 500 MW Wind Park and Tie-line KOP 6 ..... E-9  
Photographic Simulation – Proposed Tie-line KOP 7 ..... E-10  
Photographic Simulation – Proposed Tie-line, No Vegetation KOP 7 ..... E-11  
Photographic Simulation – Proposed Tie-line KOP 8 ..... E-12  
Photographic Simulation – Proposed Tie-line, No Vegetation KOP 8 ..... E-13  
Photographic Simulation – Western’s Proposed Switchyard and Tie-line KOP 9 ..... E-14  
Photographic Simulation – Western’s Proposed Switchyard and Tie-line, No Vegetation KOP 9 ..... E-15  
Photographic Simulation – Alternative Tie-Line KOP 7 ..... E-16  
Photographic Simulation – Alternative Tie-Line, No Vegetation KOP 7 ..... E-17  
Photographic Simulation – Alternative Tie-Line KOP 8 ..... E-18  
Photographic Simulation – Alternative Tie-Line, No Vegetation KOP 8 ..... E-19



Photo



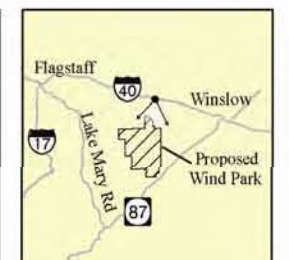
Simulation



**Proposed Action - KOP #1 (Intersection of I-40 and Meteor Crater Road)**

This depicts one possible view of the proposed wind park. The view pans from the southeast to the southwest from a point near the intersection of Interstate 40 and Meteor Crater Road. The rim of Meteor Crater is located near the left-hand side of the photograph and Anderson Mesa is located near the right-hand side of the photograph. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately six and one-half miles away, located within background views.

Grapevine Canyon Wind Project



Photo



Simulation



**Proposed Action - KOP #1 (Intersection of I-40 and Meteor Crater Road)**

This depicts one possible view of the proposed wind park. The view pans from the southeast to the southwest from a point near the intersection of Interstate 40 and Meteor Crater Road. The rim of Meteor Crater is located near the left-hand side of the photograph and Anderson Mesa is located near the right-hand side of the photograph.

This simulation depicts an initial wind park phase of up to 250 MW. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately eight miles away, located within background views.

Grapevine Canyon Wind Project





Photo



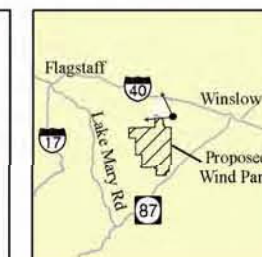
Simulation



Proposed Action - KOP #2 (Meteor Crater Visitors Center)

This depicts one possible view of the proposed wind park. The view pans from the west to the north, typical of the viewshed experienced through the Meteor Crater Visitors Center picture window. The rim of Meteor Crater is located near the left-hand side of the photograph and the San Francisco Peaks are located in the center of the photograph. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately three and one-half miles away, located within middleground views.

Grapevine Canyon Wind Project





Photo



Simulation



**Proposed Action - KOP #3 (Meteor Crater)**

This depicts one possible view of the proposed wind park. The view pans from the southwest to the northwest from a point along the rim of Meteor Crater. The rim of Meteor Crater is located in the foreground near the left-hand side of the photograph and Anderson Mesa is located in the background of the photograph. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately three miles away, located within middleground views.

Grapevine Canyon Wind Project





Photo



Simulation



**Proposed Action - KOP #3 (Meteor Crater)**

This depicts one possible view of the proposed wind park. The view pans from the southwest to the northwest from a point along the rim of Meteor Crater. The rim of Meteor Crater is located in the foreground near the left-hand side of the photograph and Anderson Mesa is located in the background of the photograph. This simulation depicts an initial wind park phase of up to 250 MW. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately four and one half miles away, located within background views.

Grapevine Canyon Wind Project





Photo



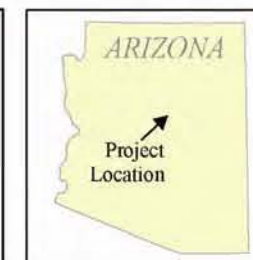
Simulation



**Proposed Action - KOP #4 (Chavez Pass Road)**

This depicts one possible view of the proposed wind park. The view pans from the northwest to the northeast from a point along Chavez Pass Road, near the base of Chavez Mountain. Anderson Mesa rises from the left-hand side of the photograph extending to the center and the San Francisco Peaks are visible in the distant background near the extreme left-hand side of the photograph. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately one and one-half miles away, located within middleground views.

Grapevine Canyon Wind Project





Photo



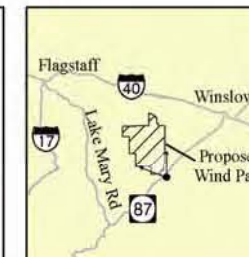
Simulation



**Proposed Action - KOP #5 (State Route 87)**

This depicts one possible view of the proposed wind park. The view pans from the northwest to the north from a point along State Route 87. Anderson Mesa rises near the left-hand side of the photograph and West Sunset Mountain rises near the right-hand side of the photograph. In addition, the San Francisco Peaks are visible in the distant background near the left-hand side of the photograph. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately one mile away, located within middleground views.

Grapevine Canyon Wind Project





Photo



Simulation



**Proposed Action - KOP #5 (State Route 87)**

This depicts one possible view of the proposed wind park. The view pans from the northwest to the north from a point along State Route 87. Anderson Mesa rises near the left-hand side of the photograph and West Sunset Mountain rises near the right-hand side of the photograph. In addition, the San Francisco Peaks are visible in the distant background near the left-hand side of the photograph. This simulation depicts an initial wind park phase of 250 MW. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately 12 miles away, located within background views.

Grapevine Canyon Wind Project





Photo



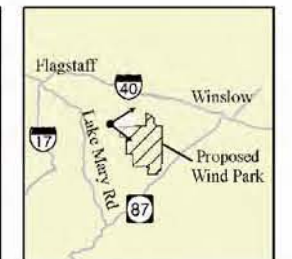
Simulation



**Proposed Action - KOP #6 (Forest Road 125)**

This depicts one possible view of the proposed wind park and transmission tie-line. The view pans from the northeast to the southeast from along Forest Road 125 as it drops from Anderson Mesa. WTGs are depicted at a height of approximately 430 feet, with the nearest WTGs approximately two and one-half miles away, located within middleground views. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located approximately one-half mile away, within foreground views.

Grapevine Canyon Wind Project







**Proposed Action - KOP #7 (Intersection of Forest Road 125 and Forest Road 82)**

This depicts one possible view of the proposed transmission tie-line. The view pans from the northeast to the east from a point along Forest Road 125 near the intersection of Forest Road 82. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located within immediate foreground views, approximately one-tenth mile away.

Grapevine Canyon Wind Project





Photo



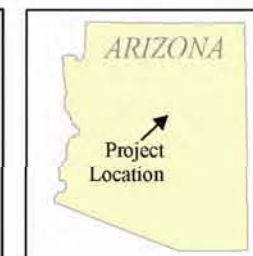
Simulation



**Proposed Action - KOP #7 (Intersection of Forest Road 125 and Forest Road 82)**

This depicts one possible view of the proposed transmission tie-line. This photographic simulation was prepared as if the vegetation were removed, or drastically changed. The view pans from the northeast to the east from a point along Forest Road 125 near the intersection of Forest Road 82. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located within immediate foreground views, approximately one-tenth mile away.

Grapevine Canyon Wind Project





Photo



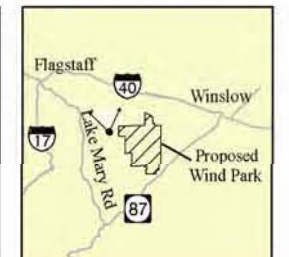
Simulation



**Proposed Action - KOP #8 (Forest Road 82)**

This depicts one possible view of the proposed transmission tie-line. The view pans from the northwest to the northeast along Forest Road 82, just south of Forest Road 125. Mormon Mountain rises above the trees slightly near the left-hand side of the photograph. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located within immediate foreground views, approximately one-tenth mile away.

Grapevine Canyon Wind Project





Photo



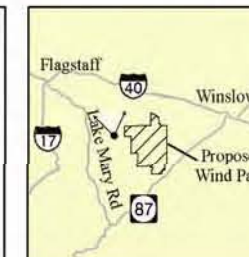
Simulation



**Proposed Action - KOP #8 (Forest Road 82)**

This depicts one possible view of the proposed transmission tie-line. This photographic simulation was prepared as if the vegetation were removed, or drastically changed. The view pans from the northwest to the northeast along Forest Road 82, just south of Forest Road 125. Mormon Mountain rises near the left-hand side of the photograph and the San Francisco Peaks are located in the distant background near the center of the photograph. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located within immediate foreground views, approximately one-tenth mile away.

Grapevine Canyon Wind Project





Photo



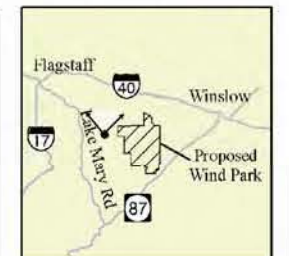
Simulation



**Proposed Action - KOP #9 (Forest Road 125 and Existing Transmission Line Corridor)**

This depicts one possible view of the proposed switchyard and transmission tie-line. The view pans from the northwest to the northeast from a point near the intersection of Forest Road 125 and the existing Western transmission line corridor. The existing transmission line structures are approximately 120 feet tall and the proposed tie-line towers are also depicted at this height, spaced about 1,000 feet apart. The switchyard and the nearest tie-line tower are approximately six-tenths mile away, located within middleground views.

Grapevine Canyon Wind Project

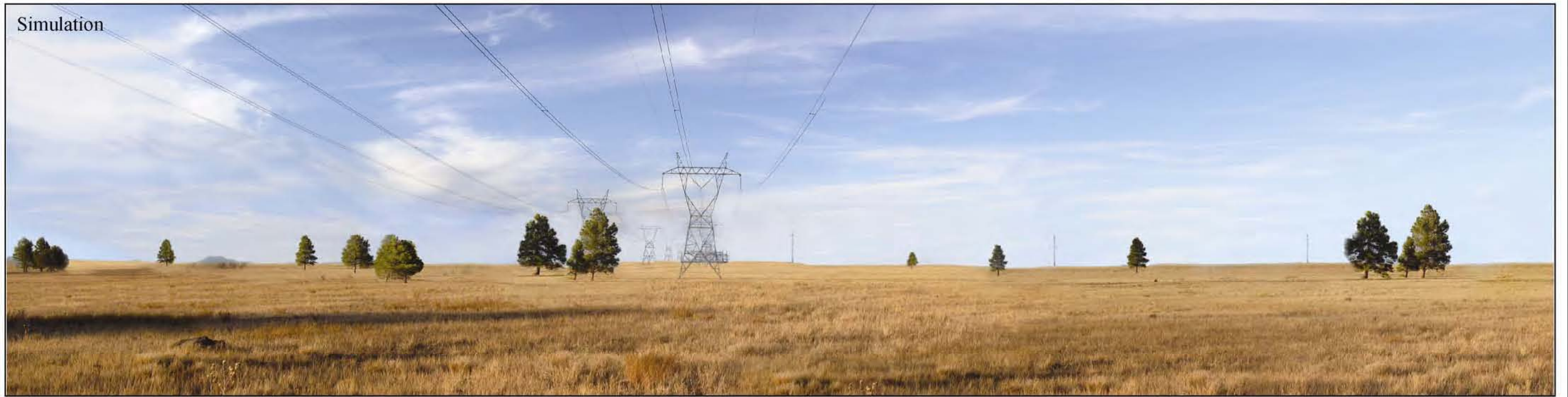




Photo



Simulation



**Proposed Action - KOP #9 (Forest Road 125 and Existing Transmission Line Corridor)**

This depicts one possible view of the proposed switchyard and transmission tie-line. This photographic simulation was prepared as if the vegetation were removed, or drastically changed. The view pans from the northwest to the northeast from a point near the intersection of Forest Road 125 and the existing Western transmission line corridor. The San Francisco Peaks are visible in the distant background near the left-hand side of the photograph. The existing transmission line structures are approximately 120 feet tall and the proposed tie-line towers are also depicted at this height, spaced about 1,000 feet apart. The switchyard and the nearest tie-line tower are approximately six-tenths mile away, located within middleground views.





Photo



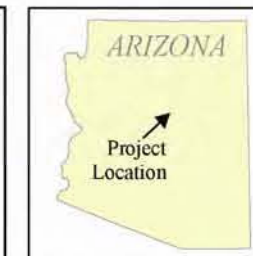
Simulation



**Alternative Transmission Line Corridor - KOP #7 (Intersection of Forest Road 125 and Forest Road 82)**

This depicts one possible view of the alternative transmission tie-line. The view pans from the northeast to the east from a point along Forest Road 125 near the intersection of Forest Road 82. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located approximately one-half mile away, within foreground views.

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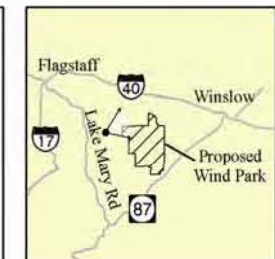




Alternative Transmission Line Corridor - KOP #7 (Intersection of Forest Road 125 and Forest Road 82)

This depicts one possible view of the alternative transmission tie-line. This photographic simulation was prepared as if the vegetation were removed, or drastically changed. The view pans from the northeast to the east from a point along Forest Road 125 near the intersection of Forest Road 82. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located approximately one-half mile away, within foreground views.

Grapevine Canyon Wind Project





Photo



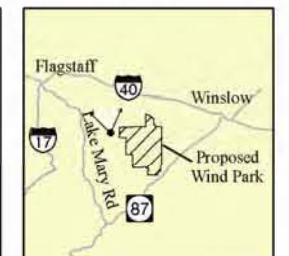
Simulation



Alternative Transmission Line Corridor - KOP #8 (Forest Road 82)

This depicts one possible view of the alternative transmission tie-line. The view pans from the northwest to the northeast along Forest Road 82, just south of Forest Road 125. Mormon Mountain rises above the trees slightly near the left-hand side of the photograph. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located approximately three-tenths mile away, within foreground views.

Grapevine Canyon Wind Project

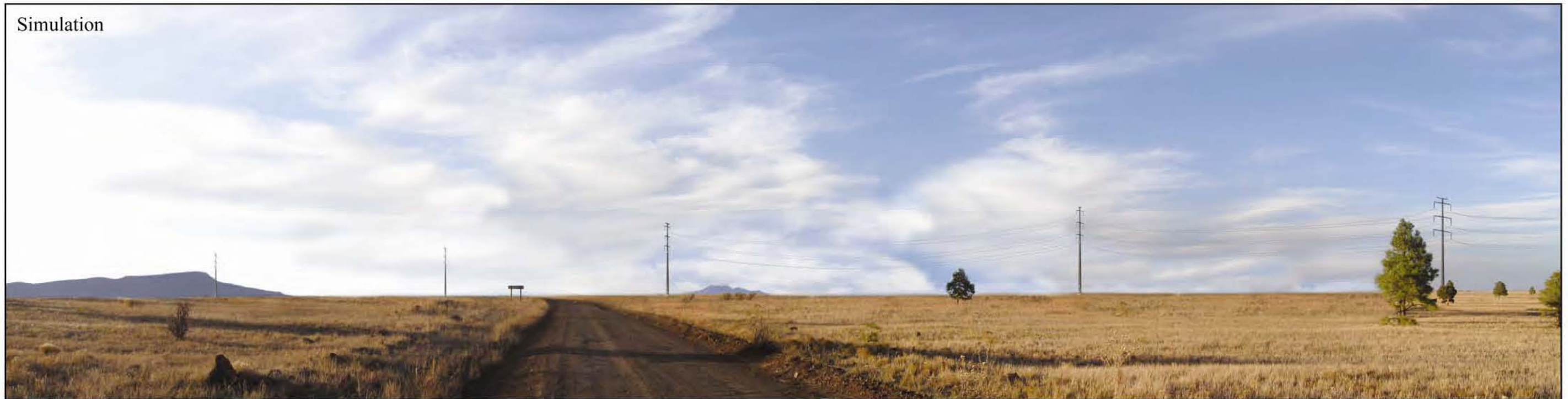




Photo



Simulation



**Alternative Transmission Line Corridor - KOP #8 (Forest Road 82)**

This depicts one possible view of the alternative transmission tie-line. This photographic simulation was prepared as if the vegetation were removed, or drastically changed. The view pans from the northwest to the northeast along Forest Road 82, just south of Forest Road 125. Mormon Mountain rises near the left-hand side of the photograph and the San Francisco Peaks are located in the distant background near the center of the photograph. Tie-line towers are depicted at a height of approximately 120 feet and spaced about 1,000 feet apart. The nearest tower is located approximately three-tenths mile away, within foreground views.

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