SEPTEMBER 1996

COLUMBIA RIVER GORGE VEGETATION MANAGEMENT PROJECT

Final Environmental Assessment
DOE/EA–1162

BONNEVILLE
POWER ADMINISTRATION

COLUMBIA RIVER GORGE VEGETATION MANAGEMENT ENVIRONMENTAL ASSESSMENT

(Hanford-Ostrander and North Bonneville-Midway Transmission Line Rights-of-Way)

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DEPARTMENT OF ENERGY

Bonneville Power Administration

Columbia River Gorge Vegetation Management
(Hanford-Ostrander and North Bonneville-Midway
Transmission Line Rights-of-way)

AGENCY: Bonneville Power Administration (BPA), Department of Energy (DOE).

ACTION: Finding of No Significant Impact (FONSI).

SUMMARY: BPA is proposing to control undesirable vegetation in a segment of the Hanford-Ostrander transmission line corridor (from tower 130/5 + 91.4 meters (m) (300 feet (ft.)) to 131/1 + 91.4 m (300 ft.) and 134/6 + 128 m (420 ft.) to 140/3 - 152.4 m (500 ft.)), and in a segment of the North Bonneville-Midway corridor (from tower 13/2 + 403.8 m (1325 ft.) to 18/3 + 97.8 m (321 ft.)) Total length to be cleared is 17 kilometers (10.5 miles). The corridors of the BPA Hanford-Ostrander 500-kilovolt (kV) and Bonneville-Midway 500-kV transmission lines are located in the Columbia River Gorge National Scenic Area in the State of Washington. Undesirable vegetation would be controlled using an Integrated Vegetation Management (IVM) approach to establishing a low-growing plant community. BPA's proposed IVM would use manual clearing and biological methods, in combination with herbicide treatments approved by the Environmental Protection Agency, to control vegetation. BPA, in cooperation with the U.S. Forest Service (USFS) has prepared an Environmental Assessment (DOE/EA-1162) evaluating the potential environmental effects of existing practices (Alternative I: No Action), and the proposed action (Alternative II). IVM on the right-of-way would not have a significant environmental impact for the following reasons: (1) as low-growing plants are established, the need for periodic clearing would be reduced, as would corresponding impacts on soils, vegetation, water resources, and wildlife resources; (2) herbicide application methods would prevent contamination of surface waters; and (3) there would be no adverse effects

on land use, air quality, visual quality, recreation. Based on the analysis in the EA, BPA has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an Environmental Impact Statement (EIS) is not required, and BPA is issuing this FONSI.

FOR FURTHER INFORMATION, CONTACT: Richard Stone - ECN, Bonneville Power Administration, P.O. Box 3621, Portland, Oregon, 97208-3621; phone number 503-230-3797; fax number 503-230-5699.

Public Availability: This FONSI will be distributed to all persons and agencies known to be interested in or affected by the proposed action or alternatives.

SUPPLEMENTARY INFORMATION: BPA operates the Federal Columbia River Transmission System (FCRTS), which supplies power to the Pacific Northwest and nearby states. To maintain FCRTS electrical reliability, vegetation must be prevented from growing into transmission lines.

Under Alternative II (proposed) effects on the physical environment would be mostly beneficial. The proposed action would eliminate the need for mechanical clearing, reducing soil disturbance and decreasing soil erosion in both the near and long-term. Soil microbes would readily break down herbicides in the soil. Herbicide use would decrease over time.

Potential effects on vegetation in the short-term would increase while corrective measures are applied. Vegetation would be selectively controlled, leaving low-growing vegetation and grasses. Over the long-term, reducing the amount of herbicide and eliminating mechanical operations would benefit low-growing vegetation communities. Noxious weeds would be controlled according to practices of weed control boards and programs. Vegetation-clearing activities would be designed to eliminate fuel buildup in the right-of-way, and would follow Federal fire regulations and state fire codes.

Although loss of vegetation would increase overland runoff and stream flows in the short term, this effect would diminish once desirable vegetation communities were established. No herbicide treatment would occur near surface waters. Buffers would be established near water bodies to avoid impacts on rivers, streams, and wetlands. Only the Rodeo® formulation of Glyphosate and Triclopyr herbicide would be used within 3.05 m (10 ft.) of streams. Impacts from the approved herbicide treatments would be localized, low, and short term.

Wildlife habitat would benefit from the establishment and stabilization of low-growing vegetation communities and grasses. Short-term impacts would occur as corrective actions were taken to help establish such communities. However, over time, vegetation management activities would be less severe and less frequent, and humans would disturb the area less frequently for maintenance. There would be no effect on threatened or endangered species, or their habitat.

Visual quality over time would improve. Clearing would occur less frequently because the more vigorously growing vegetation would be eliminated, giving lower-growing vegetation a chance to become established and to crowd out less desirable plants. There would be no need for large-scale clearing.

The expectation of the presence of cultural resources in the rights-of-way is low to very low. None of the areas within the project area rights-of-way has been professionally inventoried for historic or prehistoric cultural resources. However, if any archaeological or historic site were discovered, work in the area would be halted and consultation be initiated with the State Historic Preservation Office. No known recreation resources are in the right-of-way.

All mitigation measures specifically designed for the project and described in the EA are adopted and will be monitored.

Determination: Based on the information in the EA, as summarized here, BPA determines that the proposed action is not a major Federal action significantly affecting the quality of

the human environment within the meaning of NEPA, 42 U.S.C. 4321 et seq. Therefore, an EIS will not be prepared, and BPA is issuing this FONSI.

Issued in Portland, Oregon, on September 6, 1996.

Randall W. Hardy
Administrator and
Chief Executive Officer

1 Purpose and Need

The Bonneville Power Administration (BPA) operates the Federal Columbia River Transmission System, which supplies power to the Pacific Northwest (PNW) and nearby states. BPA must maintain the system's electrical reliability (Federal Columbia River Transmission System Act, section 4). Trees and other tall-growing vegetation threaten that reliability by potentially growing or falling into transmission lines. Shrubs and similar vegetation may also threaten system reliability by growing into access roads and keeping maintenance crews from needed access to transmission towers and lines. BPA needs to be able to keep its rights-of-way sufficiently clear to ensure maintenance and operational reliability.

More than 368 kilometers (km) (230 miles (mi.)) of BPA transmission lines are operated in the Columbia River Gorge National Scenic Area (NSA), which lies mainly on the border between the states of Oregon and Washington. Much of that area is forested. Reliability of two BPA transmission line corridors (the Hanford-Ostrander 500,000-volt (500-kV) corridor, and the North Bonneville-Midway 230-kV corridor; see Figure 1) is threatened in the NSA by vegetation growth. BPA needs to find an effective and cost-efficient way to prevent tall-growing vegetation from disrupting system operations, and to keep access roads clear, while still protecting the environment and complying with national policies and mandates.

Background

Both transmission corridors are located northeast of the Bonneville Dam, near the city of Carson, Washington. They cross Federal, state, and private lands in the NSA. This environmental assessment (EA) focuses on certain portions of those corridors that cross primarily U. S. Forest Service (USFS) land, and some under state and private ownership. Of the total of 17 km (10.5 mi.) of concern, about 13.6 km (8.5 mi.) of right-of-way cross land managed by the USFS NSA. The corridors are located as follows:

- **Hanford-Ostrander:** from tower 130/5 + 91.4 meters (m) (300 feet (ft.) to 131/1 + 91.4 m (300 ft.) and 134/6 + 128 m (420 ft.) to 140/3 - 152.4 m (500 ft.);
- **North Bonneville-Midway:** from tower 13/2 + 403.8 m (1325 ft.) to 18/3 + 97.8 m (321 ft.).

For approximately 22 years, BPA's original Land Use Grant and associated right-of-way management plan determined how vegetation was managed on National Forest System land crossed by these lines. Management included authorized, selective use of herbicides. However, in the 1980's, an injunction barred the PNW Region from using herbicides on National Forest System lands.

The application of herbicides for vegetation management is currently governed by the 1989 Mediated Agreement[1] (see Appendix A). In 1993, the USFS issued guidelines for complying with the terms of that agreement. These guidelines require detailed site-

[1] The Mediated Agreement also specifies that, when considering the use of herbicides, an environmental assessment must be prepared.

Columbia River Gorge Vegetation Management
(Hanford-Ostrander and N. Bonneville-Midway Transmission Lines)

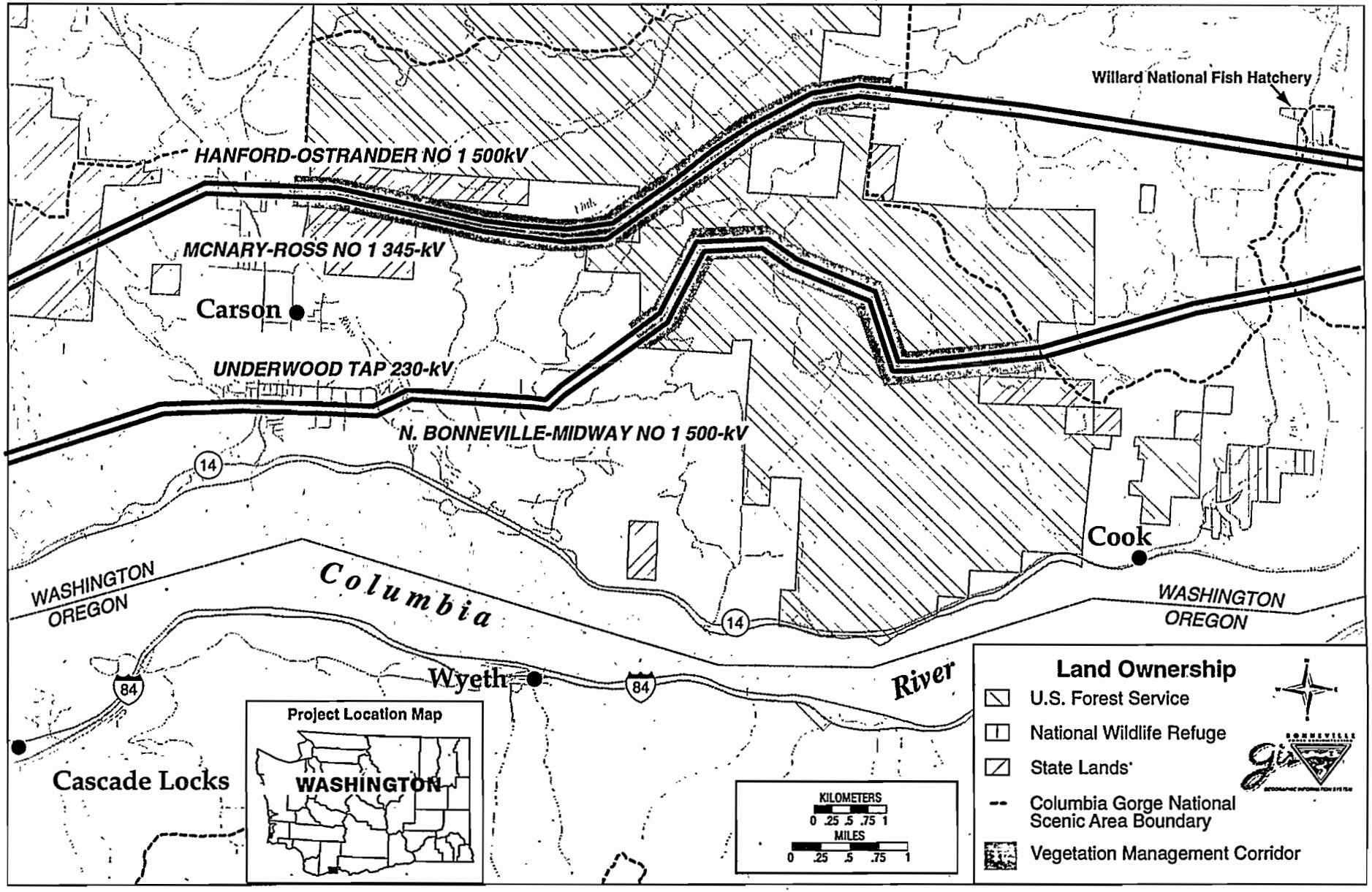

Figure 1

specific analysis and public involvement on most vegetative management activities, including those on rights-of-way.

Since 1984, BPA has been able to use only mechanical-clearing and hand-clearing techniques for undesirable vegetation (defined as tall-growing vegetation potentially threatening to grow or fall into transmission lines; vegetation bordering access roads; and noxious weeds or other pest species). Cut trees have re-sprouted, producing even more dense vegetation. It has therefore not been possible to establish more desirable low-growing vegetation such as vine maples, rhododendrons, ferns, salal, and so on.

Other drawbacks are associated with mechanical- and hand-clearing methods. Mechanical and hand clearing promotes dense growth, which in turn increases hazards to workers trying to operate sharp equipment, often on steep, uneven terrain. Mechanical clearing often disturbs the ground excessively, and may cause soil erosion. It is also more expensive to maintain a right-of-way that has been mechanically cleared: it costs more in time and dollars to clear per acre; clearing is a slower process; and the fixed cost of the equipment is a large component of total cost per acre.

The Hanford-Ostrander and North Bonneville-Midway corridors are increasingly crowded with overgrowth of western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii*), big-leaf maple (*Acer macrophyllum*), western red cedar (*Thuja plicata*), and red alder (*Alnus rubra*). The lines require vegetative clearing now because trees are growing very close to the limits of safe electric clearance.

To avoid the impacts and delays of current vegetation management practices, BPA and the USFS NSA have jointly completed an evaluation of current right-of-way practices, with the objective of reducing short-term and long-term environmental impacts and costs. The study using the two corridors was completed in March 1996 and provides the proposal being addresses by this EA. The methods used include the identification of sensitive resources and vegetation management options that avoid impacts and ensure compliance with regulatory requirements (USFS and Bureau of Land Management Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest-Related Species Within the Range of the Northern Spotted Owl, the final environmental impact statement (EIS) for Managing Competing and Unwanted Vegetation, the USFS Mediated Agreement, and other environmental regulations). The method is designed to promote the development of low-growing vegetation.

Public Involvement Summary

On March 12, 1996, a scoping notice was sent to area landowners and others potentially interested in the project. Comments were accepted through April 1, 1996. Comments received (see Appendix E) ranged from support of the integrated vegetation management concept and of eradication of noxious weeds, to concerns about and opposition to the use of herbicides, particularly on individual landowner's property. Concerns expressed are summarized below, together with a listing of places in the EA that address the concerns:

- Concern for migration of herbicides through air or water to adjacent property, including potential effects on grazing animals, fruit trees, or untargeted vegetation; preference for use of no chemicals in specific areas; a request that only

environmentally approved chemicals be used. [See description of Alternative II, in section 2; descriptions of impacts and mitigation measures for Alternative II under Vegetation, Wildlife, and Water Resources in section 3; and section 4 for consultation requirements for these resources (particularly the Federal Insecticide, Fungicide, and Rodenticide Act). Appendices A, B, and C contain additional information on herbicides and their appropriate, regulated use.]

- Concern for wildlife habitat and corridors as they might be affected by management practices. (See section 3, Wildlife discussion and Table 3; section 4 for consultation requirements that may affect wildlife; and Appendix D, which contains analysis data relating to wildlife.)
- Concern for impacts on ground- or other water through runoff from cleared areas; concern that adequate erosion control measures be used. (See section 2, Table 1, for information relating to use of herbicides near water resources; section 3, Soils and Water Resources discussions; section 4, for consultation requirements relating to water quality; and Appendix C, for more general information on herbicide characteristics as they may relate to water.)
- Concern for visual effects: a desire that large-area clearings be eliminated and other techniques used; a desire that the right-of-way be cleared so as to blend with adjacent areas. (See section 3, Table 3 and Visual Quality, for discussions on impacts and mitigation measures relating to this concern; see also Appendix D for analysis measures regarding visual quality.)
- Commenters also asked questions about long-term maintenance needs and the possibility of decreasing herbicide use over time (see Table 2 and impacts discussion for Vegetation); appropriate control of noxious weeds (see Vegetation impacts and mitigation measures, section 3); management of fire hazard during equipment operation (see mitigation measures for Vegetation in section 3); past and current tree-clearing practices and ownership of/profit from merchantable trees (compensation depends on the nature of the easement document); ways that BPA would ensure no impacts off the designated right-of-way (see Table 1 and Appendices A, B, and C for specifications on controls for application of herbicides; also mitigation measures for individual resources); who clears BPA rights-of-way that cross USFS land (BPA does); and the nature of the vegetative community that would be established.
- Also recommended were coordination with other government entities seeking to control vegetation so as to present an effective approach; and use of youths or senior citizens to act as "weed teams." (BPA coordinates with other governments and weed control boards as a matter of policy; individual projects will determine the participants in vegetation control.)

Decisions to Be Made

Decisions to be based on this EA:

- BPA would decide whether or not to update right-of-way plans and clear the right-of-way using an Integrated Vegetation Management (IVM) method with Herbicides (see section 2, below), in accordance with the National Environmental Policy Act (NEPA).
- The USFS (NSA Area Manager) would decide whether to approve the updated right-of-way plan to allow the use of herbicides under the IVM method.

2 Proposed Action and Alternatives

Alternative I: No Action

BPA would continue the current practice of controlling undesirable vegetation on the Hanford-Ostrander and Bonneville-Midway transmission line corridors using manual, mechanical, and biological methods.

Manual, Mechanical, and Biological Methods

Manual vegetation management techniques currently used involve chain saws and hand tools. **Mechanical** vegetation management techniques would involve the use of crawler tractors or low-ground-pressure tractors equipped with blades or mowing attachments to cut, till, or mow undesirable plants.

Biological vegetation management techniques would involve two techniques: (1) encouraging low-growing species to dominate the vegetation community by eliminating the taller trees; and (2) introducing species-specific parasites (for example, the cinnabar moth to control tansy ragwort, a noxious weed).

No chemical methods (herbicides) would be used.

Available methods of vegetation management would continue to be selected to control undesirable vegetation, depending on species' growth characteristics and proximity to sensitive resources such as streams. Vegetation management methods are and would be frequently used in combination with one another.

Alternative II: Proposed Action - Integrated Vegetation Management (IVM) with Herbicides

Rather than continue to fall behind in clearing, BPA is looking to expand its vegetation management to include additional techniques on these lands. The proposed methods (see below) may reduce the amount of clearing needed, by promoting the growth of competitive, low-growing vegetation. The objective is to convert rights-of-way occupied by undesirable, tall-growing trees to a stable or quasi-stable community of low-growing plants that inhibits re-establishment of undesirable species. The proposed methods may also reduce risk to the lines, to the PNW power supply, and to maintenance personnel; they may also be more cost-effective, within the context of environmental responsibility and regulatory compliance. Adoption of the proposed alternative may also result in revisions to the lines' existing right-of-way management plans.

BPA proposes to control undesirable vegetation through IVM in selected areas of the identified transmission line corridors. This approach would use chemical, as well as manual and biological methods. **No mechanical clearing would be used.** Methods would be selected to control undesirable vegetation, based on species' growth characteristics and on the need to avoid impact on sensitive resources such as streams. These methods would frequently be used in combination.

Herbicide Methods

In addition to the manual techniques listed under Alternative I, **chemical (herbicide)** vegetation management methods would be used. These involve the following:

- Broadcast Foliar Treatments:
  a) Land-based (not aerial) high-volume foliar application - herbicide applied to large areas of target species vegetation ("large-area broadcast").
  b) Land-based low-volume foliar application - herbicide applied to specific target vegetation ("spot foliar").
- Basal application: Herbicide applied to the lower stems and root collars of individual trees or clumps of shrubs.
- Cut-stump/stubble application: Herbicide applied to freshly cut stumps of hardwood trees and shrubs to prevent resprouting.
- Basal/stem injection: Herbicide injected into sapwood around the bases of individual trees.

All chemicals that would be used are approved by the Environmental Protection Agency (EPA). See Table 1 (pages 7-8) and Appendices B (Treatment Details) and C (Herbicide Information Profile).

Phased Actions

The goal of Alternative II is the establishment of a diversified low-growing plant community of desirable plants that would reduce or preclude the growth of tall trees and other unwanted vegetation, while not affecting sensitive environmental resources. This must be accomplished by first removing the tall-growing vegetation using hand-clearing methods (Corrective Action), followed by phased herbicide applications (Early Treatment).

Corrective Action

Hand clearing would reduce vegetation below a threshold of 4.3 m (14 ft.) from the ground. Herbicides would then be applied in accordance with sensitive area zonal restrictions. Chemicals would be applied under specific direction as to terrain, soil, water, and vegetation conditions characterized by mapped zones.[2] The zones are shown in Table 1, and Figure 2. Corrective action would be completed following the Decision Notice. Some corrective hand clearing might be done during the second year. Follow-up selective treatment with herbicide would be undertaken immediately after hand clearing in order to reduce resprouting of tall-growing vegetation and encourage low-growing plant communities.

Native shrub and herbaceous species would be preferred; any non-native species selected must not be so aggressive as to exclude desired native species.

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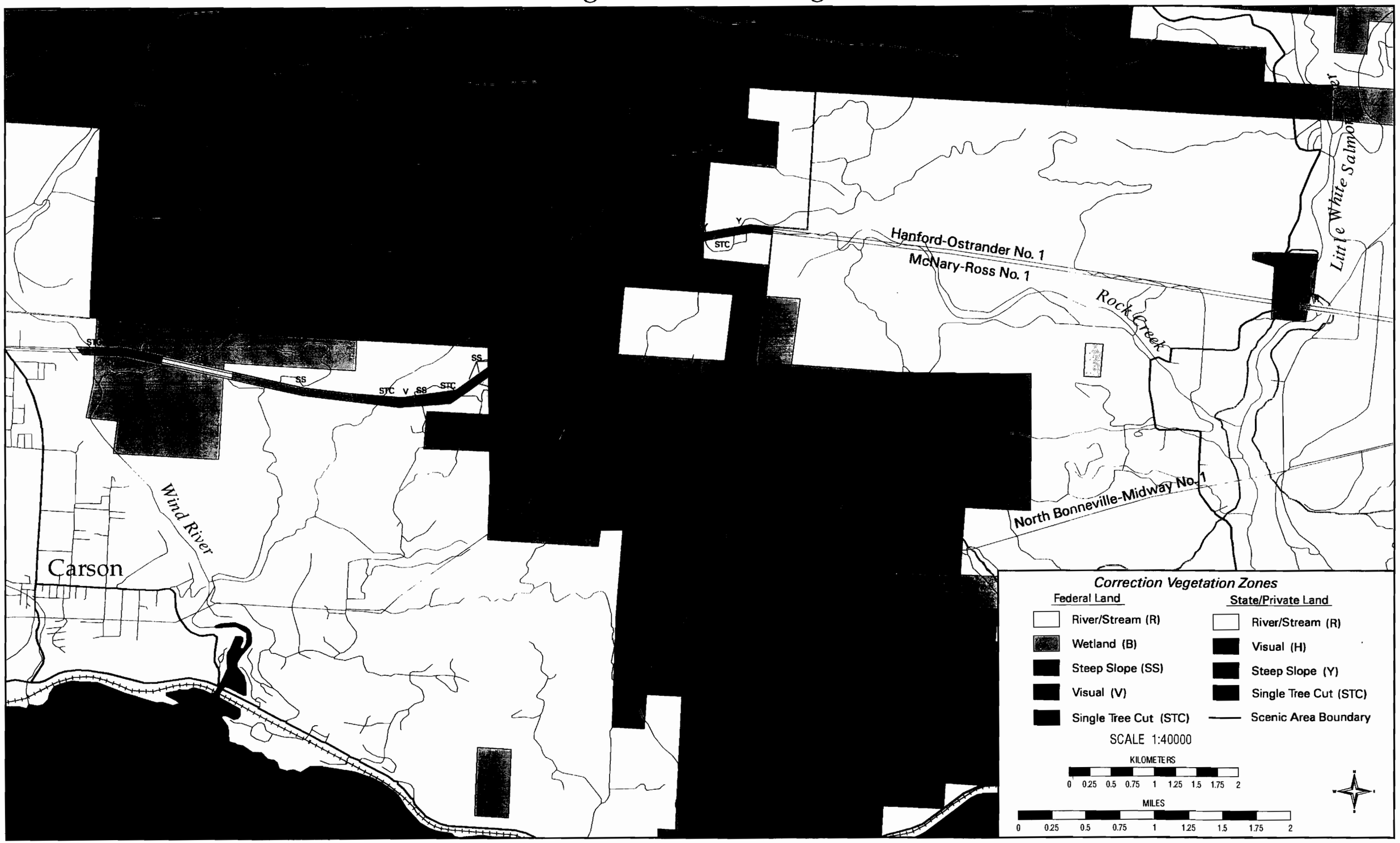
[2] The zonal information is adopted from a management plan developed by David Evans and Associates for the Bonneville Power Administration: *Prototype Integrated, Impact Avoidance Right-of-Way Management Plan* (1996).

Table 1: Treatment Zones

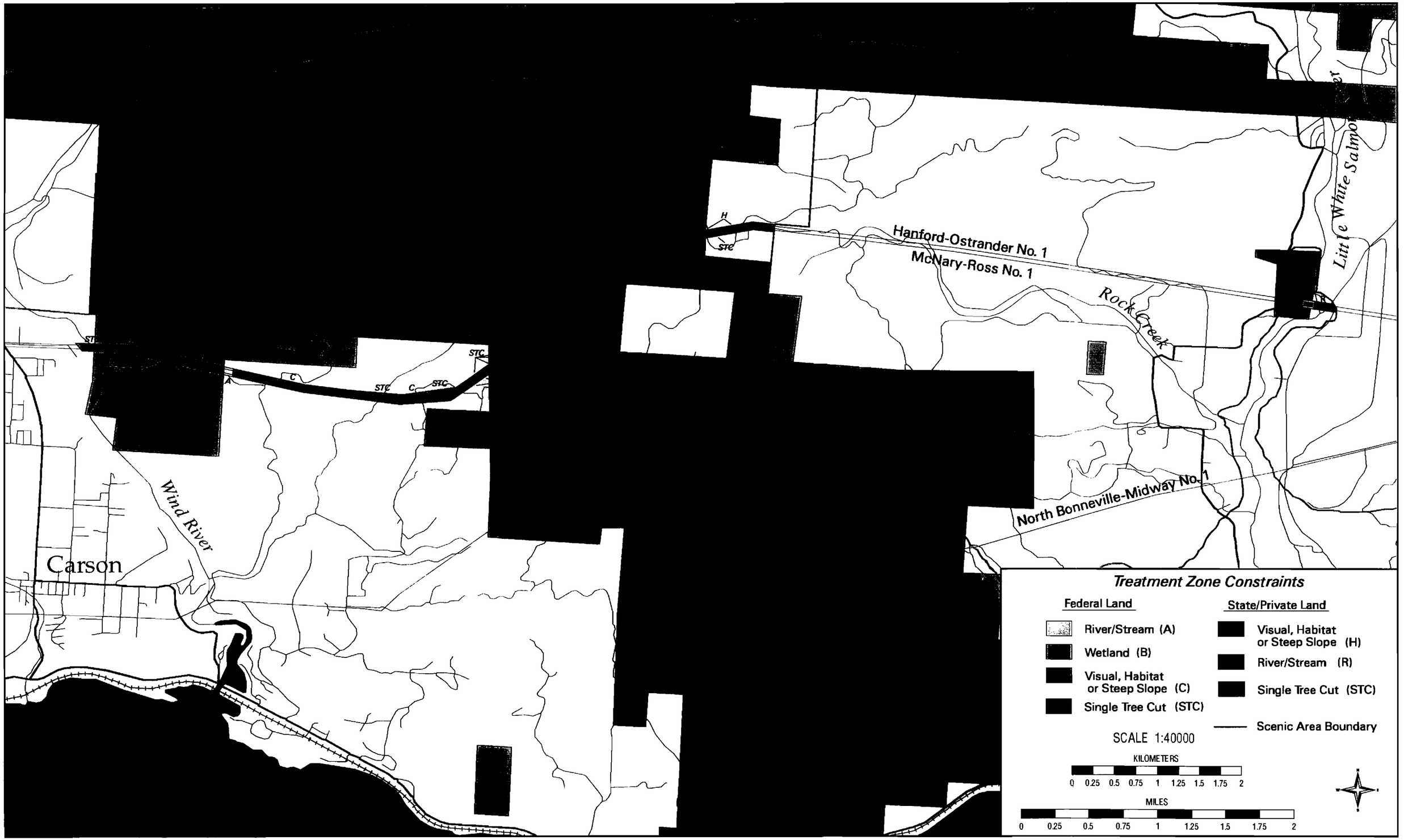
Zones	Stage: Corrective Action
Y	NSA state or private lands where a steep slope precludes mechanical treatments. Available: all manual and biological treatments; all herbicide treatments. **Herbicides:** Glyphosate, Picloram, Triclopyr, Dicamba may be prescribed for cut-stump, stem-injection, and basal-application treatments, as well as for spot-foliar and broadcast-foliar treatments.
H	NSA state or private lands that contain both steep slopes and a significant visual resource. Available: all manual and biological treatments; all herbicide treatments except broadcast-foliar applications and cut-stubble treatments. **Herbicides:** Glyphosate, Picloram, Triclopyr, and Dicamba may be prescribed for cut-stump, stem-injection, and basal-application treatments, as well as for spot-foliar treatments.
R	NSA state or private lands, within 30.5 m (100 ft.) of a stream. Available: all manual and biological treatments. **Herbicides:** No herbicide treatments, except for cut-stump treatments using the Rodeo® formulation of Glyphosate and Triclopyr.
Z	NSA FS-administered land, Late Successional Reserve (LSR)[3], with no other environmental constraints. Available: all manual, biological, and herbicidal treatments. **Herbicides:** Glyphosate, Picloram, Triclopyr, and Dicamba may be prescribed for cut-stump, stem-injection, and basal-application treatments; Glyphosate, Picloram, and Triclopyr for spot-foliar and broadcast-foliar treatments; Picloram for cut-stubble treatments.
V	NSA USFS-administered lands that have either a significant visual resource or habitat suitable for Forest Sensitive species. Steep slopes may also be present. Available: all manual and biological treatments; all herbicide treatments, as specified below. **Herbicides:** Glyphosate, Picloram, Triclopyr, and Dicamba may be prescribed for cut-stump, stem-injection, basal-application, or spot-foliar treatments.
SS	NSA USFS-administered lands where a steep slope precludes the use of mechanical treatments. Available: all manual and biological treatments; all herbicide treatments except a cut-stubble treatment. **Herbicides:** Glyphosate, Picloram, Triclopyr, and Dicamba may be prescribed for cut-stump, stem-injection, basal-application, spot-foliar, or broadcast foliar treatments.
B	NSA FS-administered lands where wetlands preclude the use of mechanical treatments and broadcast-foliar herbicide applications. Available: all manual and biological treatments, selected herbicides. **Herbicides:** Only the Rodeo® formulation of Glyphosate and Triclopyr may be prescribed for cut-stump, basal-application, stem-injection, and spot-foliar treatments. Glyphosate may be used within 3.05 m (10 ft.) of any perennial streams. Triclopyr may be used only more than 3.05 m (10 ft.) from streams.

[3] Late-Successional Reserves (LSR) are identified with an objective to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth forest-related species.

Correction Vegetation Management Zones



Early Treatment Vegetation Management Options



Zones	Stage: Corrective Action *(con't)*
STC	Any areas in the corridor with greater than 38.1 m (125 ft.) vertical distance between the ground surface and transmission lines. Here, removal is periodically required only of individual trees (single tree cuts) that could encroach into the transmission corridor danger zone. **Herbicides:** None.

Zones	Stage: Early Treatment
H	NSA state or private lands that do not contain water bodies, wetlands, or riparian reserves buffers. Available: all manual and biological treatments; all herbicide treatments except large-area broadcast. **Herbicides:** Glyphosate, Picloram, Triclopyr, and Dicamba may be prescribed for cut-stump, stem-injection, and basal-application treatments, as well as for spot-foliar treatments.
R	NSA state or private lands, within 30.5 m (100 ft.) of a stream. Available: all manual and biological treatments. **Herbicides:** No herbicide treatments, except for cut-stump treatments using Rodeo® formulation of Glyphosate and Triclopyr.
STC	Any areas in the corridor with greater than 38.1 m (125 ft.) vertical distance between the ground surface and transmission lines. Here, removal is periodically required only of individual trees (single tree cuts) that could encroach into the transmission corridor danger zone. **Herbicides:** None.
C	NSA USFS-administered areas that do not contain water bodies, including wetlands, and their associated riparian reserve buffers. Available: all manual and biological treatments, all herbicide treatments except large-area broadcast. **Herbicides:** Glyphosate (Roundup® and Rodeo®), Picloram, Triclopyr, and Dicamba may be prescribed for cut-stump, stem-injection, basal-application, and spot-foliar treatments.
A	NSA USFS-administered lands that are within 90 m (300 ft) of a stream. Available: manual and biological methods only. **Herbicides:** None.

Early Treatment Vegetation Management

About 2 - 3 years after corrective action has been taken, BPA would take further steps to establish and enhance a dense low-growing plant community and grasses that would provide direct competition to the establishment and growth of tall-growing tree species. These actions would take place at scheduled intervals over the following 5 to 8 years; they might also be initiated as needed, depending on the effectiveness of the control methods and on the potential for tall-growing species to reoccupy the site.

The methods proposed for use would include the maintenance options listed under corrective action, as modified to protect the low-growing plant community being established. For instance, broadcast-foliar and cut-stubble herbicide applications would not be used, in order to protect these resources. Chemicals would be applied under

specific direction as to terrain, soil, water, and vegetation conditions characterized by mapped zones, described in Table 1.[4] See Figure 3 for treatment zone constraints.

Comparison of Alternatives

Table 2, below, compares the two alternatives in terms of system reliability, cost-effectiveness, and environmental considerations.

Table 2: Comparison of Alternatives

Issue	I. No Action	II. Proposed Action: IVM, with Herbicides
Transmission System Reliability	Threat to system reliability is constant.	Threat is reduced after initial treatment.
Cost-Effectiveness	Highest cost increase due to growth of vegetation and increased control required to clear right-of-way.	Higher short-term treatment cost; lowest long-term maintenance cost. Most cost-effective in long term. Maintenance cycle decreases, as low-growing plants are established.
Environmental Considerations	Highest long-term impact on soils, water, vegetation, and wildlife habitat. Increasing resprout of tall-growing hardwood vegetation and invasion of noxious weeds. Continued soil erosion.	Lowest overall impact on wildlife and water resources (sedimentation) as a result of establishing low-growing vegetation. Enhanced by establishing vegetation for wildlife habitat.

[4] The zonal information is adopted from a management plan developed by David Evans and Associates for the Bonneville Power Administration: *Prototype Integrated, Impact Avoidance Right-of-Way Management Plan* (1996).

3 Affected Environment and Environmental Consequences

Affected Environment

The transmission line corridors are located northeast of the Bonneville Dam, in Skamania and Klickitat counties, near the city of Carson, Washington. They cross Federal, state, and private lands. The Hanford-Ostrander and McNary-Ross lines, sited in the same corridor, cross Wind River, Little Wind River, Brush Creek, and Little White Salmon River. The terrain is flat to rolling to steep slopes of greater than 20 percent. The North Bonneville-Midway and Underwood Tap lines, sited in the second corridor, cross Dog Creek; the terrain is flat to rolling to steep slopes of greater than 20 percent. The vegetation is in the Western Hemlock zone plant classification.

Environmental Consequences

Environmental consequences are described below for nine resources, and are summarized in Table 3. Each description is accompanied by mitigation measures for the resource. In addition, further mitigation measures comparable to those found in the USFS's Managing Competing and Unwanted Vegetation EIS (USDA 1988) are provided for in the following BPA programs, policies, procedures, and guidance documents:

- Occupational Safety and Health Administration (OSHA) training for employees engaged in hazardous waster site operations and emergency response (October 1994),
- Transmission Maintenance Standards, Procedures, Instructions, and Informations,
- Integrated, Impact Avoidance Right-of-Way Management Plan (March 1996),
- Environmental Standards and Procedures for Herbicide Selection, Application, Storage, and Disposal,
- Quarterly Water Quality monitoring program for substations, and
- Field Monitoring and Appraisal Plans.

Land Use

Land uses adjacent to the right-of-way are USFS timber lands and private timber lands. A portion of the right-of-way crosses the U.S. Fish and Wildlife Service (USFWS) land associated with the Willard Fish Hatchery. The line also crosses county roads.

BPA obtained the easement necessary to construct the transmission lines from the affected landowners and appropriate government agencies in the 1930's, 1940's, and 1950's. These easements include the right to enter, operate, maintain, repair, rebuild, and patrol facilities within the right-of-way.

Impacts

Alternative I (No Action) and Alternative II (Proposed)
There would be no additional land use impacts from these alternatives, since the right-of-way is a designated corridor which has been cleared for transmission lines.

Table 3: Summary of Environmental Consequences

Affected Resource	I. No Action	II. Proposed Action: IVM, with Herbicides
Land Use	No change from the existing conditions.	
Soils	Disturbance with mechanical process. Manual methods would have little or no disturbance.	Disturbance minimized. Herbicide treatments are of short duration. Soil microbes break down herbicides.
Vegetation	Mechanical methods would remove all vegetation and result in the resprouting of unwanted vegetation. Noxious weed problem.	Vegetation selectively controlled. Low-growing plant community and grasses established. Noxious weed control more feasible.
Water Resources	Mechanical damage might increase run-off, erosion, off-site transport, and siltation.	Potential for negative effects via chemical contamination would be minimized by following plan.
Wildlife Resources	Changes in habitat diversity.	Stable habitat. Increased viability of populations.
Air Quality/Global Warming	No change/no effect.	No change/no effect.
Visual Quality (VQ)	Impacts would be short-term and low, related to seasonal changes. Some short-term visual impacts from soils exposed by mechanical clearing.	Long-term impacts would be reduced. As vegetation grows over time, right-of-way will blend in with surroundings.
Recreation	No impacts.	No impacts.
Cultural Resources	Mechanical clearing would disturb ground and require surveys and mitigation.	Adverse effects minimized through mitigation measures.

Mitigation

None.

Soils

Soils in the right-of-way vary from gravely loam and gravely silty clay loam, to rock outcrop. The soils are predominately very deep and well-drained, and have a moderate to severe water erosion hazard (USDA-SCS, 1990). The soils are derived primarily from basalt and andesite, and are covered with a thin layer of volcanic ash.

Vegetation management can affect soil characteristics such as available soil moisture, nutrient supply, erosion, and slope stability. Proper application of manual and chemical vegetation control methods have low impacts on soil resources. However, where manual or chemical treatments reduce viable cover, there could be slight localized reductions in soil infiltration and the amount of water absorbed by plants, as well as increased surface run-off. Herbicides can also affect soil productivity by inhibiting soil microbial activity and the growth of non-target plants.

Impacts

Alternative I (No Action)
Potential impacts on soils from manual and biological techniques would be both direct and indirect, of low intensity, and of short duration. Manual treatments include the use of hand-operated tools to clear, prune, thin, or otherwise control target species. These treatments would cause little or no soil disturbance.

Mechanical clearing involving crawler tractors or low-ground-pressure tractors equipped with blades or mowing attachments often completely removes vegetation and disrupts the surface soil. Vegetation and soil disturbance would be greater than under Alternative II. Where vegetation is removed, direct impacts on soils include a reduced ability to absorb water, increased run-off and erosion, and consequent loss of soil productivity. The greatest impact would occur on steep terrain with high erosion risk. Impacts would be greatest immediately following treatment, and would continue until sufficient groundcover were established (see **Mitigation**, below).

Alternative II (Proposed)
Potential impacts on soils from biological and manual clearing methods would be similar to those for Alternative I, above, except that no mechanical techniques would be used.

Additional soil-related impacts from recommended herbicide treatments would be low and of short duration. Herbicide effects depend on their chemical properties and how they interact with the environment. This interaction determines how the chemical moves through the environment, and how long it lasts (is present).

All the prescribed herbicides (see section 2) are non-toxic, or only slightly toxic, to soil micro-organisms. Soil microbes can break down all of the recommended herbicides. Picloram can stay active in the soil for a moderately long time, depending on soil conditions, and may exist at levels toxic to plants for more than a year after application at normal rates. Alkaline conditions, fine-textured clay soils, and a low density of plant roots can increase picloram's persistence (USDA-FS et al., 1992). Surface soils within the affected corridors are neutral to moderately acidic and medium-textured. Soils also have a high root density. Under normal conditions, it is unlikely that long-term buildup of picloram or any of the prescribed herbicides in the soil would occur. The treatment zones for application of herbicides (see Table 1 and Appendix B) have been selected to avoid or minimize the impacts of herbicides specified.

Mitigation

Alternative 1 (No Action)
To reduce ground disturbance and risk of erosion, no mechanical treatments, except mowing, would be used on slopes less than 20 percent and in dense vegetation. Mowing would be allowed only where the ground surface would not be disturbed. If vegetation treatments remove groundcover, the site would be seeded or planted with acceptable low-growing plant species as soon as practicable. Vegetation management activities would be suspended on unstable slopes during periods of prolonged rainy weather, as the likelihood for slope failure and soil erosion increases as soils become saturated. Other soil erosion control measures (e.g., straw bales and silt fences) would be used to control erosion during any ground-disturbing activities.

Alternative II (Proposed)
Herbicides would be applied in accordance with label directions at their recommended use rates, to avoid buildup of herbicide levels within the soil (see Appendix C, Herbicide Information Profile). Only herbicides listed for use in each treatment zone would be permitted. If wetlands or other herbicide-sensitive natural resources were found in a given zone, herbicide use would be restricted.

Vegetation

Vegetation in these transmission line corridors falls within the western hemlock associations. Much of the area has been harvested at different times, and is now dominated by Douglas fir and areas of hardwood and/or shrub communities. Hardwoods dominate the riparian areas, and disturbances (both natural and human) have created areas of different seral stages (one of a series of stages that follow each other in an ecological succession before the area becomes a fully mature forest), including brushy areas. Within the forested matrix are numerous basalt cliffs, talus slopes, and open meadows/grasslands, usually found on drier sites with poor soil conditions that would not support the larger conifers.

The right-of-way crosses these vegetation communities; maintenance clearing has kept the area in artificial early seral communities, creating a marked change from forest to right-of-way. This abrupt change benefits some species, but fragments the habitat needs of others.

The more common conifers found within the right-of-way include western hemlock, Douglas fir, grand fir (*Abies grandis*), western red cedar, and noble fir (*Abies procera*). The more common hardwoods include red alder, Oregon white oak (*Quercus garyanna*), and big-leaf maple. Within the right-of-way, these species are found only as young trees that are periodically cut down. Without conifers and hardwoods, many areas are now dominated by shrubs, including ocean spray (*Holodiscus discolor*), vine maple (*Acer circinatum*), serviceberry (*Amelanchier alnifolia*), Oregon grape (*Berberis* spp.), dogwood (*Cornus nuttallii*), California hazel (*Corylus cornuta*), thimbleberry (*Rubus parviflorus*), and huckleberry (*Vaccinium* spp.).

Grass species dominate in areas of droughty soils: species include Idaho fescue (*Festuca idahoensis*), western fescue (*Festuca occidentalis*), Columbia brome (*Bromus vulgaris*), cheatgrass (*Bromus tectorum*), bulbous bluegrass (*Poa bulbosa*), and others. Mixed with the grasses are numerous flowering herbs, including some endemic species, such as long-

bearded hawkweed (*Hieracium longiberbe*). Many of these areas represent natural openings before transmission line construction and, as such, represent important natural communities, adding diversity to the vegetation.

The riparian vegetation has largely been spared from maintenance impacts because it grows far below the lines. Thus, riparian vegetation has remained in near-natural condition in many places. Many small wetlands, springs, and seeps have not fared as well because past treatments did not recognize these as important wetlands, and treatments were not modified to reflect their sensitivity.

Noxious weeds have become a major problem within the right-of-way. Soil disturbance and the failure to revegetate immediately have encouraged unwanted vegetation to colonize these areas. As a result, scotch broom (*Cytisus scoparius*) and knapweeds (*Centaurea* spp.) have become a serious problem and threat, not only to the native vegetative communities, but also to wildlife that forage in the area.

Fire also presents a risk; it depends on a combination of the amount of fuels, an ignition source, fuel conditions, environment, and topographic features. The intensity and size of a fire are affected by fuels (vegetation) and by meteorological and slope characteristics, as well as by suppression capability.

Impacts

Alternative I (No Action)
Vegetation would be selectively controlled by manual, mechanical, and biological methods. All communities would be kept in an artificial early seral state, with frequent human disturbance. Mechanical tractors equipped with blade or mowing attachments would crop vegetation within the corridor. (Mowing only would be used on slopes less than 20 percent and in dense vegetation.) Vegetation would resprout rapidly to near-original height, sometimes within 2 years after cutting. Sprout density might be up to five times that of the original stand, requiring more intensive mechanical clearing during next maintenance cycle. Cost of control would increase because vegetation would be thicker and more clearing visits would be required.

Alternative II (Proposed)
Vegetation would be selectively controlled by manual, biological, and herbicidal methods. In the short term, this alternative might increase the impacts of hand clearing while corrective measures are being applied; however, over the long term, the alternative would greatly benefit the vegetation by reducing the amount and frequency of herbicide treatment and eliminating mechanical applications.

The corrective and early treatment activities are designed to respond to the different ecological situations and vegetative communities present. Herbicides would be applied to target vegetation (selectively), thus avoiding impacts on nontarget vegetation in each treatment zone.

Mitigation

Alternatives I (No Action) and II (Proposed)
Unwanted vegetation would be manually cleared and herbicides applied so that nontarget vegetation would be left to grow. Under the proposal, vegetation would be cleared or left according to sensitive resource constraints defined for each clearing zone (Corrective and Early Treatment). Debris from lop-and-scatter of trees and vegetation would be left on the right-of-way. Trees greater than 25 centimeters (10 inches) diameter breast height (dbh) would be felled into or across streams where a deficit of large woody debris exists within the stream.

BPA would assist and cooperate with landowners and local weed control boards to control noxious weeds along rights-of-way where active weed control programs are in existence.

BPA would keep vegetation clear of the transmission line, thus eliminating a potential fire hazard. Tall trees and vegetation being cleared would be lopped and scattered on the right-of-way, eliminating fuel buildup. BPA is required to follow Federal fire regulations and state fire codes. BPA maintenance crews carry fire suppression tools, when they are required, and observe fire closure times.

Water Resources

The major streams draining the Wind River - White Salmon water resource area are designated as excellent (Class A) to extraordinary (Class AA) waters, according to Washington's surface water classification system (Washington Department of Ecology, April 1992. Statewide Water Quality Assessment Section 305(b) Report). However, according to the draft 1996 Federal Clean Water Act Section 303(d) Report (WDOE, 1996), the White Salmon River is listed as "water quality limited." Segments of this river have a fecal coliform level exceeding the standard set for their surface water classification. Groundwater aquifers within the area are categorized as local and isolated. A shallow water table above an impermeable subsurface layer and unsaturated layers ("perched" water table) may be present from winter to early spring in soils along the Hanford - Ostrander right-of-way in the area of the Little Wind and Wind Rivers. No public water supplies, including EPA-designated sole source aquifers, occur within the affected rights-of-way.

Impacts

Alternative I (No Action)
Protection of water resources is a major objective for both vegetation management strategies. Vegetation management methods can increase water and sediment yields, affecting surface water and groundwater quality. Disruption of the soil surface and vegetation increases surface run-off, erosion susceptibility, and the likeliness of off-site transport of soil. Where slopes or dense vegetation do not restrict its use, mechanical clearing would be employed. (Mowing only would be used on slopes less than 20 percent and in dense vegetation.)

The use of manual treatments could temporarily reduce viable plant cover, lower water interception and transpiration losses by plants, and increase overland and stream flows.

Manual treatments target individual plants and minimize ground disturbance. Impacts from increased sediment levels and stream flows would be lower than those from mechanical clearing, and would be eliminated once desirable vegetation communities were established.

Mechanical tractors equipped with blades or mowing attachments often completely remove vegetation and disrupt the top layers of soil. They are also the most cost-effective method of clearing. Groundcover would be more extensively removed (than under Alternative II) and surface soil more disturbed, facilitating erosion, increasing surface run-off, and encouraging off-site movement of sediment. The greatest impact would occur on steep terrain with high erosion risk. Impacts would be greatest immediately following treatment, and would continue until sufficient groundcover was established.

Alternative II (Proposed)
Protection of water resources is a major objective for both vegetation management strategies. Impacts would include those listed above for Alternative I, except those from mechanical techniques (not part of the proposal). It is expected that neither surface nor ground water would be affected by direct contact with herbicides.

Hand clearing could temporarily reduce viable plant cover, lower water interception and transpiration losses by plants, and increase overland and stream flows. However, when combined with chemical treatments, IVM techniques should minimize groundcover and soil disturbance and, subsequently, erosion and sedimentation of surface waters. Impacts from increased sediment levels and stream flows would be low, and would be eliminated once desirable vegetation communities were established.

The areas most susceptible to herbicide contamination include surface water and wetlands. Water can leach or transport any amount of applied herbicide that is not degraded, taken up by plants, volatilized, or adsorbed. The amount of chemical residue actually entering a stream from surface flow is affected by distance to the stream, infiltration and organic layer properties of the soil, and the rate of surface flow (Moore and Norris, 1981). To avoid impacts on rivers, streams, and wetlands, their locations and extents were determined and buffers established where vegetation management activities would be limited. Buffer widths around these sensitive areas were determined according to the Standards and Guidelines of the Northwest Forest Plan and the Washington Forest Plan, as well as according to Washington Forest Practices Act rules (WAC 222). (See also restrictions for **Zones**, above.) Zones were defined for environmental protection at both the Corrective and Early Treatment phases.

Picloram and Dicamba are persistent in soil, are susceptible to transport by surface waters, and can leach into groundwater under certain conditions (USDA-FS et al., 1992). Consequently, Picloram and Dicamba would not be applied directly to surface waters or wetlands, or within their buffer zones. Within riparian zones and wetlands on non-USFS - administered lands, all herbicide treatments (except cut-stump treatments using Glyphosate and Triclopyr and stem-injection techniques using Glyphosate) would be precluded. Only manual and biological methods of vegetation management would be allowed within 90 m (300 ft.) of streams or wetlands on lands administered by the USFS.

Impacts from the approved herbicide treatments would be localized, low, and short-term. Broadcast foliar treatments would be used only for corrective vegetation management in the initial stages of the proposed plan, and their use would be very restricted. All other herbicide treatments would target specific plants. No herbicide treatments would occur near surface waters.

Mitigation

Alternatives I (No Action)
Erosion control best management practices would be used to control erosion resulting from hand and mechanical clearing. They would include those standard practices spelled out in BPA maintenance directives (Standards, Procedures, Instructions, and Information: SPIFs). These measures would include the recontouring and reseeding of disturbed areas with a native grass cover crop, and the use of straw bales and silt fences where necessary to keep sediment out of wetlands, riparian areas, and drainage systems. Existing access roads would be used, and any areas disturbed by vehicles off established roads would be restored to natural conditions.

Alternative II (Proposed)
To prevent erosion and possible sedimentation, mechanical treatments would not be used. To prevent chemical contamination of surface waters, herbicides used in Alternative II would be applied in accordance with the treatment zones. They would not be broadcast on steep slopes, or near wetlands or surface waters. They would be applied in accordance with BPA maintenance directives (SPIFs), herbicide labels, and Federal, State and local directives. They would also be applied in accordance with the USFS Mediated Agreement.

Wildlife Resources

The wildlife inhabiting and using the right-of-way include a diversity of birds, from neotropical migrants to raptors; wildlife, including the black tail deer (*Odocoileus virginianus*), elk (*Cervus canadensis*), and bear (*Ursus americanus*); and a host of other small mammals, insects, amphibians, reptiles, and micro-organisms.

Although the rights-of-way have dissected the conifer forest, the resulting edge effects and habitat diversity have greatly increased the habitat for many species. Deer and elk forage in these areas; song birds and neotropical migrants nest and feed here; and increased grass habitat has increased some small mammal populations. On the other hand, forest fragmentation has diminished large tracts of undisturbed habitat for other species, such as the spotted owl and flying squirrel.

Without natural fires, the occurrences of large areas of early seral and grass/shrub habitats have decreased, to be replaced by scattered logging areas. Included in these habitats were a variety of fruit-bearing shrubs, such as elderberry, mountain ash, serviceberry, and chokecherry, vital food sources for many of the birds and small mammals. Within the right-of-way, these shrubs have been able to re-establish themselves and are providing an important element in the habitat needs of many wildlife species.

A variety of frogs and amphibians is found in the wetland and riparian areas. These areas also provide important corridors for other wildlife species. Most of these areas have not been affected by maintenance activities, and thus are in fairly good natural condition. Streams and fisheries have thus been protected from direct impacts, but maintenance road failures, erosion, and some mass wasting have created extensive siltation.

Species such as the peregrine falcon (*Falco peregrinus*) and bald eagle (*Haliaeetus leucocephalus*) are known to forage in the vicinity of these rights-of-way. Furthermore, suitable habitat for several threatened, endangered, or sensitive species is found within the right-of-way. This includes such flora as golden chinquapin (*Castanopsis chrysophella*), western ladies-tresses (*Spirantha porrifolia*), clustered lady-slipper (*Cyprideium fasiculatum*), and branching nonita (*Mantia diffusa*), and such fauna as northern spotted owl (*Strix occidentalis*), red-legged frog (*Rana aurora*), Larch mountain salamander (*Plethodan larselli*), and north American lynx (*Lynx canadensis*). The right-of-way crosses spotted owl (*Strix occidentalis caurina*) dispersal, reproductive, and foraging habitat.

Impacts

Alternative I (No Action)
Human disturbance of the wildlife populations and to the habitats created within the rights-of-way would continue to be more frequent (then under an alternative that included herbicide use). Manual control would require large work crews for several days in one area; these efforts would occur more often over time (see **Vegetation** impacts, Alternative I). Habitats would change drastically each time the existing management practices were completed, and species that have subsequently become established would be displaced. Most of the species are not adapted to such frequent changes in habitats. Impacts on individual plant species are summarized in Appendix D. Those species normally found in upland habitats would be more likely to be affected by mechanical treatments, while those in wetland habitats would be afforded more protection. A USFS Biological Assessment (Appendix D) concludes "No Effect" on threatened or endangered species or their habitat.

Alternative II (Proposed)
The largest impact on wildlife resources would occur as the corrective action is taken to help establish the low-growing communities. The initial treatment would have more dramatic impact because of the magnitude of the treatment required to eliminate those plant species designated or not desirable. The treatments would change the vegetation character and the habitat, and would therefore affect wildlife present. The magnitude of these impacts would depend on how radically the vegetation were changed in achieving the low-growing community. Such changes would vary from location to location.

The establishment of the low-growing communities would result in less severe and less frequent vegetative management activities. Humans would disturb the area less frequently. Habitat would become more stable, and would increase the viability of the wildlife and threatened or endangered species populations. For sensitive plants in riparian areas, where herbicide treatments would be severely limited, the negative impacts would be negligible (see Appendix D). In the upland areas, where herbicide use and other treatments would be more readily used, possible negative impacts would be more likely to occur. In no case are the impacts considered likely to lead to Federal listing of a species.

A USFS Biological Assessment (Appendix D) concludes "No Effect" on threatened or endangered species or their habitat.

Mitigation

Alternatives I and II

The following measures may be used to mitigate impacts on wildlife resources. Timing restrictions on correction treatments would be considered between March 1 and July 1 to prevent disturbance to burrows, nesting birds, and rearing of wildlife, amphibians, and reptiles.

Vegetation treatments are preferably completed during Spring (May-June) and Fall (September-October). Work in mid-summer will be allowed if fire restrictions do not limit work. Work crews will be presented information on wildlife species to be protected and on how impacts can be minimized.

The applicator would not apply herbicide directly to any wildlife. All sensitive areas (threatened and endangered flora or fauna, wetlands, and riparian areas) would be protected by applying appropriate buffer zones and treatment options. High-pressure foliar applications would be minimized to avoid inadvertent exposure.

Air Quality/Global Warming

Air Quality

The proposed project lies within the Columbia River Gorge NSA. Like most of the United States, the Scenic Area is classified as a Class II airshed. This classification allows moderate degradation of air quality. In recent years, several interest groups have been trying to change the area's classification to that of a Class I airshed (large national parks and large wilderness areas). Air quality degradation is not allowed in Class I airsheds. The change to Class I has not yet occurred, and new air pollution sources are still allowed within the Gorge.

Global Warming

Certain gases ("greenhouse gases") absorb and reradiate infrared radiation, preventing heat loss to space. Greenhouse gases include water vapor, carbon dioxide, methane. chlorofluorocarbons, ozone, and nitrous oxides. Without greenhouse gases, the mean temperature on earth would be about 5° Fahrenheit (-15° Celsius). An increase in the concentration of greenhouse gases in the atmosphere since pre-industrial times is thought to be the cause of an apparent warming trend seen on earth for the last century.

Two of the greenhouse gasses (carbon dioxide and methane) contain carbon atoms. Carbon atoms are cycled through several media (e.g., the atmosphere, plants, oceans, rocks, and sediments), which act as carbon reservoirs. The more carbon released to the atmosphere from these reservoirs (in the form of carbon dioxide and methane), the greater the potential for global warming. Activities such as timber harvesting release carbon to the atmosphere, and thus potentially affect global warming.
The proposed project would clear small trees and noxious weeds from a 17-km (10.5-mi.) section of right-of way. These trees and plants would no longer collect carbon, but would emit carbon as they degrade, potentially contributing to global warming. However, the

proposed amount of clearing is insignificant from the perspective of carbon balance because the trees are small and most of the noxious weeds contain little, if any woody growth. In addition, low-growing vegetation would be seeded to replace most of the cleared plants, replacing the carbon reservoirs. In summary, this project would not affect global warming.

Impacts

Alternative I (No Action)
Air pollution sources associated with manual clearing include: exhaust from hand-held equipment and personnel vehicles, and periodic dust generated by off-road vehicle traffic. Fugitive dust would be controlled by wetting on an as-needed basis, and only in severe dust situations. Exhaust would also be insignificant and short-term, and would not affect air quality at the project area or elsewhere in the Columbia River Gorge NSA. Thus, impacts would be insignificant.

Alternative II (Proposed)
The impacts described under Alternative I would also apply to Alternative II.

Volatilization would be minimized by using manual spot application or localized broadcast techniques, and through the use of application nozzles that would deliver a coarse spray rather than fine droplets. Application would also be limited to relatively calm periods (wind at less then 2.5 m/second or 5.6 mph) and periods with temperatures in the Fahrenheit 45-75° range.

Mitigation

Dust would be controlled by wetting on an as-needed basis.

Visual Quality

General Description of Impacts

The Hanford-Ostrander and North Bonneville-Midway corridors are existing physical elements within the Columbia Gorge Scenic Area. Impacts from these lines are directly related to the visibility of the towers, conductors, and other components associated with a transmission line, including access roads and cleared right-of-way. The significance of impacts would vary according to location in relation to sensitive viewpoints and the ability of the landscape to absorb change. The visual presence of the towers, conductors, and related hardware would remain the same through the life of the lines. However, the visual character of the right-of-way changes both seasonally and gradually over time as vegetation grows.

When vegetation becomes a hazard to the line, the type and extent of maintenance activities used to control the vegetation directly and immediately affects visual impacts, and can dramatically change the character of a right-of-way. As a result, selective clearing techniques must be used in sensitive areas, not only to maintain the line in a safe reliable condition, but also to maintain the integrity of the visual resource. Any extensive clearing would draw attention to the transmission line corridor and conflict with scenic resources within the Columbia Gorge NSA.

Impacts

Alternative I (No Action)
Visual impacts could range from low to high, depending on the landscape setting, amount of clearing required, proximity, and sensitivity of visual resource. With large-scale clearing, the end result is a clear-cut appearance that is highly visible. Impacts could be mitigated to a low level if selective clearing were done in sensitive areas. Impacts would be low where few people see the line or where the right-of-way requires minimal clearing. Impacts would be higher in sensitive areas, when extensive clearing was required.

Alternative II (Proposed)
Initially, visual impacts would be the same as those for Alternative I. However, clearing would occur less frequently over time, because the more vigorously growing vegetation would be eliminated, giving lower-growing vegetation a chance to become established and to crowd out less desirable plants, so that there would be no need for large-scale clearing. Therefore, long-term impacts would be reduced.

Mitigation

Alternatives I and II
The following areas have been identified as visually sensitive. Both alternatives require that as much vegetation as possible be retained as screening or to reduce the contrast between the corridor and adjacent vegetation. All tower locations are on the Hanford-Ostrander corridor unless otherwise noted.

Tower 140/3 to 140/2:	Retain vegetation within 183 m (600 ft.) of Wind River.
Tower 138/5 to 138/4:	Retain vegetation along south edge of right-of-way.
Tower 138/2 to 138/1:	Retain vegetation within 183 m (600 ft.) of Little Wind River.
Tower 137/1 to 135/2:	Retain vegetation within 152 m (500 ft.) of creek.
Tower 131/2 to 130/5:	Retain non-threatening vegetation between towers.

The following tower locations are from the North Bonneville-Midway corridor:

Tower 13/2 to 14/6:	Retain non-hazardous vegetation.
At a location 152 m (500 ft.) back on line (BOL) of tower 15/4 to a location 51 m (200 ft.) ahead on line (AOL) of tower 16/1:	Retain non-threatening vegetation.
At a location 122 m (400 ft.) BOL of 18/4 to tower 18/6:	Retain non-threatening vegetation.

Recreation

There are no known recreation resources in the rights-of-way. The USFS has abandoned the old Pacific Crest Trail route through the area (which passes under the Hanford-Ostrander transmission line); the trail is not maintained and is no longer a recognized trail system. Therefore, there would be no impacts on recreation from either of the alternatives.

Cultural Resources

Expectation of cultural resource occurrences for the rights-of-way within the project area is for the most part low to very low. The rights-of-way do not traverse topographic features or natural environs known to be preferred localities for concentrated activities, such as permanent or semi-permanent habitation or temporary camp sites. Exceptions would be ridge tops and other crests in elevation, where some type of resource extraction activity or temporary use may have occurred. Unfortunately, these areas have already been mechanically cleared for tower sites and roads.

Cultural resources expected to be encountered in the project areas would not be observable under any but ideal field conditions for detection. Ridge tops would be sensitive for Native American trails and travel corridors, temporary use gathering and hunting sites, and perhaps cairn construction where suitable rock was available. Steeper slopes would have been employed for transient activities such as hunting and pursuit of game, gathering of vegetal materials, and cross-country travel. Streamside zones and wetland margins may have been traversed or temporarily used by people in passing through the topography.

None of the areas within the project area rights-of-way has been professionally inventoried for historic or prehistoric cultural resources. Power-line construction took place before Federally mandated cultural resource inventories.

Impacts

Alternatives I (No Action) and II (Proposed)
The vegetation controls proposed are anticipated to have no effect on any cultural resources, which have very low potential to be present.

Mitigation

Alternatives I and II
If any archaeological or historic site were discovered, all work in the area would be halted. A professional archaeologist would be notified within 24 hours, and the State Historic Preservation Office (SHPO) consulted. Measures would then be identified and implemented as necessary to avoid or mitigate impacts on any sites discovered.

Cumulative Effects

Both transmission lines are located in existing utility corridors in the Columbia Gorge. Most of the cumulative impacts would occur from near-term clearing and herbicide use (in the case of Alternative II) to convert the right-of-way into a stable plant community. Herbicides are EPA-approved and would not present an unreasonable risk of adverse

effects on humans or on the environment when applied in accordance with treatment zones and herbicide label directions (see Appendix C, Herbicide Information Profile). The chemical composition of the herbicides is environmentally safe, and soil microbes break herbicides down.

Near-term impacts would be temporary loss of undesirable vegetation resulting in increased exposure of soil surface, possibly causing some localized erosion and soil movement. A consistently elevated rate of erosion is not anticipated; initially, however, some sediment might find its way into adjoining water resources. Wildlife resources (animals) would still be present on the right-of-way.

Long-term positive impacts would result from the regrowth of low-growing plants and shrubs and from seeding of grasses on the rights-of-way to establish a stable community. Soils and steep slopes would become stable as plants and grasses grow and reduce soil erosion. Wildlife habitat would become more stable, and wildlife populations would increase. The establishment of the low-growing plant communities would result in fewer and less frequent maintenance activities.

4. CONSULTATION, REVIEW, AND PERMIT REQUIREMENTS

Table 4: Summary of Environmental Consultation, Review, and Permit Requirements

Requirement	Applicability	Comments
National Environmental Policy Act	Yes	EA and FONSI
Endangered Species Act	Yes	Biological Assessment concludes "No Effect."
Fish and Wildlife Conservation	No	No foreseen impacts or requirements
Heritage Conservation	No	No foreseen impacts or requirements
Land use plan consistency	No	Proposed project is found to be consistent
Floodplains	Yes	No impacts from proposal
Wetlands	Yes	No impacts from proposal
Farmlands	No	None on right-of-way
Recreation Resources	No	No foreseen impacts
Clean Air Act	No	No foreseen impacts
Clean Water Act	Yes	Mitigation-driven
Solid Waste	Yes	Statutory requirements/BPA's maintenance standards
Hazardous Waste	Yes	Statutory handling/shipping requirements
Safe Drinking Water	Yes	Required Best Management Practices implementation
Noise	Yes	Short-term
Herbicides	Yes	Statutory handling/shipping requirements
Toxic Substances	No	Statutory requirements
State, Areawide, and Local Plan and Program Consistency.	Yes	Requirements in this document and in planning the project (vegetation clearing)

National Environmental Policy

This EA was prepared pursuant to the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*) and implementing regulations; which require Federal agencies to assess the impacts that their proposed actions may have on the environment. Based on information contained in the EA, a determination would be made that the proposal would either significantly affect the quality of the human environment, in which case an EIS is required, or that the proposal would not have significant impacts, permitting a FONSI.

Threatened and Endangered Species

The Endangered Species Act requires that Federal agencies review the consequences of an activity on threatened or endangered species and the ecosystem on which these species depend. The USFS has determined that there would be no effect on any threatened or endangered species or their habitat (see Appendix D). BPA concurs with this determination. See also discussion of these species under **Wildlife** in section 3.

Floodplains

Executive Order 11988 (Floodplain Management) and Department of Energy regulations implementing the Executive Order (10 CFR Part 1022) direct BPA to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. Both Klickitat and Skamania counties' Flood Insurance Rate Maps were examined for floodplains. Only the Wind River floodplain is crossed by the right-of-way, but would be unaffected because none of the alternatives under consideration would involve its development or modification. Establishment and enhancement of low-growing plant communities would protect riparian reserves.

Wetlands

Executive Order 11990 and Department of Energy regulations require BPA to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. None of the alternatives under consideration would destroy or degrade wetlands crossed by these rights-of-way. Establishment and enhancement of low-growing plant communities would protect riparian reserves.

Solid and Hazardous Waste

The Resource Conservation and Recovery Act, 42 U.S.C. 6910 et seq. act regulates the storage, use, and disposal of solid and hazardous waste. Domestic solid waste generated by maintenance during vegetation management activities (e.g., triple-rinsed herbicide containers, disposable clothing and gloves, broken cutting tools) must be disposed of in state-approved sanitary landfills. BPA's maintenance would dispose of waste accordingly.

Safe Drinking Water Act

The Safe Drinking Water Act, as amended, applies to public water systems. The Act specifies contaminants that may have adverse health effects, and contains criteria and procedures to assure a supply of drinking water that complies with established maximum permissible contamination levels.

Under the Act, the term "public water system" is defined as a "system to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals." There are no public water sources crossed by these rights-of-way, including any sole source aquifer that could be affected by the use of herbicides. The proposed use of buffers around wetlands, streams, and water bodies should prevent any pesticides from entering any waters of the U.S. All herbicides would be applied in the manner specified by the label and by state and Federal regulations.

Noise Pollution and Abatement

Project noise would consist primarily of noise associated with chain saws and forest-harvesting equipment. Washington Administration Code WAC 173-60-050 exempts sounds originating from forest harvesting and silvicultural activities from State Noise standards.

Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 136 et seq.

This Act regulates the manufacture and use of pesticides, including herbicides. Under Alternative II, herbicides would be used to control unwanted vegetation and incompatible weedy vegetation on the right-of-way. Only EPA-approved herbicides would be used, and only according to manufacturers' labels. Herbicides would be stored in a BPA storage building. Herbicide container would be triple-rinsed and poured into a sprayer, and the container would be disposed of at a state-approved disposal site. Herbicides would be applied by licensed applicators only on an as-needed basis, and would not be stored on the right-of-way.

Federal, State, Areawide and Local Plan and Program Consistency.

Since the proposed maintenance would occur on already permitted rights-of-way (USFS Land Use Grant on Federal Land and easement agreements on State and private lands); they are authorized land uses. Maintenance activities are subject to the requirements of these agreements, as well as to current environmental laws. Right-of-Way Land Use Grants are prepared in accordance with the requirements of the BPA/USFS 1974 Memorandum of Understanding (MOU). Right-of-Way Management Plans were jointly prepared by BPA and the USFS under the terms of the MOU and the issued Federal Land Use Grants. The proposed Prototype Integrated, Impact Avoidance Right-of-Way Management Plan and completion of the EA will result in updates to these original management plans.

The new management plan is directed at avoiding impacts and addressing new environmental requirements such as those found in the USFS Mediated Agreement and the Northwest Forest Plan. By avoiding impacts, the proposed management plan will be consistent with these requirements. (Appendix A documents questions and answers related to compliance with the USFS Mediated Agreement.) The ecosystem standards and guidelines for management of habitat for late-successional and old-growth forest-related species within the range of the northern spotted owl (Northwest Forest Plan) have been considered in developing proposed management zones and prescriptions. Right-of-way maintenance and upgrades are also specifically recognized as an accepted use in the Columbia Gorge NSA legislation. Consistency with other Federal, State and local environmental laws and regulations is addressed in the previous sections of the EA.

5. Agencies and Persons Consulted

BPA	William Erickson, John Hooson, Bruce Lavier, Tom McKinney, Richard Stone, John Zimmerly
U.S. Department of Agriculture. USFS, Columbia River Gorge NSA	Robin Dobson, Art Guertin, Richard Larson, Cynthia Swanson
USFWS	Shannon Madrona
Washington State Department of Natural Resources	Neil Smith

6. References

David Evans and Assoc., Inc. March 12, 1996. Prototype Integrated, Impact Avoidance Right-of-Way Management Plan, Hanford-Ostrander Corridor and North Bonneville-Midway Corridors, Columbia River Gorge National Scenic Area. Prepared for: USDOE-BPA and USDA-FS.

Federal Columbia River Transmission System Act. August 1983. Section 4 16 USC 838b.

Moore, D. G., and L. A. Norris. 1981. Forest chemicals in watershed management. *In*: Forest Soils of the Douglas-Fir Region. Washington State University Cooperative Extension Service, Pullman WA.

U.S. Department of Energy, Bonneville Power Administration. 1983. Transmission Facilities Vegetation Management Program Final Environmental Impact Statement. DOE/EIS - 0097 - F

USDA (U.S. Department of Agriculture), Soil Conservation Service. 1990. Soil Survey of Skamania County Area, Washington.

USDA-Forest Service. 1978. Vegetation Management with Herbicides Final Environmental Impact Statement. USDA-F6-R6-FES (Adm) 75-18.

_____. 1988. Managing Competing and Unwanted Vegetation Final Environmental Impact Statement. Pacific Northwest Region.

USDA-FS, U.S. Department of Interior Bureau of Land Management (USDI-BLM), U.S. Department of Energy-BPA. January 1992. Pesticide Fact Sheets.

_____. April 1994. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

APPENDIX A: Mediated Agreement Questions

The six questions below are part of a site-specific analysis required by the U.S. District Court for the District of Oregon's mediated agreement on the use of herbicides in the USFS PNW Region. The mediated agreement reached between the USFS and the plaintiffs requires that in planning for and before proceeding with site-specific vegetation management projects, the strategy of prevention must be analyzed.

1. Question: What is the nature and role of associated vegetation?

Answer: BPA's proposed transmission line vegetation management plan is directed at promoting the establishment of low-growing vegetation species that will not grow into transmission line conductors. The establishment of low-growing vegetation will reduce the need for recurring maintenance, with its resultant soil and ecosystem disturbances, it will also prevent power line outages caused by tall growing vegetation and danger trees. Since transmission line right-of-ways are linear, the long-term prevention of noxious weed infestations from adjacent properties is more difficult.

2. Question: Do conditions exist that favor the presence of competing and unwanted vegetation? (Competing and unwanted vegetation on transmission rights-of-way include rapidly sprouting trees, tall-growing brush that interferes with maintenance and access, and noxious weeds.)

Answer: Yes. The climatic and soil conditions in the Columbia Gorge promote vegetation growth exceeding 5 feet per year for many species of tall-growing vegetation. These species must be regularly controlled to avoid power line outages. At present, the rights-of-way must be maintained using mechanical or hand clearing (non-herbicide treatment) at least every 5 years. Noxious weeds are a prevalent problem in the Columbia Gorge and on BPA rights-of-way.

3. Question: If conditions exist that favor the presence of competing and unwanted vegetation, have past management actions exacerbated the situation?

Answer: Yes. Mechanical- and hand-clearing techniques have not reduced the cycle required for vegetation control. In fact, they have resulted in more difficult clearing conditions, as tall-growing vegetation species that are cleared then resprout more densely. Subsequent clearing results in more ground disturbance and greater safety hazards for workers.

4. Question Do natural controls exist on the site?

Answer: No. The only natural control that could be used to control tall-growing vegetation species is fire. The use of fire on the right-of-way is not acceptable, however: fire and smoke could cause line outages. Noxious weed control through biological methods (such as insect-control rearing sites) is possible where site conditions and species

permit successful application. BPA will work with landowners and local weed control boards where requested and where success can be reasonably achieved.

5. Question: Can management actions be taken that either encourage natural controls or help avoid the conditions that favor the presence of competing and unwanted vegetation?

Answer: There are no practical natural controls that can control tall-growing vegetation species on the more than 144 hectares (357 acres) of right-of-way that must be controlled. The selective and controlled use of herbicides, as proposed, will over time encourage low-growing vegetation species, resulting in greatly reduced maintenance requirements, including reduced use of herbicides. BPA will work with the USFS, landowners, and local weed control boards to further examine the possible use of biological methods to control noxious weed.

6. Question: Is it feasible to undertake the management actions, and if not, why? If undertaken, are impacts on the USFS objectives and goals acceptable?

Answer: Yes. The selective use of herbicides being proposed should avoid impacts and, in fact, should greatly reduce the ground-disturbing impacts resulting from the mechanical methods currently being used. The USFS has agreed to the use of this impact avoidance IVM approach as a way of more effectively controlling vegetation and reducing environmental impacts.

APPENDIX B: Treatment Details

Hanford-Ostrander/McNary-Ross

Treatment Details

TWR	to	TWR	Owner	>125 ft.	Constraint	Length	Width	Acres	treatment Zone COR	treatment Zone EAR
130/5+300		130/5+800	PVT	no	r,ss,v	500	312.5	3.6	R	R
130/5+800		131/1-965	PVT	no	r,v	315	312.5	2.3	R	R
131/1-965		131/1-500	USFWS	no	lsr,v,w	465	312.5	3.3	B	B
131/1-500		131/1+395	USFWS	no	lsr,ss,v	895	312.5	6.4	V	C
134/6+427		135/2+540	PVT	no	ss	2548	312.5	18.3	Y	H
135/2+540		135/3-680	PVT	yes		767	312.5		STC	STC
135/3-680		135/3-300	PVT	no	ss	380	312.5	2.7	Y	H
135/3-300		135/3	USFS	no	none	300	312.5	2.2	Z	C
135/3		135/4-100	USFS	no	lsr,ss	1151	312.5	8.3	SS	C
145/4-100		135/4+100	USFS	no	lsr,ss,v	200	312.5	1.4	V	C
135/4+100		136/1-900	USFS	no	lsr,ss	827	312.5	5.9	SS	C
136/1-900		136/1-500	USFS	yes		400	312.5		STC	STC
136/1-500		136/2-1000	USFS	no	lsr,ss	1598	312.5	11.5	SS	C
136/2-1000		136/2-280	USFS	yes		720	312.5		STC	STC
136/2-280		136/2+1000	USFS	no	lsr,ss	1280	325	9.6	SS	C
136/2+1000		137/1-400	USFS	yes		1219	300		STC	STC
137/1-400		137/1+800	USFS	no	lsr,ss	1200	300	8.3	SS	C
137/1+800		137/1+1050	USFS	yes		250	300		STC	STC
137/1+1050		137/2-880	USFS	no	lsr,ss	46	300	0.3	SS	C
137/2-880		137/2-740	USFS	yes		140	300		STC	STC
137/2-740		137/2-580	USFS	no	lsr,ss	160	300	1.1	SS	C
137/2-580		137/2-40	USFS	yes		540	300		STC	STC
137/2-40		137/2+250	USFS	no	lsr,ss	290	300	2.0	SS	C
137/2+250		137/2+425	USFS	yes		175	300		STC	STC
137/2+424		137/3-480	USFS	no	lsr,ss	308	300	2.1	SS	C
137/3-480		137/4+650	USFS	yes		1497	300		STC	STC
137/4+650		138/1-800	USFS	no	lsr,ss	289	325	2.2	SS	C
138/1-800		138/1+200	USFS	no	lsr,ss,v	1000	350	8.0	V	C
138/1+200		138/2-900	USFS	yes		1003	325		STC	STC
138/2-900		139/2+300	USFS	no	lsr,ss	5476	312.5	39.3	SS	C
139/2+300		139/3	USFS	no	lsr,r,ss	291	312.5	2.1	A	A
139/3		139/5	DNR	no	r,ss	2459	312.5	17.6	R	R
139/5		140/2	DNR	no	ss	1890	312.5	13.6	Y	H
140/2		140/2+250	DNR	no	ss,v	250	312.5	1.8	H	H
140/2+250		140/2+750	DNR	yes		500	312.5		STC	STC
140/2+750		140/3-500	PVT	yes		680	312.5		STC	STC
TOTAL								173.8	ACRES	
										Con't.

N. Bonneville-Midway/Underwood Tap
Treatment Details

TWR	to	TWR	Owner	>125 ft.	Constraint	Length	Width	Acres	treatment Zone COR	treatment Zone EAR
13/2+1325		14/6-100	USFS		lsr,v,ss	3975	150	13.7	V	C
14/6-100		14/6+115	USFS		lsr,ss	215	150	0.7	SS	C
14/6+115		14/6+500	USFS		lsr,ss	385	175	1.5	SS	C
14/6+500		14/7-100	USFS		lsr, w	475	175	1.9	B	B
14/7-100		14/7	USFS		lsr,ss	100	175	0.4	SS	C
14/7		14/7+250	USFS		lsr,ss	250	187	1.1	SS	C
14/7+250		15/1-500	USFS	yes	lsr,ss,w	477	225		STC	STC
15/1-500		15/1	USFS		lsr,ss	500	275	3.2	SS	C
15/1		15/3+725	USFS		lsr,ss	2363	300	16.3	SS	C
15/3+725		15/4-380	USFS	yes	lsr,ss	577	300		STC	STC
15/4-380		16/1	USFS		lsr,ss,v,sp	2082	300	14.3	V	C
16/1		16/1+225	USFS		lsr,ss,v,sp	225	300	1.5	V	C
16/1+225		16/1+625	USFS		lsr,ss	400	300	2.8	SS	C
16/1+625		16/1+950	USFS	yes	lsr,ss,r	325	300		STC	STC
16/1+950		16/2-575	USFS		lsr,ss	348	300	2.4	SS	C
16/2-527		16/2-425	USFS	yes	lsr,ss	150	300		STC	STC
16/2-425		16/2+100	USFS		lsr,ss	525	300	3.6	SS	C
16/2+100		16/3+200	USFS		lsr,ss,sp	450	300	3.1	V	C
16/3+200		16/3+460	USFS	yes	lsr,ss	260	300		STC	STC
16/3+460		17/1	USFS		lsr,ss	815	300	5.6	SS	C
17/1		17/2	USFS		lsr,ss,sp	425	300	2.9	V	C
17/2		17/6+360	USFS		lsr,ss	2710	300	18.7	SS	C
17/6+360		18/1-480	USFS	yes	lsr,ss,r	1040	300		STC	STC
18/1-480		18/3+321	USFS		lsr,ss	2161	300	14.9	SS	C
TOTAL								108.6	ACRES	

Owner
PVT = Private
USFWS = U.S. Fish and Wildlife Service
DNR = Washington Department of Natural Resources
USFS = U.S. Forest Service

Constraint
r = river
sp = sensitive plant habitat
ss = steep slope
v = visual resource
w = wetland
lsr = late successional reserve

Treatment Zone
COR Corrective
EAR Early

See Table 1 for details.

United States
Department of
Agriculture

Forest Service
Pacific Northwest Region

Healthy Forests
Make A World
Of Difference

Dicamba

HERBICIDE INFORMATION PROFILE

This information profile is produced by the USDA Forest Service, Pacific Northwest Region, for employees, forest workers, and for the public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide dicamba and its formulations. A list of definitions is included in Section VIII of the information profile. For general information on herbicide use by the Forest Service, refer to the PNW Region Treatment Methods Profile for Herbicides.

The principal sources of information and findings in this profile are the PNW Region FEIS (Final Environmental Impact Statement) for Managing Competing and Unwanted Vegetation; Forest Service "Herbicide Background Statement: Dicamba"; and product labels and Material Safety Data Sheets. Information from other sources is referenced in the profile.

I. BASIC INFORMATION

COMMON NAME: dicamba

CHEMICAL NAME: 3,6-dichloro-o-anisic acid

PRODUCT NAMES: Banvel® and Vanquish® products for forestry and noncrop sites

PESTICIDE CLASSIFICATION: herbicide

REGISTERED USE STATUS: "General Use"

FORMULATIONS: The dicamba products discussed in this profile are formulated from a DMA (dimethylamine) salt or a DGA (diglycolamine) salt. Dicamba formulations contain one or more substances besides dicamba itself. These substances are called inert ingredients, because they do not kill plants by themselves. The identities of inert ingredients are not usually listed on the label.

The manufacturer revealed the identity of all inerts to EPA (U.S. Environmental Protection Agency). The Forest Service has asked the manufacturer to identify all inert ingredients for public disclosure in this profile. The manufacturer has not publicly identified some inert ingredients contained in these formulations. Hazardous inert ingredients (as defined by U.S. Occupational Health and Safety Administration) have been publicly identified.

Where the manufacturer has not publicly identified inert ingredients, this profile may not fully characterize possible hazards to human health and the environment associated with a dicamba formulation.

Manufactured by Sandoz:

Banvel® or Banvel® 4S

Dicamba, as the DMA salt	48.2%
DMA salts of related acids	12.0%
Inert ingredients	39.8%

Banvel® CST

Dicamba, as the DMA salt	13.3%
DMA salts of related acids	3.3%
Inert ingredients	83.4%
Ethylene glycol	30.0%
Unidentified	53.4%

Vanquish®

Dicamba, as the DGA salt	56.8%
DGA salts of related acids	14.2%
Inert ingredients	29.0%

The results of formulation testing reported in this profile apply only to these Banvel® and Vanquish® products. These products contain only dicamba as an active herbicide ingredient.

Other formulated products contain both dicamba and another herbicide. Information in this profile does not address possible effects of these formulated herbicide mixtures.

RESIDUE ASSAY METHODS: Several methods have been described for detecting dicamba in water (EPA. 1988; Arjmand et al. 1988; Hamann et al., 1987; Jimenez et al. 1989). EPA reports that the method which detects the lowest concentration of dicamba uses capillary column gas chromatography. Jimenez et al. estimate a detection limit of 0.1 ppb, based on average recovery of 84 percent of dicamba actually present in water samples.

EPA found that adequate analytical methods are available for determining residue levels of dicamba in crop plants. The detection limit for this method is estimated to be 10 ppb, based on recoveries ranging from 70 to 120 percent of dicamba actually applied (EPA, 1993a).

Available references did not discuss residue assay methods for dicamba in soils.

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND, RIGHT-OF-WAY USES: control of annual and perennial broadleaf weeds, brush, and vines in rangeland and non-cropland areas. Non-cropland areas include fence rows, roadways, rights-of-way, and non-selective forest brush control (including site preparation).

OPERATIONAL DETAILS:

TARGET PLANTS: Dicamba is used to control broadleaf plants, brush, and vines. Dicamba does not injure grasses at recommended rates.

MODE OF ACTION: Dicamba is absorbed by leaves and roots, and moves throughout the plant. In some plants, it may accumulate in the tips of leaves. Plants respond to dicamba as if it were a growth hormone; dicamba interferes with normal plant growth processes. Some plants can break down dicamba.

METHOD OF APPLICATION: Ground or aerial broadcast, soil (band) treatment, basal bark treatment, stump (cutsurface) treatment, frill treatment, and tree injection, spot treatment.

USE RATES: 0.25 to 8 pounds acid equivalent per acre.

SPECIAL PRECAUTIONS:

Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

TIMING OF APPLICATION: Dicamba should generally be applied during periods of active plant growth. Spot and basal bark treatments can be applied when plants are dormant, but

should not be done when snow or water prevent application directly to the ground.

DRIFT CONTROL: Do not apply dicamba where it may move down in the soil or be washed along the soil surface to roots of desirable plants. Do not apply when air currents could carry spray to desirable plants. Leave buffer zones between area to be treated and desirable plants. Do not apply near desirable plants on days when the temperature is likely to exceed 85 F. Do not apply from aircraft when desirable plants are growing near the area to be treated. Avoid fine sprays.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

RESIDUAL SOIL ACTIVITY: Dicamba may be absorbed by roots from the soil and damage plants.

ADSORPTION: Dicamba does not strongly attach to most soil particles. It is highly mobile in water moving through soil.

PERSISTENCE AND AGENTS OF DEGRADATION: Dicamba is moderately persistent in soil. Its half-life in soil has ranged from one to six weeks. No studies have been reported for Pacific Northwest forest or rangeland soils.

Soil microorganisms readily break down dicamba. It degrades more rapidly under conditions that favor microbial activity: warm, moist, neutral soils with higher proportions of organic matter.

Dicamba may also volatilize from soils, unchanged; the extent and significance of loss is uncertain (PBS, 1984).

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: The main metabolite (break-down product) of dicamba in soil is 3.6-dichlorosalicylic acid. This metabolite is more strongly attracted to soil particles than dicamba, and less likely to move in soil (Comfort, et. al., 1992). Carbon dioxide is one ultimate degradation product.

WATER:

SOLUBILITY: Dicamba salts used in Banvel® and Vanquish® formulations are highly soluble in water.

POTENTIAL FOR LEACHING INTO GROUND-WATER: Dicamba was detected in 2 percent of water samples from over 3000 wells across the United States. No levels of dicamba contamination approached EPA threshold of concern. No dicamba was detected in 151 well samples in Washington and Oregon. (EPA, 1992). The potential for leaching depends on the rate of its movement in soil water versus the rate of degradation by microorganisms to its metabolite, which is less mobile (Comfort, et. al., 1992).

SURFACE WATERS: Dicamba has been found in surface runoff when a rainstorm occured soon after application to agricultural fields in western Washington (Mayer and Elkins, 1990). Reviews of dicamba mobility studies concluded that contamination of surface waters due to runoff is unlikely except when heavy rainfall occurs soon after application (Ghassemi, et. al., 1981). Dicamba was found in stream waters after aerial application to 166 acres (25 percent) of a Pacific Northwest forest watershed. Concentration rose to a maximum of 37 ppb after 5.2 hours, then dropped to background levels (<1 ppb) after 37.5 hours. The scientists attributed these residues to drift and direct application of dicamba to water instead of surface runoff.

AIR:

VOLATILIZATION: Dicamba in Banvel® formulations is relatively volatile. It can evaporate from plant surfaces, and may evaporate from the soil. Crop extension specialists in Colorado report damage from Banvel® volatiliza-

tion to surrounding sensitive crops. Banvel® was applied when air temperatures were 10 degrees hotter than the maximum temperature allowed by the label. (Westra and Schwarz, 1989)

POTENTIAL FOR BY-PRODUCTS FROM BURNING OF TREATED VEGETATION: Vanquish® may produce amines, hydrochloric acid, organochlorine molecules, and oxides of nitrogen. Banvel® may produce these same compounds, and also steam and carbon monoxide.

IV. ECOLOGICAL EFFECTS

NON-TARGET TOXICITY:

SOIL MICROORGANISMS: When 50 ppm dicamba was applied to laboratory cultures of soil microorganisms, reduction in growth was shown for some species. No studies of dicamba formulations have been reported.

PLANTS: Dicamba is toxic to many broadleaf plants and to conifers. It does not injure most grasses. Dicamba DMA salt had a half-life of two weeks in one study of range forage grasses.

AQUATIC ANIMALS: Dicamba has been tested for acute toxicity to a variety of aquatic animals. The studies accepted by EPA found dicamba acid and DMA salt to be practically non-toxic to aquatic invertebrates. Slight toxicity to specific crustaceans was reported in three tests of unknown quality not used by EPA. Studies accepted by EPA found dicamba acid to be slightly toxic to coldwater fish (rainbow trout), and practically non-toxic to warmwater fish. Other studies are generally consistent with EPA findings, but variable. Banvel® formulations discussed in this profile have been tested for acute toxicity to a variety of aquatic animals. All were categorized as practically nontoxic. EPA did not require additional testing for Vanquish®, based on the low toxicity and bioaccumulation found in Banvel® testing. Dicamba did not bioaccumulate in tests on aquatic animals in an aquarium simulating an aquatic ecosystem. Dicamba and its formulations have not been tested for chronic toxic effects, or behavioral changes in aquatic animals.

TERRESTRIAL ANIMALS: Based on acute toxicity tests, dicamba acid is classified as practically nontoxic to duck and quail. In eight-day feeding studies, formulated dicamba acid and salts were found to be practically nontoxic to duck and quail. The LC50 for mallard eggs which had been immersed in Banvel® was reported to be more than 200 times greater than the field application rate. Eye malformations and stunted growth were observed at unspecified application rates lower than the LC 50 (Hoffman and Albers 1984).

Based on acute toxicity tests dicamba is classified as slightly toxic to mammals. Banvel® formulations were found to be less toxic to laboratory mammals than dicamba alone. No tests of formulations for acute toxicity to wildlife mammals have been reported. Dicamba and its formulations have not been tested for chronic effects in wildlife mammals.

Both feeding and contact studies generally indicated a low toxicity of dicamba and Banvel® 4S to honey bees. German cockroaches were unaffected by any dose up to 1000 ppm in food.

In mammals, most dicamba is excreted, unchanged, in the urine. Studies of dicamba accumulation in animals dosed by various routes indicate that it does not bioaccumulate.

Livestock may graze dicamba-treated areas without restriction, unless they are actively producing milk. Meat animals must be removed from treated areas 30 days prior to slaughter.

THREATENED AND ENDANGERED SPECIES: Dicamba may be a hazard to endangered plant species if it is used in areas where they live. EPA does not consider dicamba in current use patterns to be a hazard to endangered animal species.

V. Health Effects Testing

The data are results of laboratory animal studies. These data have been evaluated by the Forest Service and are used to make inferences relative to potential human health effects.

For dicamba and formulations containing dicamba as the only active ingredient, findings are from studies conducted by the manufacturer. These studies have been presented to EPA to support product registration, but may not be available to the public. Formulation tests are noted for each category of acute toxicity. Test results are only shown when formulations showed greater toxicity than dicamba alone.

Acute Toxicity:

Acute Oral Toxicity: In tests in rats, the lowest median lethal dose was 1140 mg/kg. Slightly Toxic (Category III) Another study found comparable toxicity, however the median lethal dose for female rats was less than for male rats (Gaines, T. and Linder, R. 1986).

The formulations listed in this profile have been tested and found to be less toxic than dicamba itself.

Acute Dermal Toxicity: Toxicity of dicamba applied directly to skin was greater than 2,000 mg/kg in rats. Slightly Toxic (Category III).

All formulations have been tested and found to be no more toxic than dicamba itself.

Primary Irritation Score: Dicamba was slightly irritating to the skin of rabbits in laboratory tests. (Toxicity Category IV)

The formulations listed in this profile have been tested. Only Banvel® was more irritating than dicamba itself. Moderate irritant (Category III)

Primary Eye Irritation: In laboratory tests in rabbits, dicamba was extremely irritating and corrosive to eyes. (Toxicity Category I)

The formulations listed in this profile have been tested and found to be less irritating than dicamba itself.

Acute Inhalation; (study in rats): In tests in rats, the lowest toxic inhalation concentration was 9.6 mg/l. Slightly Toxic (Category III)

The formulations listed in this profile have been tested. Only Banvel® CST was more toxic (LC50 = 5.14 mg/l)than dicamba itself.

Chronic Toxicity:

These data are also based on tests in laboratory animals. EPA requires these tests only for the active ingredient dicamba. No tests of formulations for chronic toxicity have been reported. Please refer to Section X for an explanation of how NOEL (No Observable Effects Level) is calculated.

The Pacific Northwest Region FEIS risk assessment evaluated the quality of the testing that had been done on dicamba up to 1988. Quality consideration for individual studies included: ranges of doses and species that were tested; length of test; identification of the most sensitive effect. Additionally, the degree of quantitative agreement among all tests for an effect was considered. Please refer to Section X for an explanation of qualitative ratings in this section.

Systemic Toxicity:

NOEL for dicamba: 37 mg/kg/day (rat feeding study)

Observed effects include liver weight ratio and liver cell changes. One study of mouse liver response to dicamba found a decrease in enzymes that are produced in response to foreign chemicals. Whether the decrease in enzyme production would affect body response to toxins is not known (Moody et. al., 1991)

The PNW Region FEIS rated the quality of testing as Inadequate. Since the 1988 rating, two additional studies have been accepted by EPA,

improving the quality of available data. A study in dogs and a study in mice both found less systemic toxicity of dicamba than the previously-cited NOEL (EPA, 1987, and EPA, 1989).

CARCINOGENICITY/MUTAGENICITY:

CARCINOGENICITY: EPA has recently accepted studies in rats and in mice. Dicamba showed no evidence of carcinogenicity in either study including the highest doses tested (respectively, 300 and 360 mg/kg/day) (EPA, 1986, and EPA, 1989).

These studies satisfy EPA data requirements for cancer testing. EPA has not determined whether dicamba can potentially cause cancer.

MUTAGENICITY: Dicamba was not mutagenic (able to cause genetic damage) in 11 out of 13 laboratory tests done for one EPA-accepted study. Two bacterial tests for dicamba damage to DNA were positive. Reviewers considered these two tests to measure toxicity to DNA but not whether mutations would form as a result. They concluded the evidence indicates that dicamba is not mutagenic (Forest Service, 1992)

EPA cites one foreign-language study which reported an increase in chromosome deformation in mouse bone marrow cells exposed to high levels (500 mg/kg) of dicamba. No details or data were presented in the English summary; the significance of the study is unknown (EPA, 1988b). Researchers found that dicamba caused mutations of plant pollen-producing cells at concentrations of 50 ppm and greater (Ma, T. et. al., 1984).

The PNW Region FEIS rated the quality of testing as Marginal for these effects. Since the 1988 rating, the two cancer studies have been accepted by EPA, improving the quality of available data. These studies found no evidence of cancer-causing potential for dicamba.

REPRODUCTION/DEVELOPMENTAL:

DEVELOPMENTAL: EPA identified a NOEL of 30 mg/kg/day for the mother, and 150 mg/kg/day for the offspring, based on studies in pregnant rabbits (EPA, 1993b). Reduced body weights and increased post-implantation losses were observed at higher dicamba dose levels. This study supercedes a previous study in rats which had a NOEL of 3 mg/kg/day.

REPRODUCTION: A new rat study found a NOEL of 40 mg/kg/day, and is currently being reviewed by EPA (Arnold, D., 1993). A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 25 mg/kg per day.

The PNW Region FEIS evaluated the testing as Marginal for these effects. Since the 1988 rating, one rabbit study has been accepted by EPA, improving the quality of available data. This study found a lower toxicity of dicamba to both mother and offspring than the previous study used in the FEIS risk assessment.

OTHER POSSIBLE HEALTH EFFECTS

Allergic skin reactions to dicamba were studied in guinea pigs to assess immune system effects. Dicamba was judged to cause moderate allergic reactions in guinea pigs (EPA 1988). The PNW Region FEIS evaluated the testing as Inadequate for these effects. The study cited here is new, and would improve the quality of available data for assessing dicamba effects.

The potential for dicamba to damage the nervous system was studied in hens (EPA 1988), and in rats (EPA, 1993c). In hens, some nerve damage was noted for 316 mg/kg/day, the highest dose tested. In rats, effects were observed at all doses tested. The lowest dose tested was 300 mg/kg/day. In a recent study, one dog dosed with 86.7 mg/kg dicamba exhibited neuromuscular spasm

activity (Beasley et al, 1991). In a trial of an unaccepted detection method, dicamba appeared to inhibit an enzyme that helps transmit nerve impulses (acetylcholinesterase). This enzyme is inhibited by certain insecticides, and can lead to neurotoxic effects and death. This study was not designed to statistically evaluate dicamba effects, so the significance of this finding is unknown (Potter et.al., 1993). The PNW Region FEIS evaluated the testing as Inadequate for nervous system effects. All cited tests are more recent, and would improve the quality of available information for assessing dicamba effects.

VI Human Health Effects

Forest Service Evaluation of Human Health Risks:

The Pacific Northwest Region evaluated a range of dicamba health effects data, including some laboratory studies cited in Section V. Both quantitative (numerical) estimates of toxicity, and the quality of data used to make numerical estimates were evaluated. New information presented in Section V would improve the quality ratings in those categories. No new studies indicated a reduced margin of safety which would warrant additional restrictions on use of dicamba beyond those specified in the FEIS.

The FEIS Quantitative Risk Assessment predicts the amount of human exposure—both to project workers and to the public—from typical forestry operations, and also from a large accidental spill. The Risk Assessment used this information to assess health risks from typical uses. These risks were compared to EPA standards of acceptable risk for human health effects. The FEIS risk assessment identified as "Moderate" or "High" any predicted risks from Forest Service operations that were greater than EPA standards. Specific mitigation measures were designed to reduce human exposure from these operations; they are mandatory for every applicable project on National Forest lands. The complete set of risk ratings is displayed in Sec. X.

The quality of the existing data affects the reliability of these risk ratings. The FEIS judged the overall quality of available data on dicamba toxicity to be "Marginal to Inadequate". There were some studies of marginal quality that provided useful information, but studies were inconsistent and some contained flaws. It is likely that new studies would change estimates of health effects. Very cautious assumptions were made in characterizing risk.

Potential for Health Effects to the Public:

Forest visitors and nearby residents could be exposed to herbicide drift, to vegetation with herbicide residues, and to accidental spraying. They also could eat food or drink water containing herbicide residues. EPA found dicamba present in 1.4 percent of 6990 urine samples that represented the general U.S. civilian population. Amount of dicamba could not be reliably estimated (Kutz et al, 1992). No studies of public exposure to forest herbicide applications were available. Public doses were estimated based on the behavior of the herbicide in the environment. "Routine Application" estimates maximum possible public exposure under normal operating conditions. The "Large Spill" situation models the highest doses that could ever be reasonably be expected to occur. Typical public exposures and risks would be much lower than either situation.

Mitigating Measures to Reduce Identified Dicamba Risks to Public:

"Low" risk of general health effects for all routine projects. "Moderate" risk of reproductive health effects for people who receive multiple exposures from a large (400-acre) aerial application project. "Low" risk for smaller (40-acre) aerial projects, and for all ground-based applications:

> Consider potential for public exposure when designing contact procedures, posting and signing needs in the Herbicide Application Plan.

"Moderate" risk of general health effects, and "High" risk of reproductive effects if exposed to concentrated dicamba from a large spill:

> Prevent all public contact with accidental spills (emergency spill notification system, restrict public access to spill site).

Probability of a Worker Receiving a Dose Which Affects General Health or Reproduction:

Worker exposure and dose are estimated for typical forestry applications. Studies are available that measure actual worker doses of herbicide for some typical forestry applications. Studies of worker exposure in one noxious weed control ground application found up to ten times higher urine residues (Draper, W. and Street, J., 1982). These worker doses do not account for any reduction in exposure from following safety precautions or wearing protective clothing.

Mitigating Measures to Reduce Identified Dicamba Risks to Workers

The probability of worker exposure to a toxic concentration for general health effects was rated "Low" or "Negligible" for all application methods. The probability of worker exposure to a toxic concentration for reproductive effects was rated "Low" or "Negligible" for aerial and tank truck mixer/loaders; "Moderate" for backpack spray and hack-and-squirt applicators.

In the PNW Region FEIS, Mitigating Measure 13 requires workers applying any herbicide to wear protective clothing. Mitigating Measure 23 requires worker exposure monitoring for all herbicide application projects.

The 1992 Amendment to the ROD requires workers to review this Information Profile before agreeing to apply dicamba herbicides. The worker may request reassignment without penalty. Additional personal protective equipment will be available at the worksite for workers who want to reduce their exposure to the herbicide.

Acute Toxicity (Poisoning)

Reported Effects: Effects of exposures to dicamba included muscle cramps, difficult breathing, nausea, vomiting, skin rashes, loss of voice, swollen neck glands, coughing and dizziness.

Long Term Human Health Effects:

Reported Effects: There are no reported cases of long term health effects in humans due to dicamba or its formulations.

Potential for Adverse Health Effects from Inert Ingredients Contained in the Formulated Product:

The manufacturer has identified some inert chemicals in dicamba formulations; other inerts have not been identified to the public. All dicamba inert ingredients have been identified to EPA. EPA classified all inerts into one of four categories, called "Lists". List 1 contains chemicals of known toxic concern. List 2 contains chemicals of suspected toxic concern which are high priority for testing. List 4 contains chemicals of known nontoxic character, generally recognized as safe to humans. All other chemicals were classified on List 3: Inerts of unknown toxicity. EPA did not find enough information available on the toxic properties of List 3 chemicals to classify them on Lists 1, 2, or 4. All inert ingredients used in these Banvel® and Vanquish® formulations were classified by EPA on List 3 or List 4.

The only identified inert ingredient in these dicamba formulations is ethylene glycol (Banvel® CST). Ethylene glycol may cause kidney damage and birth defects. In addition to ingestion or skin absorption, people and animals may be exposed to ethylene glycol in mists from spray operations, and also to its vapors if applied in hot weather. In four week studies of human volunteers, breathing ethylene glycol in excess of about 22 ppm caused "marked complaints" of health effects. Irritation of the upper resipiratory tract was most common, with headaches and low backache also reported. Another study reported drowsiness from excessive exposure but no

irritation (ACGIH, 1992). The PNW Region FEIS did not estimate inhalation exposure levels, based on studies of workers in which inhalation doses were two percent or less of doses from skin absorption.

Health Effects Associated with Contaminants:

Traces of 2,7-dichlorodibenzo-p-dioxin (up to 50 parts per billion) are formed during production of dicamba. A possible cancer-causing association was found in male mice, but not in female mice, or rats of either sex (Huff, et. al., 1991). The more toxic dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin has not been found at the 2 ppb detection limit, and is not predicted to be an impurity in dicamba.

DMA salt formulations of dicamba (Banvel®, Banvel® CST) may be contaminated with less than 1 ppm of dimethylnitrosamine. EPA estimates the risk levels for nitrosamine in these dicamba formulations to be less than one in one million (EPA, 1983).

Health Effects Associated with Other Formulations:

Some formulations contain dicamba mixed with other herbicides such as 2,4-D or atrazine. This profile does not fully describe the potential for health or environmental effects from these formulations containing multiple herbicides. Additional information on properties and potential effects of these formulations will be prepared before they are used in the PNW Region.

Societal Perceptions:

Public opinion about herbicide use in general ranges from a perception that herbicides are completely safe, to a perception that they are very hazardous. A full range of opinion is available in the FEIS. Beginning in 1992, the PNW Region publishes a bibliography of recent anecdotal and scientific accounts, and analyzes reported worker health effects. This herbicide information profile will be updated to reflect the results of these reviews as needed.

VII. Safety Precautions:

Signal Word and Definition:

Banvel®: WARNING - Causes eye irritation. Harmful if swallowed.

Vanquish®: CAUTION - Harmful if swallowed.

Protective Precautions for Workers: Do not get in eyes, on skin, or on clothing. Avoid breathing spray mist. Wash thoroughly after handling.

Medical Treatment Procedures (Antidotes): There is no specific antidote for dicamba; treat symptoms. For exposure to the skin, wash with soap and water. For exposure to the eyes, flush with water for 15 minutes and get medical attention. If inhaled, remove victim to fresh air. Apply artificial respiration if victim is not breathing; get medical attention. If swallowed, give 1 to 2 glasses of water and induce vomiting. Get medical attention. In case of emergency call your local poison control center for advice.

Handling, Storage and Disposal: Dicamba is stable under normal storage conditions. Store in the original container in a well ventilated area separately from fertilizer, animal feeds and food. Do not contaminate water, food, or feeds by storage or disposal. Dispose of waste on site or at an approved waste disposal facility.

Emergency (Spill) Hazards and Procedures: Dike or contain spill. Absorb liquid with absorbent material such as sawdust. Place material in container for later disposal. Observe all local, state, and federal rules for disposal. In case of a large spill, call CHEMTREC at 1-800-424-9300 for advice.

VIII. Definitions

acute toxicity - The amount of a substance, as a single dose, to cause poisoning in a test animal.

adsorption - the process of attaching to a surface.

basal treatment - applied to the stem of a plant just above the soil.

bioaccumulate - the uptake of a chemical by an organism from its environment.

broadcast application - applied over an entire area.

carcinogenicity - ability to cause cancer.

chronic toxicity - Toxic effects produced in test animals exposed for long periods to a chemical.

dermal - of, or related to, the skin.

EC50 - the concentration which will cause a toxic effect in 50% of the subjects.

formulation - the form in which the pesticide is supplied by the manufacturer for use.

half-life - the time required for a chemical to be reduced by natural processes to one half its original amount.

herbicide - a substance used to destroy plants or to slow down their growth.

LC50 - the concentration in air or water which will kill 50% of the subjects

LD50 - the dose which will kill 50% of the subjects.

leach - to dissolve out by the action of water.

mg/kg - milligrams of the substance per kilogram of body weight. Equals ppm.

mg/l - milligrams of dissolved substance per liter of water. Equals ppm.

microorganisms - living things too small to be seen without a microscope.

mutagenicity - ability to cause genetic changes.

non-target - animals or plants other than the ones which the pesticide is intended to kill.

persistence - tendency of a pesticide to remain in the environment after it is applied.

ppb - parts per billion parts.

ppm - parts per million. Equal to mg/kg, and mg/l.

residual activity - the remaining amount of activity as a pesticide.

sensitizer - a delayed allergic response to a substance; symptoms usually resemble an acute toxic response.

teratogen - a compound having the property of causing birth defects

volatility - the tendency to become a vapor at relatively low temperature

IX Information Sources:

U.S. Government Agency Publications

Pacific Northwest Region, Forest Service, U.S. Department of Agriculture. 1988. *Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation.*

Chapter IV, Environmental Consequences: Human Health Effects Characterization and Management of Risk

Appendix C: Herbicide Use and Efficacy

Appendix D: Quantitative Risk Analysis

Appendix H: Qualitative Risk Analysis

Appendix J: Herbicide Review with Wildlife-oriented Effects

Forest Service, U.S. Department of Agriculture. 1984. *Pesticide Background Statements.* Volume 1. Herbicides. Agriculture Handbook No. 663.

Forest Service, USDA. 1992. *Risk Assessment for Herbicide Use in Forest Service Regions 1,2,3,4 and 10, and on Bonneville Power Administration Sites.* Chapters III and IV.

U.S. Environmental Protection Agency, Office of Drinking Water. 1988a. *Dicamba Health Advisory.* 16 pp.

U.S. Environmental Protection Agency, Office of Pesticide Programs. 1983a. *Guidance for the Reregistration of Pesticide Products Containing Dicamba as the Active Ingredient.*

U.S. Environmental Protection Agency, Office of Pesticide Programs. 1983b. *Pesticide Fact Sheet Number 8: Dicamba.* 6 pp.

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. 1987. *Letter to Dr. James S. Fickle, Sandoz Corporation re: Banvel® Dicamba Technical Herbicide (One-Year Dog Study).* 2 pp.

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. 1989. *Letter to Dr. James S. Fickle, Sandoz Corporation re: Dicamba Technical (Mouse Chronic Feeding/Oncogenicity Study and 21-Day Dermal).* 3 pp.

U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances. 1992. *EPA Pesticides in Groundwater Database, National Summary.* pp. NS 105-106.

U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances. 1993a. *Dicamba Independent Method Validation.* 2 pp.

U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances. 1993b. *Letter to Dr. Jonathan Bryant, Sandoz Corporation re: Dicamba: Review of Developmental Toxicity Study in Rabbits.* 4 pp.

U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances. 1993c. *Letter to Dr. Jonathan Bryant, Sandoz Corporation re: Dicamba Acute Neurotoxicity Study in Rats Review.* 4 pp.

SANDOZ PUBLICATIONS

Product Labels: Banvel®, 1991; Vanquish®, 1992. Material Safety Data Sheets: Banvel®, 1989; Banvel® CST, 1993; Vanquish®, 1992.

Arnold, D. 1993. *Technical Dicamba: 2-Generation Reproduction Study in Rats.* Sandoz Agro Inc. Inter-office Correspondence. 2 pp.

OTHER SOURCES

American Conference of Governmental Industrial Hygienists, Inc. 1991. *Documentation of the Threshold Limit Values and Biological Exposure Indices.* ACGIH, Inc. Cincinnati, OH. pp. 612-613.

Arjmand, M., Spittler, T.D., Mumma, R.O. 1988. *Analysis of Dicamba from Water Using Solid-Phase Extraction and Ion-Pair High-Performance Liquid Chromatography.* J. Agric. Food Chem. 36. pp. 492-494.

Beasley, V., Arnold, E., Lovell, R. 1991. 2,4-D *Toxicosis I: A Pilot Study of 2,4-Dichlorophenoxyacetic Acid- and Dicamba-Induced Myotonia in Experimental Dogs.* Vet. Hum. Toxicol. 33 (5). pp. 435-440.

Comfort, S., Inskeep, W., and Macur, R. 1992. *Degradation and Transport of Dicamba in a Clay Soil.* Journal of Environmental Quality 21:653-658.

Draper, W., and Street, J. 1982. *Applicator Exposure to 2,4-D, Dicamba, and a Dicamba Isomer.* J. Environ. Sci. Health, B17(4), 321-339.

Gaines, T. and Linder, R. 1986. *Acute Toxicity of Pesticides in Adult and Weanling Rats.* Fundamental and Applied Toxicology 7, 299-308.

Hamman, R. and Kettrup, A. 1987. Determination of Phenoxy Acid Herbicides in Water Samples. Chemosphere 16 (2/3). pp. 527-536.

Hoffman, D.J., Albers, P.H. 1984. *Evaluation of Potential Embryotoxicity and Teratogenicity of 42 Herbicides, Insecticides, and Petroleum Contaminants to Mallard Eggs.* Archives of Environmental Contamination and Toxicology 13:15-27.

Huff, J., Cirvello, J., Haseman, J., and Bucher, J. 1991. *Chemicals Associated with Site-Specific Neoplasia in 1394 Long-Term Carcinogenesis Experiments in Laboratory Rodents.* Environmental Health Perspectives (in press).

Jimenez, N.C., Atallah, Y.H., and Bade, T.R. 1989. *Capillary Column Gas Chromatographic Determination of Dicamba in Water, Including Mass Spectrometric Confirmation.* J. Assoc. Off. Anal. Chem. 72 (5). pp. 840-844.

Kutz, F., Cook, B., Carter-Pokras, O., Brody, D., Murphy, R. 1992. *Selected Pesticide Residues and Metabolites in Urine from a Survey of the U.S. General Population.* Journal of Toxicology and Environmental Health, 37:277-291.

Ma, T., Harris, M., Anderson, V., Ahmed, I., Mohammad, K., Bare, J., and Lin, G. 1984. *Tradescantia Micronucleus Tests on 140 Health-related Agents.*

Mayer, J., and Elkins, N. 1990. *Potential for Agricultural Pesticide Runoff to a Puget Sound Estuary: Padilla Bay, Washington.* Bull. Environ. Contam. Toxicol. 45:215-222.

Moody, D., Narloch, B., Shull, L., and Hammock, B. 1991. *The Effect of Structurally Divergent Herbicides on Mouse Liver Xenobiotic-metabolizing Enzymes and Carnitine Acetyltransferase.* Toxicology Letters 59:175-185.

Potter, W., Garry, V., Kelly, J., Tarone, R., Griffith, J., and Nelson, R. 1993. *Radiometric Assay of Red Cell and Plasma Cholinesterase in Pesticide Appliers from Minnesota.* Toxicol. Appl. Pharmacol. 119, 150-155.

Westra, P. and Schwartz, H. 1989. *Potential Herbicide Volatility and Drift Problems on Dry Beans.* Colorado State University Cooperative Extension "Service in Action" No. 2.803.

X. Toxicity and Risk Categories

Estimates of Health Risks to the Public and to Workers from Forest Service Operations

The FEIS predicts levels of human exposure (dose) for project workers and for the public, for both a typical field project and for a large accidental spill. These dose levels are compared to the highest dose level in animal tests that showed no health effect (No Observed Effects Level). The risk is ranked from "Negligible" to "High" based on the margin between the expected human dose and the highest NOEL—"no effect" dose. A "High" risk rating means that the highest NOEL dose is not more than ten times larger than predicted human dose under the specified conditions. A "Moderate" risk rating means that the highest NOEL dose is between 10 and 100 times larger than the expected human dose.

Estimated Health Risks To The Public

Situation	General Health	Reproduction
Routine Large Aerial Application	Low	Moderate
Routine Application—Other	Negligible	Negligible
Large Spill	Moderate	High

Estimated Health Risks to Project Workers

Worker	General Health	Reproduction
Aerial Mixer/Loader	Low	Low
Backpack Sprayer	Low	Moderate
Right-of-way Mixer/Loader	Negligible	Negligible
Hack-and-Squirt	Low	Moderate

Ecotoxological Categories

Mammalian (Acute Oral):	
mg/kg	*Risk Category*
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Avian (Acute Oral):	
mg/kg	*Risk Category*
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Avian (Dietary):	
mg/kg	*Risk Category*
<50	very highly toxic
50-500	highly toxic
501-1000	moderately toxic
1001-5000	slightly toxic
>5000	practically non toxic

Aquatic:	
ppm	*Risk Category*
<0.1	very highly toxic
0.1-1	highly toxic
>1-10	moderately toxic
>10-100	slightly toxic
>100	practically non toxic

TABLES OF CATEGORIES OF TOXICITY

Human Hazards				
		Route of Administration		
Risk Category	Signal Word	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (mg/kg)
I	DANGER--Poison	0-50	0-200	0-0.2
II	WARNING	>50-500	>200-2000	>0.2-2.0
III	CAUTION	>500-5000	>2000-20,000	>2.0-20
IV	NONE	>5000	>20,000	>20

	Hazard	
Category	Eye Irritation	Skin Irritation
I	Corrosive: corneal opacity not reversible within 7 days	corrosive
II	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV	no irritation	mild or slight irritation at 72 hours

Categories of Quality of Health Effects Data	
Inadequate:	Inadequate information available for evaluating toxicity. There were too few studies of sufficient quality to yield useful or reliable information.
Marginal-Inadequate:	Some useful information exists for evaluating toxicity. There were studies of marginal quality that provided useful information, but studies were inconsistent and some contained flaws. It is likely that new studies would change estimates of health effects.
Marginal:	Marginal but useful information available for evaluating toxicity. There were studies of adequate quality, and results did not vary greatly, but more information would increase reliability. Although new studies may change estimates of health effects, the results are considered moderately reliable.
Adequate:	Adequate information is available. Studies are of sufficient quality and quantity that estimates of human health are considered reliable. New studies are unlikely to change estimates of health effects.

United States
Department of
Agriculture

Forest Service
Pacific Northwest Region

October, 1994

Healthy Forests
Make A World
Of Difference

Glyphosate

HERBICIDE INFORMATION PROFILE

This information profile is produced by the USDA Forest Service, Pacific Northwest Region, for employees, forest workers, and for the public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide glyphosate and its formulations. A list of definitions is included in Section VIII of the information profile. For general information on herbicide use by the Forest Service, refer to the PNW Region Treatment Methods Profile for Herbicides.

The principal sources of information and findings in this profile are the PNW Region FEIS (Final Environmental Impact Statement) for Managing Competing and Unwanted Vegetation; Forest Service "Herbicide Background Statement: Glyphosate"; and product labels and Material Safety Data Sheets. Information from other sources is specifically referenced.

Beginning in 1992, the PNW Region publishes a bibliography of recent anecdotal and scientific accounts, and analyzes reported worker health effects. This herbicide information profile has been updated to reflect new information from a review of new literature through 1991, plus a few more recent studies submitted to the Forest Service.

I. BASIC INFORMATION

COMMON NAME: Glyphosate

CHEMICAL NAME: N-(phosphonomethyl) glycine

COMMON PRODUCT NAMES: Rodeo®, Accord®, Roundup®

PESTICIDE CLASSIFICATION: Herbicide

REGISTERED USE STATUS: "General Use"

FORMULATIONS: Commercial glyphosate products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than the active plant-killing ingredient. The names of inert ingredients are not usually listed on the label. The contents of three glyphosate formulations are listed below:

Rodeo®	
glyphosate	53.5%
water	46.5%
Accord®	
glyphosate	41.5%
water	58.5%
Roundup®	
glyphosate	41.0%
related organic acids of glyphosate	1.5%
isopropylamine	0.5%
polyethoxylated tallow amine surfactant	15.4%
water	41.6%

Rodeo® and Accord® formulations of glyphosate require adding other chemicals, called surfactants, for some labeled uses. Entry II is a surfactant which consists of the same inert ingredients found in Roundup®. Therefore, Roundup® formulation information in this profile also characterizes potential effects from Accord® plus Entry II used in Forest Service applications.

Other surfactants that can be used with Rodeo® or Accord® are listed on the label. This profile does not discuss any possible effects on the human environment from using other surfactants in Forest Service applications of Rodeo® or Accord®. The PNW Region has not reviewed these surfactants for potential effects on the human environment.

RESIDUE ASSAY METHODS: Gas/liquid chromatography and high performance liquid chromatography methods are available for residue assay. In laboratory tests, an average of 82 percent of known glyphosate concentrations was recovered. New detection methods report 1.0 ppb detection limit, using simpler and shorter processes. (Oppenhuizen and Cowell, 1991).

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND, RIGHT-OF-WAY USES: Planting site preparation, conifer release, forest nurseries, rights-of-way and facilities maintenance, and noxious weed control. Rodeo® is labeled for control of plants growing in or immediately adjacent to water.

OPERATIONAL DETAILS:

TARGET PLANTS: Glyphosate is used to control grasses, herbaceous plants, including deep rooted perennial weeds, brush, some broadleaf trees and shrubs, and some conifers. Glyphosate does not control all broadleaf woody plants. Timing is critical for effectiveness on some broadleaf woody plants and conifers.

MODE OF ACTION: Glyphosate is applied to foliage. It is absorbed by leaves and rapidly moves through the plant. Glyphosate prevents the plant from producing amino acids that are the building blocks of plant proteins. The plant, unable to make proteins, stops growing and dies. Glyphosate is metabolized or broken down by some plants, while other plants do not break it down. AMPA (aminomethylphosphonic acid) is the main break-down product of glyphosate in plants.

METHOD OF APPLICATION: Aerial spraying, spraying from a truck, backpack or hand-held sprayer; wiper application; frill treatment; cut stump treatment, and by cartridge injecting lance (E-Z-Ject®).

USE RATES: 0.3 to 4.0 pounds of active ingredient per acre.

SPECIAL PRECAUTIONS:

Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

TIMING OF APPLICATION: Apply after leaves expand fully but before fall color change.

DRIFT CONTROL: Do not allow careless application or spray drift. Do not permit spray or spray drift to contact desirable plants.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

RESIDUAL SOIL ACTIVITY: Glyphosate does not have herbicidal properties once it contacts soil. It is not absorbed from the soil by plant roots.

A related chemical, called N-nitroso-glyphosate or NNG, has been detected in test soils after applying glyphosate at five times the normal use rate. No studies have found conclusive evidence of NNG production using normal application rates. (Khan and Young, 1977; Newton, et. al., 1984)

ADSORPTION: Glyphosate and the surfactant used in Roundup® are both strongly adsorbed by the soil.

PERSISTENCE AND AGENTS OF DEGRADATION: Glyphosate remains unchanged in the soil for varying lengths of time, depending on soil texture and organic matter content. The half-life of glyphosate in soil can range from 3 to 249 days. Soil microorganisms break down glyphosate. The surfactant in Roundup® has a soil half-life of less than 1 week. Soil microorganisms break down the surfactant.

METABOLITES/DEGRADATION PRODUCTS AND POTENTIAL ENVIRONMENTAL EFFECTS: The main break-down product of glyphosate in soil is AMPA (aminomethylphosphonic acid), which is broken down further by soil microorganisms. The main break-down product of the surfactant used in Roundup® is carbon dioxide.

WATER:

SOLUBILITY: Glyphosate dissolves easily in water.

POTENTIAL FOR LEACHING INTO GROUND-WATER: The potential for leaching is low. Glyphosate and the surfactant in Roundup® are strongly adsorbed to soil particles and are not easily released back into water moving through soil. Monitoring found neither glyphosate nor AMPA were susceptible to leaching after a forest application in British Columbia (Feng and Thompson, 1989).

SURFACE WATERS: Test shows that the half-life for glyphosate in water ranges from 35 to 63 days. The surfactant half-life ranges from 3 to 4 weeks. Studies examined glyphosate and AMPA residues in surface water after forest application in British Columbia with and without no-spray streamside zones. With a no-spray streamside zone, very low concentrations were sometimes found in water and sediment after the first heavy rain. Where glyphosate was sprayed over the stream, higher peak concentrations in water always occurred following heavy rain, up to 3 weeks after application. Glyphosate and AMPA residues peaked later in stream sediments, where they persisted for over 1 year. These residues were not easily released back into the water. (Wan, 1986).

AIR:

VOLATILIZATION: Glyphosate does not evaporate easily.

POTENTIAL FOR BY-PRODUCTS FROM BURNING OF TREATED VEGETATION: Major products from burning treated vegetation include phosphorus pentoxide, acetonitrile, carbon dioxide and water. Phosphorous pentoxide forms phosphoric acid in the presence of water. None of these compounds is known to be a health hazard at the levels which would be found in a vegetation fire.

IV. ECOLOGICAL EFFECTS

SOIL MICROORGANISMS:

Most studies have shown no adverse effects on soil microorganisms, including soil nitrogen cycling processes. (USDA-FS, 1984) One study found a significant reduction in nitrogen fixation by bacteria associated with clover that was planted in a sandy soil 120 days after glyphosate was applied. The authors could not conclude whether the reduction was due to direct glyphosate effects on the bacteria, or on plant processes that support nitrogen fixation. (Eberbach and Young, 1983) Monitoring of Roundup® application to British Columbia forest soils found no long-term effects to any soil animals or microorganism populations over six months. Some populations were reduced after spraying but recovered within thirty days. (Preston and Trofymow, 1989). Monitoring of pine seedlings and associated mycorrhizal fungi found no effect on seedling growth or ectomycorrhizal development following field applications of glyphosate in Ontario, Canada.

(Chakravarty, P. and Chartapaul, L. 1990).

PLANTS:

Contact with non-target plants may injure or kill plants. Roundup® was not toxic to algae species in British Columbia forest streams at post-spray levels, and appears to act as a source of phosphorus for algal growth where the nutrient is in short supply. (Austin et al., 1991).

AQUATIC ANIMALS:

Glyphosate is no more than slightly toxic to fish, and practically non-toxic to aquatic invertebrate animals. It does not build up (bioaccumulate) in fish. A misprinted concentration in fish fillets in one published study has caused confusion. (Folmar, 1984)

The Accord® and Rodeo® formulations are practically non-toxic to freshwater fish and aquatic invertebrate animals. The Roundup® formulations is moderately to slightly toxic to freshwater fish and aquatic invertebrate animals. Glyphosate and its formulations have not been tested for chronic effects in aquatic animals. Acute toxic levels are:

RODEO® AND ACCORD®

species	LC50
fish	>1,000 ppm
invertebrates	930 ppm

ROUNDUP®

species	LC50
fish	5 to 26 ppm
invertebrates	4 to 37 ppm

TERRESTRIAL ANIMALS:

Glyphosate is practically non-toxic to birds and mammals. It is practically non-toxic to bees. Acute toxic levels are:

GLYPHOSATE

species	LD50
bobwhite quail	3,850 mg/kg
bee	>100 micrograms/bee

No significant effects on survival and reproduction of deer mice and Oregon voles were observed over five years following Roundup® release treatment of Douglas-fir plantations in British Columbia. Roundup® had little or no direct effect on development of young mice or vole populations; however possible health effects on individual animals were not directly studied (Sullivan, 1990).

In mammals, most glyphosate is excreted, unchanged, in urine and feces. Glyphosate was not broken down in rats given oral doses, and it did not bioaccumulate (Brewster et al, 1991).

Glyphosate and its formulations have not been tested for chronic toxicity on wildlife species. Testing on laboratory mammals of glyphosate and its formulations are reported in Section V.

THREATENED AND ENDANGERED SPECIES:

Glyphosate may be a hazard to endangered plants if it is applied to areas where they live. EPA identified 76 species that may be endangered by glyphosate use, including 74 plant, one toad and one beetle species.

V. Health Effects Testing

These data are results of laboratory animal studies. These data have been evaluated by the Forest Service and are used to make inferences relative to potential human health effects.

For glyphosate and its formulations, findings are from studies conducted by the manufacturer. These studies have been presented to EPA to support product registration, but may not be available to the public.

For glyphosate, the Environmental Protection Agency has evaluated these studies during the registration process. For **Roundup® formulation,** the findings are from studies supported by the manufacturer that are cited in the Material Safety Data Sheet. The **Rodeo® and Accord® formulations,** which consist of glyphosate and water only, are not expected to cause any greater health effects than concentrated glyphosate.

Acute Toxicity:

Acute Oral Toxicity; tests in male and female rats

Glyphosate

Median lethal dose: 4,320 mg/kg.
Slightly Toxic (Category III)

Roundup® formulation

Median lethal dose: 5,000 mg/kg.
Slightly Toxic (Category III)

Acute Dermal Toxicity; tests on rabbits

Glyphosate

Median lethal dose (males): 5,010 mg/kg
(females): 794 mg/kg
Slightly Toxic (Category III)

Roundup® formulation

Median lethal dose: >5,000 mg/kg
Practically Nontoxic (Category IV)

Primary Skin Irritation; tests on rabbits

Glyphosate

Not an irritant. (Category IV)

Roundup® formulation

Slightly Irritating (Category III)

Primary Eye Irritation; tests on rabbits;

Glyphosate

Mild eye irritant. (Category III)

Roundup® formulation

Moderately irritating (Category II)

Acute Inhalation—this requirement was waived by the EPA for glyphosate.

Roundup® formulation

Median lethal concentration: 3.18 mg/l (Rat)
Slightly Toxic (Category III)

Chronic Toxicity:

These data are also based on tests in laboratory animals. EPA requires chronic toxicity tests only for the active ingredient glyphosate. Reports of Roundup® formulation testing are from the MSDS (Material Safety Data Sheet).

Please refer to Section X for an explanation of how NOEL (No Observable Effects Level) is calculated.

The Pacific Northwest Region FEIS risk assessment evaluated the quality of the testing that had been done for glyphosate up to 1988. Quality consideration for individual studies included: ranges of doses and species that were tested; length of test; identification of the most sensitive effect. Additionally, the degree of quantitative agreement among all tests for an effect was considered. Please refer to Section X for an explanation of qualitative ratings in this section.

SYSTEMIC TOXICITY:

NOEL for glyphosate: 31 mg/kg/day (rat): 20 mg/kg/day (dog)

The PNW Region FEIS rated the quality of testing as Marginally Adequate; the dose at which effects are seen in animal studies varies widely.

After repeated skin exposure for three weeks to Roundup® formulation at five times recommended use concentration, severe skin irritation and systemic toxic effects were observed in rabbits. Slight to moderate skin irritation was the only effect in rabbits treated with three times recommended use strength.

CARCINOGENICITY:

The PNW Region FEIS rated the quality of testing as Marginally Adequate, and assumed that glyphosate could cause cancer. Since the 1988 rating, EPA has concluded that glyphosate should be classified as having evidence of non-carcinogenicity for humans. There was no convincing evidence of carcinogenicity in new studies in two animal species. (Dykstra and Ghali, 1991)

Glyphosate was negative in tests for mutagenicity (the ability to cause genetic damage).

REPRODUCTION/DEVELOPMENTAL:

The PNW Region FEIS used a NOEL of 10mg/kg/day, based on kidney effects observed in rat pups. This NOEL was accepted by the EPA for developmental effects; however, EPA has changed their estimated NOEL recently (US-EPA, 1993a and 1993b). A new study did not find any kidney effects in rat pups fed larger doses of glyphosate over similar lengths of time. EPA concluded that the kidney effects observed in the earlier study were not glyphosate-related (US-EPA, 1993a).

The EPA now considers the NOEL for developmental effects from glyphosate to be 175 mg/kg/day, a dose 17.5 times larger than the previous estimate. The new NOEL is based on observed diarrhea, nasal discharge, and death observed in rabbits given larger doses (US-EPA, 1993b).

The PNW Region FEIS evaluated the testing as Marginally Adequate for these effects.

IMMUNE SYSTEM EFFECTS

The PNW Region FEIS evaluated the testing as Inadequate for these effects.

NERVOUS SYSTEM EFFECTS

The PNW Region FEIS evaluated the testing as Inadequate for nervous system effects.

VI HUMAN HEALTH EFFECTS

FOREST SERVICE EVALUATION OF HUMAN HEALTH RISKS:

The Pacific Northwest Region evaluated a range of glyphosate health effects data, including some laboratory studies cited in Section V. Both quantitative (numerical) estimates of toxicity, and the quality of data used to make numerical estimates were evaluated. The new information cited in Section V would improve the "quality of information" ratings. No new studies indicated a reduced margin of safety which would warrant additional restrictions on use of glyphosate beyond those specified in the FEIS.

Two new studies (US-EPA, 1993a&b); and Middendorf, 1993) indicate that the margin of safety for the public and for some workers may be greater than estimated in the PNW Region FEIS. FEIS ratings may overstate risks, based on the new information.

The FEIS Quantitative Risk Assessment predicts the amount of human exposure—both to project workers and to the public—from typical forestry operations, and also from a large accidental spill. The Risk Assessment used this information to assess health risks from typical uses. These risks were compared to EPA standards of acceptable risk for human health effects. The FEIS risk

assessment identified as "Moderate" or "High" any predicted risks from Forest Service operations that were greater than EPA standards. Specific mitigation measures were designed to reduce human exposure from these operations: they are mandatory for every applicable project on National Forest lands.

The complete set of risk ratings is displayed in Sec. X.

The quality of the existing data affects the reliability of these risk ratings. The FEIS judged the overall quality of available data on glyphosate toxicity to be "Marginal". There were studies of adequate quality and results did not vary greatly, but more information would increase reliability. Although new studies may change estimates of health effects, the results are considered moderately reliable.

Potential for Health Effects to the Public:

Forest visitors and nearby residents could be exposed to herbicide drift, to vegetation with herbicide residues, and to accidental spraying. They also could eat food or drink water containing herbicide residues.

No studies of public exposure to forest herbicide applications were available. Public doses were estimated based on the behavior of the herbicide in the environment. "Routine Application" estimates maximum possible public exposure under normal operating conditions. The "Large Spill" situation models the highest doses that could ever be reasonably be expected to occur. Typical public exposures and risks would be much lower than either situation.

Mitigating Measures to Reduce Glyphosate Risks to Public:

"Low" risk of general health effects for all routine projects. "Moderate" risk of reproductive health effects for people who receive multiple exposures to glyphosate from a large (400-acre) aerial application project. "Low" risk for smaller (40-acre) aerial projects, and for all ground-based applications:

> Consider potential for public exposure when designing contact procedures, posting and signing needs in the Herbicide Application Plan.

"Moderate" risk of general health effects, and "High" risk of reproductive effects if exposed to concentrated glyphosate from a large spill:

> Prevent all public contact with accidental spills (emergency spill notification system, restrict public access to spill site).

Probability of a Worker Receiving a Dose which Affects General Helath or Reproduction:

Worker exposure and dose are estimated for typical forestry applications. Worker doses do not account for any reduction in exposure from following safety precautions or mitigating measures (such as wearing protective clothing).

Studies are available that measure actual worker doses of herbicide for some typical forestry applications. Backpack applicators of Roundup® in forest plantations have been monitored for the doses they absorbed in actual spray operations (Middendorf, 1993). The measured doses for workers averaged 1/1000 the amount that was predicted in the PNW Region FEIS for Routine applications, and 1/67 the amount predicted for a Worst-case application situation. The worker risks would be much lower than the estimates used if these new operational doses were substituted for doses predicted by PNW Region FEIS.

Mitigating Measures to Reduce Identified Glyphosate Risks to Workers:

The probability of worker exposure to a toxic concentration for general health effects was rated "Low" or "Negligible" for all application methods. The probability of worker exposure to a toxic concentration for reproductive effects was rated "Low" or "Negligible" for aerial and tank truck mixer/loaders; "Moderate" for backpack spray and hack-and-squirt applicators.

In the PNW Region FEIS. Mitigating Measure 13 requires workers applying any herbicide to wear protective clothing. Mitigating Measure 23 requires worker exposure monitoring for all herbicide application projects.

The 1992 Amendment to the ROD requires workers to review this Information Profile before agreeing to apply glyphosate herbicides. The worker may request reassignment without penalty. Additional personal protective equipment will be available at the worksite for workers who want to reduce their exposure to the herbicide.

Acute Toxicity (Poisoning)

Reported Effects: Most incidents reported in humans have involved skin or eye irritation in workers after exposure during mixing, loading or application of glyphosate formulations. Nausea and dizziness have also been reported after exposure.

Swallowing the Roundup® formulation caused mouth and throat irritation, pain in the abdomen, vomiting, low blood pressure, reduced urine output, and in some cases, death. These effects have only occurred when the concentrate was accidentally or intentionally swallowed, not as a result of the proper use of Roundup®. The amount swallowed averaged about 100 milliliters (about half a cup).

Chronic Toxicity:

Reported Effects: There are no reported cases of long term health effects in humans due to glyphosate or its formulations.

Potential for Adverse Health Effects from Inert Ingredients Contained in the Formulated Product:

Inert ingredients found in glyphosate formulations may include water and a surfactant (polyethoxylated tallowamines). The surfactant is a skin irritant and a severe eye irritant in concentrate form (Entry II). The surfactant compounds are more diluted in water and less toxic in the Roundup® formulation. The only inert ingredient in Rodeo® or Accord® is water, which is considered nontoxic.

The manufacturer has identified the inert ingredients in glyphosate formulations to EPA and to the public. EPA classified all inerts into one of four categories, called "Lists". List 1 contains chemicals of known toxic concern. List 2 contains chemicals of suspected toxic concern which are high priority for testing. List 4 contains chemicals of known nontoxic character, generally recognized as safe to humans. All other chemicals were classified on List 3: Inerts of unknown toxicity. EPA did not find enough information available on the toxic properties of List 3 chemicals to classify them on Lists 1, 2, or 4.

All inert ingredients used in Rodeo®, Accord®, and Roundup® formulations were classified by EPA on List 3 or List 4.

Health Effects of Exposure to Formulated Products:

Because Accord® and Rodeo® contain water as the only inert ingredient, health effects are assumed to be no greater than those for pure glyphosate. The Roundup® formulation is moderately toxic, and may cause skin irritation and eye irritation. Effects of Roundup® characterize the effects expected for a spray mix of Accord® with Entry II surfactant; please refer to Section I, Formulations for details.

Health Effects Associated with Contaminants:

Glyphosate contains the contaminant N-nitroso glyphosate (NNG) at 0.1 ppm or less. The potential for NNG to cause cancer is unknown. The EPA has not assessed the health risks of NNG. No carcinogenic effects were observed in tests of glyphosate; the EPA concluded these tests were evidence of noncarcinogenicity. (Dykstra and Ghali, 1991)

1,4-dioxane is a contaminant of surfactant in Roundup®. Dioxanes caused liver and kidney damage, and possible tumors in rats exposed to

high levels (1000 ppm in water for two years). These effects were not observed at lower exposure levels, or in other animal species. (ACGIH. 1991.) The EPA decided that the reported trace level of 1,4-dioxane (30 ppm) in the Roundup® formulation was not likely to result in unreasonable adverse health effects. Monsanto reports that 1,4-dioxane contamination has been further reduced to 23 ppm. (Monsanto Corp. Undated(b)).

Health Effects Associated with Other Formulations:

Some formulations contain glyphosate mixed with other herbicides such as 2,4-D or dicamba. This profile does not fully describe the potential for health or environmental effects from these formulations containing multiple herbicides. Additional information on properties and potential effects of these formulations will be prepared before they are used in the PNW Region.

Societal Perceptions:

Public opinion about herbicide use in general ranges from a perception that herbicides are completely safe, to a perception that they are very hazardous. A full range of opinion is available in the FEIS.

VII. Safety Precautions:

Signal Word and Definition:

Roundup®: WARNING - Causes substantial but temporary eye injury. Harmful if inhaled.

Rodeo®: CAUTION - May cause eye irritation. May be harmful if inhaled.

Accord®: CAUTION - May cause eye irritation.

Protective Precautions for Workers:

Avoid contact with eyes, skin or clothing. Avoid breathing vapors or spray mist. Wash thoroughly with soap and water after handling.

Medical Treatment Procedures (Antidotes):

There is no specific antidote for glyphosate; treat symptoms. For exposure to the eyes, flush with plenty of water for at least 15 minutes. Get medical attention. For exposure to the skin, flush skin with plenty of water. In case of emergency, call your local poison control center for advice.

Handling, Storage and Disposal:

Glyphosate is corrosive to unlined steel and galvanized steel. Do not mix, store or apply glyphosate in galvanized steel or unlined steel containers of spray tanks. Glyphosate is stable under normal storage conditions for at least 5 years. Wastes should be disposed of in a landfill approved for pesticide disposal or according to federal, state, and local rules. Do not contaminate water, food, animal feeds or seed by storage.

Emergency (Spill) Hazards and Procedures:

Spills that soak into the ground should be dug up and put in plastic lined metal drums for disposal. Spills on floors or other hard surfaces should be contained or diked. An absorbent clay should be used to soak up the spill. The contaminated absorbent should be put in plastic-lined metal drums. Drums of contaminated soil should be disposed of in a landfill approved for pesticide disposal or according to federal, state and local rules. Do not contaminate water, food, animals feeds or seeds by disposal. In case of a large spill, call CHEMTREK at 1-800-424-9300 for advice.

VIII. Definitions

acute toxicity - The amount of a substance, as a single dose, to cause poisoning in a test animal

adsorption - the process of attaching to a surface

basal treatment - applied to the stem of a plant just above the soil

bioaccumulate - the uptake of a chemical by an organism from its environment.

broadcast application - applied over an entire area

carcinogenicity - ability to cause cancer

chronic toxicity - Toxic effects produced in test animals exposed for long periods to a chemical

dermal - of, or related to, the skin

EC50 - the concentration which will cause a toxic effect in 50% of the subjects

formulation - the form in which the pesticide is supplied by the manufacturer for use

half-life - the time required for a chemical to be reduced by natural processes to one half its original amount.

herbicide - a substance used to destroy plants or to slow down their growth

LC50 - the concentration in air or water which will kill 50% of the subjects

LD50 - the dose which will kill 50% of the subjects

leach - to dissolve out by the action of water

mg/kg - milligrams of the substance per kilogram of body weight. Equals ppm.

mg/l - milligrams of dissolved substance per liter of water. Equals ppm.

microorganisms - living things too small to be seen without a microscope

mutagenicity - ability to cause genetic changes

non-target - animals or plants other than the ones which the pesticide is intended to kill

persistence - tendency of a pesticide to remain in the environment after it is applied

ppb - parts per billion parts

ppm - parts per million parts. Equal to mg/kg, and mg/l.

residual activity - the remaining amount of activity as a pesticide

sensitizer - a delayed allergic response to a substance; symptoms usually resemble an acute toxic response.

teratogen - a compound having the property of causing birth defects

volatility - the tendency to become a vapor at relatively low temperature

IX Information Sources:

U.S. Government Agency Publications

Forest Service, U.S. Department of Agriculture, 1984. *Herbicides.* Agriculture Handbook No. 633.

Pacific Northwest Region, Forest Service, USDA, Portland, OR, 1988. *Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation.*

Chapter IV, Environmental Consequences: Human Health Effects Characterization and Management of Risk

Appendix C: Herbicide Use and Efficacy

Appendix D: Quantitative Risk Analysis

Appendix J: Herbicide Review with Wildlife-oriented Effects

U.S. Environmental Protection Agency, Office of Pesticide Programs. Washington, DC, 1986. *Pesticide Background Statements. Volume I.* EPA Publication No. 540/FS-88-124

U.S. Environmental Protetion Agency, Office of Prevention, Pesticides, and Toxic Substances. Washington D.C. 1993a. *Reregistration Eligibility Decision: Glyphosate.* EPA Publication No. EPA 738-R-93-014.

U.S. Environmental Protetion Agency, Office of Prevention, Pesticides, and Toxic Substances, Washington D.C. 1993b. *Pesticide Tolerances for Glyphosate (Proposed Rule).* Federal Register, Vol. 58, No. 85, May 5, 1993, pp. 26725-26727.

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances, Washington, DC. 1986. *Guidance for the Reregistration of Pesticide Products Containing Glyphosate as the Active Ingredient.* EPA Publication No. 540/RS-R6-156,

Forest Service, USDA, Atlanta, GA. 1989. *Final Environmental Impact Statement. Vegetation Management in the Coastal Plan/Piedmont.* Management Bulletin R8-MB-23.

Forest Service, USDA, San Francisco, California, 1989.*Final Environmental Impact Statement. Vegetation Management for Reforestation.*

MONSANTO AGRICULTURAL COMPANY PUBLICATIONS

Monsanto Corp. (anon.). 1992. *Roundup® Material Safety Data Sheet.*

Monsanto Corp. (anon.). 1993a. *Accord® Material Safety Data Sheet.*

Monsanto Corp. (anon.). 1993b. *Rodeo® Material Safety Data Sheet.*

Monsanto Corp. (anon.). Undated(a). *Backgrounder; Roundup® Herbicide Ingredients.*

Monsanto Corp. (anon.). Undated(b). *1,4-Dioxane Questions and Answers.*

OTHER SOURCES

American Conference of Governmental IndustrialHygienists. Inc. 1991. *Documentation of the Threshold Limit Values and Biological Exposure Indices.* ACGIH. Inc. Cincinnati, OH. pp 512-515.

Austin, A.P., Harris, G.E., and Lucey, W.P. *Impact of an Organophosphate Herbicide (Glyphosate) on Periphyton Communities Developed in Experimental Streams.* Bull. Environ. Contam. Toxicol. 47: 29-35. 1991.

Brewster, D. W., Warren, J., and Hopkins, W.E. *Metabolism of Glyphosate in Sprague-Dawley Rate: Tissue Distribution, Identification, and Quantitation of Glyphosate-Derived Materials following a Single Oral Dose.* Fundamental and Applied Toxicology 17. 1991. pp 43-51.

Chakravarty, P., and Chartapaul, L. *Non-target Effect of Herbicides: II. The Influence of Glyphosate on Ectomycorrhizal Symbiosis of Red Pine under Greenhouse and Field Conditions* . Pestic. Sci. 0031-613X. 1990.

Dykstra, W., and Ghali, G. *Second Peer Review of Glyphosate.* U.S. Environmental Protection Agency Memo. 1991.

Eberbach, P. L.; Douglas, L. A. 1983. *Persistence of Glyphosate in a Sandy Loam. Soil Biology and Biochemistry* 15 (4). 485-487.

Feng, J.C., and Thompson, D.G. *Persistence and Dissipation of Glyphosate in Foliage and Soils of a Canadian Coastal Forest Watershed.* In: Proceedings of the Carnation Creek Herbicide Workshop. Forestry Canada, FRDA Report ISSN 0835-0752; 063. 1989.

Folmar, Dr. Leroy C. , U.S. Department of Commerce, National Oceanic and Atmospheric Administration. *Personal Communication to Dr. Robert A. Campbell re: Error in Published Roundup® Concentration in Fish Fillets.* 1984.

Khan. Shahamat U.. and Young, J. Christopher. 1977. *N-Nitrosamine Formation in Soil from the Herbicide Glyphosate.* Journal of Agricultural and Food Chemistry 25; no. 6: 1430-1432.

Middendorf. P.J. 1993. *Forest worker exposures to glyphosate during directed foliar applications of Roundup® herbicide.* Rep. Project #A-8196-000. Ga. Tech. Res. Inst., Ga. Inst. Tech,, Environ. Sci. and Technol. Lab. 71 p.

Newton, Michael, et. al. *Fate of Glyphosate in an Oregon Forest Ecosystem.* Journal of Agricultural and Food Chemistry 32, no. 5. 1144-1151.

Oppenhuizen, M.E.; Cowell, J.E. *Liquid Chromotographic Determination of Glyphosate and AMPA in Environmental Water: Collaborative Study*, J. Assoc. Off. Anal. Chem. Vol. 74, No. 2. 1991.

Preston, C.M. and Trofymow, J.A. *Effects of Glyphosate (Roundup®) on Biological Activity ofTwoForest Soils.* In: Proceedings of the Carnation Creek Herbicide Workshop. Forestry Canada, FRDA Report ISSN 0835-0752; 063. 1989.

Sullivan, Thomas P. *Influence of Forest Herbicide on Deer Mouse and Oregon Vole Population Dynamics.* J. Wildlife Management, Vol 54, No. 4. 1990. pp 566-576.

Wan, M.T.K. *The Persistence of Glyphosate and its Metabolite Amino-methyl-phosphonic Acid in Some Coastal British Columbia Streams. Environment.* Canada, Environmental Protection Service, Pacific and Yukon Region, Regional Program Report 85-01. 1986.

For more information on glyphosate contact your local Forest Service Office

October 1994

Estimates of Health Risks to the Public and to Workers from Forest Service Operations

The FEIS predicts levels of human exposure (dose) for project workers and for the public, for both a typical field project and for a large accidental spill. These dose levels are compared to the highest dose level in animal tests that showed no health effect (No Observed Effects Level). The risk is ranked from "Negligible" to "High" based on the margin between the expected human dose and the highest NOEL—"no effect" dose. A "High" risk rating means that the highest NOEL dose is not more than ten times larger than predicted human dose under the specified conditions. A "Moderate" risk rating means that the highest NOEL dose is between 10 and 100 times larger than the expected human dose.

Estimated Health Risks To The Public

Situation	General Health	Reproduction
Routine Application	Low	Moderate
Large Spill	Moderate	High

Estimated Health Risks to Project Workers

Worker	General Health	Reproduction
Aerial Mixer/Loader	Low	Low
Backpack Sprayer	Low	Moderate
Right-of-way Mixer/Loader	Negligible	Negligible
Hack-and-Squirt	N/A*	N/A*

* Glyphosate was presumed not to be used in hack-and-squirt operations.

Ecotoxological Categories

	Mammalian (Acute Oral)	Avian (Acute Oral)	Avian (Dietary)	Acquatic
Risk Category	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
very highly toxic	<10	<10	<50	<0.1
highly toxic	10-50	10-50	50-500	0.1-1
moderately toxic	51-500	51-500	501-1000	>1-10
slightly toxic	501-2000	501-2000	1000-5000	>10-100
practically non toxic	>2000	>2000	>5000	>100

HUMAN HAZARDS

Category	Signal Word	Route of Administration			Hazard	
		Oral (mg/kg)	Dermal (mg/kg)	Inhalation (mg/l)	Eye irritation	Skin irritation
I	DANGER Poison	0-50	0-200	0-0.2	corrosive: corneal opacity not reversible within 7 days	corrosive
II	WARNING	>50-500	>200-2000	>0.2-2.0	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III	CAUTION	>500-5000	>2000-20,000	>2.0-20	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV	none	.5000	>20,000	>20	no irritation	mild or slight irritation at 72 hours

CATEGORIES OF QUALITY OF HEALTH EFFECTS DATA

Inadequate:	Inadequate information available for evaluating toxicity. There were too few studies of sufficient quality to yield useful or reliable information.
Marginal-Inadequate:	Some useful information exists for evaluating toxicity. There were studies of marginal quality that provided useful information, but studies were inconsistent and some contained flaws. It is likely that new studies would change estimates of health effects.
Marginal:	Marginal but useful information available for evaluating toxicity. There were studies of adequate quality, and results did not vary greatly, but more information would increase reliability. Although new studies may change estimates of health effects, the results are considered moderately reliable.
Adequate:	Adequate information is available. Studies are of sufficient quality and quantity that estimates of human health are considered reliable. New studies are unlikely to change estimates of health effects.

Picloram

HERBICIDE INFORMATION PROFILE

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE, PACIFIC NORTHWEST REGION

Healthy Forests Make A World Of Difference

This information profile is produced by the USDA Forest Service, Pacific Northwest Region, for employees, forest workers, and for the public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide Picloram and its formulations. A list of definitions is included in Section VIII of the information profile. For general information on herbicide use by the Forest Service, refer to the PNW Region Treatment Methods Profile for Herbicides.

I. BASIC INFORMATION

COMMON NAME: Picloram

CHEMICAL NAME: 4-amino-3,5,6-trichloropicolinic acid

PRODUCT NAMES: Tordon®

REGISTERED USE STATUS: All formulations that may be broadcast on soil or foliage are classified as "Restricted Use" pesticides. Sale and use of these picloram formulations are limited to licensed pesticide applicators or employees under their supervision, and only for uses covered by the applicator's certification. This is due to picloram's potential to contaminate groundwater, and its ability to damage nontarget plants, including important food crops *(US-EPA, 1988a.)*

The formulations discussed in this profile are both Restricted Use Pesticides.

FORMULATIONS: Commercial picloram products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than the herbicide. The names of inert ingredients are not usually listed on the label.

Tordon® K and Tordon® 22K
(Manufactured by DowElanco)

Picloram, as the potassium salt	24.4%
Inert ingredients:	75.6%
Water	
Dispersing agents	

The manufacturer has not revealed the identity of the inert ingredients other than water in these formulations *(DowElanco a, 1992)*. Where the identity of inerts is not available, this profile cannot fully characterize possible hazards to human health and the environment associated with these compounds.

The manufacturer has revealed all inerts to EPA (U.S. Environmental Protection Agency). No inert ingredient in Tordon® K or 22K formulations was categorized by EPA to have evidence or suggestion of toxic effects. The inert ingredients were categorized as either: low priority for health effects testing based on absence of data or chemical structure that would indicate toxic effects *(List 3)*; or generally recognized to be safe *(List 4)*.

The results of formulation testing reported in this profile apply only to Tordon® K and Tordon® 22K. They contain only picloram as an active ingredient.

Other herbicide formulations contain both picloram and another herbicide. For Forest Service applications , these include: Access®, Pathway®, Tordon® RTU, and Tordon® 101. Information in this profile does not address possible effects of these formulated herbicide mixtures.

Residue Assay Methods: Gas/liquid chromatography and reverse phase high performance liquid chromatography methods are available for residue assay. Detection limits in tests submitted to EPA are:

Water	0.1	ppb
Soil	5.0	ppb
Plants	50	ppb

(DowElanco Publication d. Undated.)

EPA cites a validated detection limit for picloram in water of 0.14 ppb *(EPA, 1988c).*

A 1982 study found that among 10 contract laboratories, water samples with 50 ppb picloram added were frequently underestimated, and sometimes not detected *(Norris, 1982).*

II. Herbicide Uses

Registered Forestry, Rangeland, Right-of-Way Uses: Tordon® K is used to prevent regrowth of woody plants in rights-of-way, such as along roads and power lines. In forestry, Tordon® K is used to control unwanted woody plants and to prepare sites for planting trees. On rangelands, Tordon® 22K is used to control noxious weeds and woody plants. It is also used to control plants on non-crop industrial/facility sites.

Operational Details:

Target Plants: Picloram is used to control broadleaf plants, brush, conifers and broadleaf trees. Most grasses are resistant to picloram.

Mode of Action: Picloram is absorbed through plant roots, leaves and bark. It moves both up and down within the plant, and accumulates in new growth. It acts by interfering with the plant's ability to make proteins and nucleic acids. Picloram is metabolized or broken down by plants into carbon dioxide, oxalic acid, 4-amino-2,3,5-trichloropyridine and 4-amino-3,5-dichloro-6-hydroxypicolinic acid.

Method of Application: Broadcast or spot treatment as foliar (leaf) or soil spray; by air as broadcast spray.

Use Rates: The amount to be applied depends on the type of plant to be killed, and the formulation of picloram used. The formulations containing only picloram as the active ingredient use the potassium salt.

Picloram, potassium salt: 1.0 to 2.0 lb. active ingredient/acre.

Special Precautions:

Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Timing of Application: Consult product label for precise timing guidelines for various soil and foliar treatments of picloram formulations. Do not apply picloram on snow or frozen ground.

Drift Control: Do not allow careless application or spray drift. Do not permit spray or spray drift to contact desirable plants.

III. Environmental Effects/Fate

Soil:

Residual Soil Activity: Picloram can stay active in soil for a moderately long time, depending on the type of soil, soil moisture and temperature. It may exist at levels toxic to plants for more than a year after application at normal rates. The half-life of picloram has been reported to vary from one month under favorable environmental conditions, to more than four years in arid regions *(USDA, 1984).*

Adsorption: Picloram chemically attaches to clay particles and organic matter. If the soil has little clay or organic matter, picloram is easily moved by water.

Persistence and Agents of Degradation: Long-term build-up of picloram in the soil generally does not occur. Break-down caused by sunlight and microorganisms in the soil are the main ways in which picloram degrades in the environment. Picloram will dissipate more quickly in warm, wet weather. Alkaline conditions, fine textured clay soils, and a low density of plant roots can increase the persistence of picloram.

Metabolites/Degradation Products and Potential Environmental Effects: Carbon dioxide is the major end-product of the breakdown of picloram in the soil. Carbon dioxide is a gas normally found in the air. The relatively small amount from picloram breakdown would not be expected to have any harmful effect on the environment.

One study of picloram breakdown in soil identified two compounds produced in minor amounts: 4-amino-3,5-dichloro-6-hydroxy-picolinic acid; 4-amino-2,3,5-trichloro-pyridine. These compounds have also been found as metabolism products of picloram in plants. The study found that these products are not part of the main breakdown pathway in soil, and they do not accumulate in soil *(DowElanco Publication e, Mullison. Undated).*

Water:

Solubility: Picloram dissolves readily in water.

Potential for Leaching into Groundwater: The mobility of picloram in soil is characterized by EPA as intermediate to very mobile in soils ranging in texture from clay to loam. Picloram movement is greatest for soils with low organic matter content, alkaline soils, and soils which are highly permeable, sandy, or light-textured.

Picloram can travel through soil, and under certain conditions has the potential to contaminate groundwater. Do not apply picloram where:

Soils have a rapid to very rapid permeability (such as loamy sand to sand) and the water table of an underlying aquifer is shallow; **OR:**

Soils contain sinkholes over limestone bedrock, severely fractured surfaces, and substrates which would allow direct introduction into an aquifer *(DowElanco Publication a. Undated).*

Surface Waters: Picloram can be carried by surface run-off water. To prevent water pollution, picloram spray drift or run-off should not be allowed to fall onto banks or bottoms of irrigation ditches, or water intended for drinking or household use. Picloram should not be applied directly to water or wetlands, such as swamps, bogs, marshes or potholes.

Air:

Volatilization: Picloram does not evaporate easily, but its vapor has been shown injurious to plants. In a closed container, picloram vapors damaged plant seedlings *(Gentner, 1964).*

Potential for By-Products from Burning of Treated Vegetation: More than 95% of picloram residue is destroyed during burning. At 225°C, picloram decomposed to 4-amino-2,3,5-trichloropyridine (also found in plant and soil decomposition.). At 900°C, it decomposed to carbon dioxide, carbon monoxide, chlorine gas, hydrogen chloride, and ammonia. No organochlorine compounds were detected (Dost, 1984). Under fire conditions, Tordon® K produces hydrogen chloride and nitrous oxides *(DowElanco Publication b. 1990).*

By-products from burning plants treated with picloram have not been identified in the field.

IV. Ecological Effects

Please refer to Section X for definitions of eco-toxicological categories.

Soil Microorganisms: Picloram has very low toxicity to soil microorganisms at up to 1,000 parts per million. No studies of effects of the picloram formulations were reported.

Plants: Picloram is highly toxic to many non-target plants. Most grasses are resistant to picloram. Picloram is active in the soil and can pass from soil into growing plants. It can move from treated plants, through the roots, to nearby plants. Irrigation water polluted with picloram may damage or kill crop plants.

Aquatic Animals: Picloram is moderately to slightly toxic to freshwater fish, and slightly toxic to aquatic invertebrate animals. Picloram was found to reduce fry survival and lake trout growth at the lowest level tested (35 ppb) *(Woodward, 1976).*

Acute toxic level:

Species	LC50
fish	4.0 to 24.0 ppm
invertebrates	10.0 to 68.3 ppm

The Tordon® 22K formulation has been tested for acute toxicity in numerous aquatic animals. Formulation tests indicated no greater toxicity than previously cited for picloram *(DowElanco Publication e; Mullison. Undated).*

Picloram does not build up in fish.

Terrestrial Animals: Picloram is practically non-toxic to birds. It is practically non-toxic to bees. Picloram is slightly toxic to practically non-toxic in mammals. Animals excrete most picloram in the urine, unchanged. Picloram and its formulations have not been tested for chronic effects in wildlife species.

Acute toxic level:

Species	LD50
birds	2,000 mg/kg
mammals	950 to 8,200 mg/kg

48-hour contact toxicity to bees = 14.5 micrograms per bee.

Tordon® 22K has been tested for acute oral toxicity to birds; it is considered practically nontoxic. Tordon® 22K did not cause any reproductive or developmental effects in chickens when sprayed on fertilized eggs *(EPA, 1985).*

No tests of formulations for acute toxicity to wildlife mammals have been reported. Picloram and its formulations have not been tested for chronic toxicity to wildlife mammals. A New Zealand study found a possible association of sheep grazing of picloram-treated pastures with increased intestinal cancer. The relationship was inconclusive because of the small number of sheep exposed only to picloram *(Newell, et. al., 1984).*

Testing on laboratory mammals of picloram and its formulations is reported in Section V.

Threatened and Endangered Species: Picloram may be a hazard to endangered plants when used on pastures, rangeland and forests. Picloram may be a hazard to some endangered invertebrates if it is applied to areas where they live. It is not expected to be a hazard to other endangered animals or birds.

V. Health Effects Testing

The data are results of laboratory animal studies. For picloram, the Environmental Protection Agency has evaluated these studies during the registration process. Pure picloram can be produced in several forms (acid, potassium salt, etc.). Acute toxicity test results are cited for the potassium salt, which is the only form of picloram used in Tordon® K and 22K formulations. Chronic toxicity results are cited for either the potassium salt, or for the acid, which is considered comparable by EPA.

For DowElanco formulations containing picloram as the only active ingredient (Tordon® K and Tordon® 22K), findings are from studies conducted by the manufacturer *(DowElanco e, Mullison. Undated).* These studies have been presented to EPA to support product registration, but may not be available to the public.

Formulation tests are noted for each category of acute toxicity. Numerical results are only noted for tests of formulations which showed significantly greater toxicity than pure picloram.

Acute Toxicity:

Acute Oral Toxicity (Median lethal dose):

Male rats >5,000 mg/kg
Practically Nontoxic (Category IV)

Female rats 3,536 mg/kg
Slightly Toxic (Category III)

Tordon® K and Tordon® 22K have been tested. Both were classified as Practically Nontoxic.

Acute Dermal Toxicity (Median Lethal Dose in rabbits):

Picloram >2,000 mg/kg
Slightly Toxic (Category III)

Tordon® 22K was also found to be a Category III dermal toxicant *(USDA, 1984); (DowElanco b, 1990).*

Primary Irritation Score (tests in rabbits):

Picloram
Not an irritant. (Category IV)

The K salt form of picloram is considered a skin sensitizer *(EPA, 1988).*

Tordon® 22K was found to cause skin irritation or burn from prolonged or repeated exposure *(DowElanco c, 1990).*

Primary Eye Irritation (tests in rabbits):

Picloram
Moderate eye irritant. (Category III)

Tordon® 22K has also been categorized as a Category III eye irritant. Though severe irritation may occur, it is reversible *(DowElanco c, 1990).*

Acute Inhalation; Median Lethal Concentration: study in male rats:

Picloram >1.63 mg/l.
Moderately Toxic (Category II)

No adverse effects were observed in rats during seven hours' exposure to a Tordon® 22K-saturated atmosphere, and for two weeks thereafter *(USDA, 1984.)*

Chronic Toxicity:

These data are also based on tests in laboratory animals. EPA requires these tests only for the active ingredient picloram. No tests of formulations for chronic toxicity have been reported. Please refer to Section X for an explanation of how NOEL (No Observable Effects Level) is calculated.

The Pacific Northwest Region FEIS (Final Environmental Impact Statement) risk assessment evaluated the quality of the testing that had been done on picloram up to 1988. Quality consideration for individual studies included: ranges of doses and species that were tested; length of test; identification of the most sensitive effect. Additionally, the degree of quantitative agreement

among all test for an effect was considered. Please refer to Section X for an explanation of qualitative ratings in this section.

SYSTEMIC TOXICITY:

NOEL for picloram: 7 mg/kg/day (rat and mice tests).

Increased liver weight was the observed toxic effect.

The PNW Region FEIS rated the quality of testing as Adequate.

CARCINOGENICITY:

The potential for causing tumors (oncogenicity) has not been determined at this time. EPA has not accepted available studies; dose levels were not as great as required, and the picloram used in these studies contained unacceptably high levels of a contaminant. EPA requires the mouse and rat oncogenicity tests to be repeated.

The PNW Region FEIS rated the quality of testing as Marginally Adequate.

MUTAGENICITY:

Picloram was negative in two tests for mutagenicity (the ability to cause genetic damage). EPA requires submission of data and raw report materials before accepting one of these studies. A third category of testing has not been done.

The PNW Region FEIS rated the quality of testing as Marginally Adequate.

REPRODUCTION/DEVELOPMENTAL:

DEVELOPMENTAL: A study in rats indicated no evidence of teratology (birth defects). A study in rabbits indicated a NOEL of 40 mg/kg; reduced weight gain of the fetus was the observed effect. The Environmental Protection Agency requires repeated teratology studies in rats and rabbits.

REPRODUCTION: A multi-generation reproduction study in rats did not show any adverse effects on reproduction at doses up to 150 mg/kg per day. The Environmental Protection Agency requires a repeated study, using more test animals, and a greater range of doses to establish a toxic effect level.

The PNW Region FEIS evaluated the testing as Marginally Adequate for these effects.

OTHER POSSIBLE HEALTH EFFECTS

There was insufficient information available to evaluate the potential for effect to the nervous or immune systems. No studies of picloram effects were reported.

VI HUMAN HEALTH EFFECTS

FOREST SERVICE EVALUATION OF HUMAN HEALTH RISKS:

The Pacific Northwest Region evaluated a range of picloram health effects data, including laboratory studies cited in Section V. Both quantitative (numerical) estimates of toxicity, and the quality of data used to make numerical estimates were evaluated.

The FEIS Quantitative Risk Assessment predicts the amount of human exposure—both to project workers and to the public—from typical forestry operations, and also from a large accidental spill. The Risk Assessment used this information to assess health risks from typical uses. These risks were compared to EPA standards of acceptable risk for human health effects. The FEIS risk assessment identified as "Moderate" or "High" any predicted risks from Forest Service operations that were greater than EPA standards. Specific mitigation measures were designed to reduce human exposure from these operations; they are mandatory for every applicable project on National Forest lands.

The complete set of risk ratings is displayed in Section X.

The quality of the existing data affects the reliability of these risk ratings. The FEIS judged the overall quality of available data on picloram toxicity to be "Adequate": studies are of sufficient quality and quantity that estimates are considered reliable; new studies are unlikely to change estimates of health effects.

Potential for Health Effects to the Public:

Forest visitors and nearby residents could be exposed to herbicide drift, to vegetation with herbicide residues, and to accidental spraying. They also could eat food or drink water containing herbicide residues. No studies of public exposure were available; public doses were estimated based on the behavior of the herbicide in the environment. "Routine Application" estimates maximum possible public exposure under normal operating conditions. No "Moderate" or "High" risks to public health were identified for routine application. The "Large Spill" situation models the highest doses that could ever be reasonably be expected to occur. Typical public exposures and risks would be much lower than either situation.

Mitigating Measures to Reduce Picloram Risks to Public:

"High" risk of general health effects, and "Moderate" risk of reproductive effects if exposed to concentrated picloram from a large spill:

> Prevent all public contact with accidental spills (emergency spill notification system, restrict public access to spill site).

Probability of a Worker Receiving a Dose which Affects General Health or Reproduction:

Worker exposure and dose are estimated for typical forestry applications. Studies are available that measure actual worker doses of herbicide for some typical forestry applications. Worker doses do not account for any reduction in exposure from following safety precautions or mitigating measures (such as wearing protective clothing).

Mitigating Measures to Reduce Identified Picloram Risks to Workers:

The R6 FEIS did not identify any specific mitigating measures to reduce exposure in Picloram applications. The probability of worker exposure to a toxic concentration for either general health or reproductive effects was rated "Negligible" for all application methods.

Mitigating Measure 13 requires workers applying any herbicide to wear protective clothing. Mitigating Measure 23 requires worker and public exposure monitoring for all herbicide application projects.

Acute Human Health Effects:

Cases of eye and skin irritation have been reported in workers exposed to picloram formulations.

Long Term Human Health Effects:

There are no reported cases of long term health effects in humans due to picloram or its formulations.

Potential for Adverse Health Effects from Inert Ingredients Contained in the Formulated Product:

The manufacturer has not revealed the identity of the inert chemicals other than water in these formulations. Specific toxicity information is not available for every inert ingredient. No ingredient in any picloram formulation was categorized by EPA to have evidence or suggestion of toxic effects. Picloram inert ingredients were categorized as either: low priority for health effects testing based on absence of data or chemical structure suspected to cause toxic effects *(List 3);* or generally recognized to be safe *(List 4)*.

Health Effects of Exposure to Formulated Products:

No serious health effects in humans have been verified. A few cases of eye irritation and skin irritation from exposure to picloram formulations have been reported.

Health Effects Associated with Contaminants:

Picloram, when commercially produced, is contaminated with HCB (hexachlorobenzene). HCB is classified by EPA as a Probable Carcinogen; it also had toxic effects to nursing rat pups. After the PNW Region FEIS was prepared, EPA published a health risk assessment for HCB from picloram application. Both public (dietary) and worker exposures were estimated at a HCB contamination level of 200 ppm. DowElanco has informed EPA that HCB contamination has been reduced to a maximum of 100 ppm *(DowElanco f, 1992)*. EPA considers the risks from HCB to be within acceptable limits *(EPA, 1988a)*. The estimated risks to forestry workers from HCB exceed the risks identified for picloram in the FEIS. The estimates are within acceptable limits of the FEIS, providing that Mitigating Measure #13 (required protective clothing) is followed.

EPA has required testing of some picloram formulations for level of nitrosamine contaminants, because of chemicals used in the formulation process. Tordon® K and 22K do not use these chemicals; no testing is required *(US-EPA, 1988a)*.

Health Effects Associated with Other Formulations:

Some formulations contain picloram mixed with the herbicides 2,4-D or triclopyr. Information Profiles for 2,4-D or Triclopyr will describe the properties and potential effects of these herbicide ingredients.

None of the profiles on individual herbicides fully describe the potential for health or environmental effects from the formulations containing multiple herbicides. Additional information on the properties and potential effects of these formulations will be prepared before they are used in the PNW Region.

Societal Perceptions:

Public opinion about herbicide use in general ranges from a perception that herbicides are completely safe, to a perception that they are very hazardous. A full range of opinion is available in the FEIS. Beginning in 1992, the PNW Region will publish a bibliography of recent anecdotal and scientific accounts, and an analysis of reported worker health effects. These information packages will be updated to reflect the results of these reviews as needed.

VII. Safety Precautions:

Signal Word and Definition:

Tordon® K: WARNING. Causes substantial but temporary eye injury. Harmful if inhaled or absorbed through skin.

Tordon® 22K: WARNING. Causes substantial but temporary eye injury. Harmful if inhaled or absorbed through skin.

Protective Precautions for Workers: Do not get picloram in eyes or on clothing. Wear goggles, face shield or safety glasses when handling picloram. Avoid contact with skin. Wash thoroughly with soap and water after handling picloram. After using picloram, remove and wash clothing before reuse. Do not drink picloram solution. Avoid breathing spray mist.

Medical Treatment Procedures (Antidotes): No specific antidote to picloram is known; treat symptoms. For exposure to the eyes, flush with plenty of water for at least 15 minutes. Get medical attention. For exposure to the skin, wash with plenty of soap and water. Get medical attention if irritation persists. In case of emergency, call your local poison control center for advice.

HANDLING, STORAGE AND DISPOSAL: Picloram is stable under normal storage conditions for at least two years. Do not ship or store with food, animal feeds, drugs or clothing. Dispose of by burying in a non-cropland area away from water supplies, or dispose of in a landfill approved for pesticides in accordance with applicable federal, state and local regulations.

EMERGENCY (SPILL) HAZARDS AND PROCEDURES: Absorb spills in inert material such as kitty litter or sawdust. For large spills, dike area to contain spill; consult manufacturer for clean-up. In case of a large spill, call CHEMTREK at 1-800-424-9300 for advice.

VIII. DEFINITIONS

acute toxicity - The amount of a substance, as a single dose, to cause poisoning in a test animal

adsorption - the process of attaching to a surface

basal treatment - applied to the stem of a plant just above the soil

broadcast application - applied over an entire area

carcinogenicity - ability to cause cancer

chronic toxicity - Toxic effects produced in test animals exposed for long periods to a chemical

dermal - of, or related to, the skin

EC50 - the concentration which will cause a toxic effect in 50% of the subjects

FEIS - Final Environmental Impact Statement

formulation - the form in which the pesticide is supplied by the manufacturer for use

herbicide - a substance used to destroy plants or to slow down their growth

LC50 - the concentration in air or water which will kill 50% of the subjects

LD50 - the dose which will kill 50% of the subjects

leach - to dissolve out by the action of water

mg/kg - milligrams of the substance per kilogram of body weight

mg/l - milligrams of dissolved substance per liter of water

microorganisms - living things too small to be seen without a microscope

mutagenicity - ability to cause genetic changes

non-target - animals or plants other than the ones which the pesticide is intended to kill

persistence - tendency of a pesticide to remain in the environment after it is applied

ppb - parts per billion parts

ppm - parts per million parts

residual activity - the remaining amount of activity as a pesticide

teratogen - a compound having the property of causing birth defects

volatility - the tendency to become a vapor at relatively low temperature

IX INFORMATION SOURCES:

Pacific Northwest Region, Forest Service, U.S. Department of Agriculture. 1988. ***Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation.***

Chapter IV, Environmental Consequences: Human Health Effects Characterization and Management of Risk.

Appendix C: Herbicide Use and Efficacy

Appendix D: Quantitative Risk Analysis

Appendix J: Herbicide Review with Wildlife-oriented Effects

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. 1988. ***Guidance for the Reregistration of Pesticide Products Containing Picloram as the Active Ingredient.*** EPA Publication No. 540/RS-88-132, 1988a.

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. 1988b. ***Pesticide Fact Sheet: Picloram.*** EPA Publication No. 540/FS-88-133, 1988.

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. 1985. ***Science Chapters in Support of the Registration of Picloram, Ecological Effects Profile, SC-13C.***

U.S. Environmental Protection Agency, Office of Drinking Water. 1988c. ***Picloram Health Advisory.***

Forest Service, U.S. Department of Agriculture. 1984. ***Pesticide Background Statements. Volume I. Herbicides.*** Agriculture Handbook No. 663.

DowElanco Publications:

a. ***Ingredient Lists for Products Containing Picloram,*** 1992.

b. ***Product Labels: Tordon® K; Tordon® 22K.*** Undated.

c. ***Material Safety Data Sheet: Tordon® K and 22K.*** 1990.

d. ***Picloram Technical Information Guide.*** Undated.

e. Mullison, Dr. Wendell R. Undated. ***A Toxicological and Environmental Review of Picloram.***

f. ***Personal communication,*** V. Carrithers, DowElanco Technical Representative. 1992.

Dost, Frank N. 1984. ***Combustion of Herbicides.*** Unpublished Report for Bonneville Power Administration, U.S. Department of Energy.

Gentner, W.A. 1964. ***Herbicidal Activity of Vapors of 4-amino-3,5,6-trichloropicolinic Acid.*** Weeds 12: 239-240.

Newell, K.W., A.D. Ross, and R.M. Renner. 1984. ***Phenoxy and Picolinic Acid Herbicides and Small-intestinal Adenocarcinoma in Sheep.*** Lancet: December 8, 1984: 1301-1305.P

Norris, Logan A. 1982. ***Accuracy and Precision of Analyses for 2,4-D and Picloram in Water by Contract Laboratories.*** Unpublished Report for: Pacific Northwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture.

Woodward, D.F. 1976. ***Toxicity of the Herbicides Dinoseb and Picloram to Cutthroat and Lake Trout.*** J. Fish. Res. Board Canada 33: 1671-1676.

For more information on picloram, contact your local Forest Service office.

April 1992

This Picloram Information Profile is based on the "Picloram Pesticide Fact Sheet" developed by Information Ventures, Inc., under USDA Forest Service Contract Number 53-3187-104.

X. Toxicity and Risk Categories

Estimates of Health Risks to the Public and to Workers from Forest Service Operations

The FEIS predicts levels of human exposure (dose) for project workers and for the public, for both a typical field project and for a large accidental spill. These dose levels are compared to the highest dose level in animal tests that showed no health effect (No Observed Effects Level). The risk is ranked from "Negligible" to "High" based on the margin between the expected human dose and the highest NOEL—"no effect" dose. A "High" risk rating means that the highest NOEL dose is not more than ten times larger than predicted human dose under the specified conditions. A "Moderate" risk rating means that the highest NOEL dose is between 10 and 100 times larger than the expected human dose.

Estimated Health Risks To The Public

Situation	General Health	Reproduction
Routine Application	Low	Negligible
Large Spill	High	Moderate

Estimated Health Risks To Project Workers

Situation	General Health	Reproduction
Aerial Mixer/Loader	Negligible	Negligible
Backpack Sprayer	Negligible	Negligible
Right-of-way Mixer/Loader	Negligible	Negligible
Hack-and Squirt	Negligible	Negligible

Ecotoxological Categories

Mammalian (Acute Oral):	
mg/kg	*Risk Category*
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Avian (Acute Oral):	
mg/kg	*Risk Category*
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Avian (Dietary):	
ppm	*Risk Category*
<50	very highly toxic
50-500	highly toxic
501-1000	moderately toxic
1001-5000	slightly toxic
>5000	practically non toxic

Aquatic Organisms:	
ppm	*Risk Category*
<0.1	very highly toxic
0.1-1	highly toxic
>1-10	moderately toxic
>10-100	slightly toxic
>100	practically non toxic

TABLE OF CATEGORIES OF TOXICITY

Human Hazards				
		Route of Administration		
Risk Category	Signal Word	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (mg/kg)
I	DANGER--Poison	0-50	0-200	0-0.2
II	WARNING	>50-500	>200-2000	>0.2-2.0
III	CAUTION	>500-5000	>2000-20,000	>2.0-20
IV	NONE	>5000	>20,000	>20

	Hazard	
Category	Eye Irritation	Skin Irritation
I	Corrosive: corneal opacity not reversible within 7 days	corrosive
II	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV	no irritation	mild or slight irritation at 72 hours

Categories of Quality of Health Effects Data	
Inadequate:	Inadequate information available for evaluating toxicity. There were too few studies of sufficient quality to yield useful or reliable information.
Marginal-Inadequate:	Some useful information exists for evaluating toxicity. There were studies of marginal quality that provided useful information, but studies were inconsistent and some contained flaws. It is likely that new studies would change estimates of health effects.
Marginal:	Marginal but useful information available for evaluating toxicity. There were studies of adequate quality, and results did not vary greatly, but more information would increase reliability. Although new studies may change estimates of health effects, the results are considered moderately reliable.
Adequate:	Adequate information is available. Studies are of sufficient quality and quantity that estimates of human health are considered reliable. New studies are unlikely to change estimates of health effects.

Triclopyr

HERBICIDE INFORMATION PROFILE

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE, PACIFIC NORTHWEST REGION

Healthy Forests Make A World Of Difference

This information profile is produced by the USDA Forest Service, Pacific Northwest Region, for employees, forest workers, and for the public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide triclopyr and its formulations. A list of definitions is included in Section VIII of the information profile. For general information on herbicide use by the Forest Service, refer to the PNW Region Treatment Methods Profile for Herbicides.

The PNW Region Final Environmental Impact Statement (FEIS) for Managing Competing and Unwanted Vegetation: Forest Service "Herbicide Background Statement: Triclopyr;" and product labels and Material Safety Data Sheets are the principal sources of information and conclusions in this profile. Information from other sources is specifically referenced in the profile.

I. BASIC INFORMATION

COMMON NAME: Triclopyr

CHEMICAL NAME: [(3,5,6-trichloro-2-pyridinyl)oxy]-acetic acid

PRODUCT NAMES: Garlon 3A®, Garlon 4®, Pathfinder®

REGISTERED USE STATUS: "General Use"

FORMULATIONS: Formulated triclopyr products contain one or more substances besides triclopyr itself. These substances are called inert ingredients, because they do not kill plants by themselves. The identities of inert ingredients are not usually listed on the label.

DowElanco manufactures all the products discussed in this profile. The manufacturer revealed the identity of all inerts to U.S. Environmental Protection Agency (EPA). The Forest Service has asked the manufacturer to identify inert ingredients for public disclosure in this profile. The manufacturer did not reveal the identity of inert ingredients listed as "surfactants," "emulsifiers," and "aromatic solvent" in these formulations. (DowElanco a, 1992). Where the identity of inerts is not available, this profile may not fully characterize possible hazards to human health and the environment associated with the triclopyr formulation.

Garlon 3A®

Triclopyr, as the triethylamine salt	44.4%
Inert ingredients:	55.6%
Water	
Surfactants	
Ethanol	

Garlon 4®

Triclopyr, as the butoxyethyl ester	61.6%
Inert ingredients:	38.4%
Kerosene	
Emulsifiers	

Pathfinder®

Triclopyr, as the butoxyethyl ester	16.7%
Inert ingredients:	83.3%
Aromatic solvent	

The results of formulation testing reported in this profile apply only to Garlon 3A®, Garlon 4®, and Pathfinder®. These products contain only triclopyr as an active ingredient.

Other formulated products contain both triclopyr and another herbicide. For PNW Region applications, these include Access®. Information in this profile does not address possible effects of these formulated herbicide mixtures.

RESIDUE ASSAY METHODS: Gas/liquid chromatography methods are available for residue assay. The manufacturer cites these detection limits for the methods it has developed and shared with other analytical laboratories:

Water	1 ppb
Soil	10 ppb
Plants	50 ppb

(DowElanco d, Undated.)

II. HERBICIDE USES

REGISTERED FORESTRY, RANGELAND, RIGHT-OF-WAY USES: Control of woody plants and broadleaf weeds on right-of-way, non-crop areas, non-irrigation ditch banks, forests, wildlife openings, rangeland and permanent grass pastures.

OPERATIONAL DETAILS:

Target Plants: Triclopyr is used to control woody plants and broadleaf weeds. Triclopyr does not injure grasses at recommended rates.

Mode of Action: Plants respond to triclopyr as if it were a growth hormone; triclopyr interferes with normal plant growth processes. It is absorbed by green bark, leaves, roots, and cut stem surfaces and moves throughout the plant. Triclopyr accumulates in the meristem (growth region) of the plant.

Method of Application: Ground or aerial foliage spray, basal bark and stem treatment, cut surface treatment, tree injection.

Use Rates: 0.25 to 9 pounds acid equivalent per acre.

SPECIAL PRECAUTIONS:

Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Use Restrictions: For triclopyr products discussed in this profile, livestock grazing and hay production are restricted in treated areas. These restrictions are intended to prevent residues of triclopyr in meat and milk that may exceed EPA standards. Time limits and application rates vary among products. Consult the product label for exact restrictions when planning for or applying triclopyr products where grazing occurs.

Timing of Application: For foliar treatment, apply triclopyr during active plant growth. Basal bark and cut surface treatments can be applied at any time of the year. Dormant stem application can only be done when trees and brush are dormant.

Drift Control: Apply triclopyr only when there is little or no hazard of spray drift. Do not allow spray to come in contact with broadleaf crops. Spray only when wind speed is low. Avoid fine spray, which may drift.

III. ENVIRONMENTAL EFFECTS/FATE

SOIL:

Residual Soil Activity: Triclopyr is absorbed by plant roots, but it is not considered an effective soil-applied herbicide.

Adsorption: Triclopyr is adsorbed primarily to organic matter particles in soil. The organic matter content is the primary factor in the degree of soil adsorption. Adsorption of triclopyr is generally characterized as "not strong."

Persistence and Agents of Degradation: Microorganisms degrade triclopyr readily. It degrades more rapidly under warm, moist conditions which favor microbial activity... Persistence varies widely, depending on soil type and climate. Half-lives for triclopyr in western Oregon soils have been reported from 75 to 81 days (Norris, 1987). This study found detectable triclopyr residues in soil 477 days after treatment.

Metabolites/Degradation Products and Potential Environmental Effects: TCP (3,5,6-Trichloro-2-pyridinol) is the major initial product of degradation. TCP is also a major degradation product of chlorpyrifos, an insecticide. Reported half-lives for TCP range from 8 to 279 days in tests on 15 soil types. TMP is another degradate; it is found less often, and in smaller amounts. Reported half-lives for TMP range from 50 to 300 days in three soils. Carbon dioxide has been identified as one final degradation product; other degradates were not identified.

WATER:

Solubility: Triclopyr solubility was recently reported to be 430-440 ppm. The PNW Region FEIS rating would be "Low" solubility. Garlon 4®and Pathfinder®(ester) are not soluble in water; Garlon 3A®(amine) is highly soluble.

Potential for Leaching into Ground-Water: The potential for triclopyr leaching increases as soil organic matter decreases, and as climatic conditions reduce soil microbial activity. Triclopyr has some characteristics conducive to leaching behavior. It is not strongly adsorbed to soil particles, and adsorbed molecules may later detach into water moving through the soil. Triclopyr exceeds the threshold for solubility used by EPA (30 ppm) when evaluating potential for leaching into groundwater (U.S. EPA, 1986).

A trace amount of the metabolite TCP was detected in groundwater at a golf course site. Chlorpyrifos, but not triclopyr, was also detected (Dupuy, 1986). In soil leaching tests, little or no triclopyr has been found below surface layers. The metabolites of triclopyr were less mobile than triclopyr itself. Triclopyr contamination of groundwater has not been reported.

Surface Waters: Sunlight rapidly breaks down triclopyr in water. The half-life of triclopyr in water exposed to sunlight is less than 24 hours. In western Oregon, triclopyr was detected in runoff nine months after application. Researchers concluded that the triclopyr did not come from upslope sprayed areas. The triclopyr had been sprayed directly onto dry streambeds, which became flowing streams during the rainy season, and carried the triclopyr downstream (Norris, 1987).

AIR:

Volatilization: Very low. In monitoring of southern Oregon airsheds, trace amounts of triclopyr were detected in less than ten percent of all samples (Bentson and Norris, 1989).

Potential for By-Products from Burning of Treated Vegetation: DowElanco reports irritating vapors from burning Garlon 3A®, nitrogen oxides, hydrogen chloride, and phosgene from Garlon 4®. Pathfinder®produces fumes, smoke, carbon monoxide, and aldehydes, and additionally, the same gases reported for Garlon 4®(DowElanco c, 1990).

Triclopyr was not detected in monitoring of prescribed burns for air pollution and worker exposure after herbicide treatment. Triclopyr was almost completely consumed when burning treated wood under natural fire conditions. Under smoldering conditions, however, 68% of triclopyr was recovered intact in smoke (McMahon and Bush, 1990); (Bush, et al., 1987).

IV. Ecological Effects

Please refer to Section X for definitions of eco-toxicological categories.

Non-Target Toxicity:

Soil Microorganisms: Triclopyr did not affect the growth of soil microorganisms up to 500 parts per million (Forest Service, 1984). No studies of effects of these triclopyr formulations have been reported.

Plants: Triclopyr is toxic to many broadleaf plants. Even very small amounts of spray may injure some plants.

Triclopyr residue may be found in edible plant parts; the maximum residue level in berries was reported at 2.4 ppm when harvested six days after treatment (Forest Service, 1984). TCP residues have been detected in root crops following application of chlorpyrifos which also degrades to TCP (Chapman, 1980).

Aquatic Animals: Triclopyr and its formulations have been tested for acute and subacute toxic effects in fish and invertebrates. Triclopyr (acid) is slightly toxic to fish, and from slightly toxic to practically non-toxic to daphnia, an invertebrate. Garlon 3A®was consistently less toxic to aquatic animals than triclopyr. Garlon 4®was consistently more toxic; however Garlon 4®rapidly changes to triclopyr acid in surface waters.

Acute toxic level:

Species	Triclopyr LC50	Garlon 3A® LC50	Garlon 4® LC50
trout	117 ppm[d] 8.4 ppm[b]	420 ppm[b]	2.7 ppm[b]
salmon	7.8 ppm[b]	275 ppm[b]	1.4 ppm[b]
bluegill	148 ppm[d]		
daphnia	133 ppm[d]		1.2 ppm[c] (EC50)

(b: Wan, 1987; c: Servizi, 1987; d: DowElanco d, undated)

Tests of Garlon 3A®reproductive/developmental effects in minnows and Daphnia showed no effects from long-term exposure (DowElanco d).

Garlon 4®has been observed to cause behavioral (neurological) changes in salmon fry that may affect survivability when exposed to 1/4 to 1/2 of lethal levels for up to 96 hours. Triclopyr acid accumulated in fish tissues during the exposure. Reversibility was not studied, but associated behavioral effects were reversible in uncontaminated water (Morgan, 1991); (Johansen, 1990). Physiological stress was not observed during other tests of long-term exposure of salmon fry to Garlon 3A® and Garlon 4®(Janz, 1990).

Terrestrial Animals: Triclopyr is slightly toxic to mammals and to birds. Triclopyr is practically non-toxic to bees. Acute toxic level of triclopyr:

Species	LD50
mammals	310-713 mg/kg
ducks	1,698 mg/kg

48-hour contact toxicity to bees = >60 micrograms/bee.

In eight day dietary studies in birds, the LC50 for triclopyr ranged from 2,935 ppm to greater than 5,000 ppm. The formulations were less toxic than triclopyr itself to birds in both acute toxic and dietary studies .

No tests of formulations for acute toxicity to wildlife mammals have been reported. Triclopyr and its formulations have not been tested for chronic effects in wildlife mammals.

In mammals, most triclopyr is excreted, unchanged, in the urine. Triclopyr has been observed to concentrate slightly in ovaries of laboratory animals given repeated doses. No accumulation was observed in other tissues. The authors concluded that triclopyr and its

metabolites are likely to have a low potential to accumulate upon repeated exposure (Timchalk et al., 1990).

Threatened and Endangered Species: Triclopyr may be a hazard to endangered plant species if it is used in areas where they live. EPA has not determined whether triclopyr could be a hazard to endangered animal species.

V. Health Effects Testing

The data are results of laboratory animal studies. These data have been evaluated by the Forest Service and are used to make inferences relative to human health.

For triclopyr and DowElanco formulations containing triclopyr as the only active ingredient (Garlon 3A®, Garlon 4®, and Pathfinder®), findings are from studies conducted by the manufacturer. These studies have been presented to EPA to support product registration, but may not be available to the public.

Formulation tests are noted for each category of acute toxicity. Numerical results are only noted for tests of formulations which showed significantly greater toxicity than triclopyr alone.

Acute Toxicity:

Acute Oral Toxicity: In tests in rats, the acute oral median lethal dose was 630 to 729 mg/kg. Slightly Toxic (Category III).

All formulations listed in this profile have been tested and found to be less toxic than triclopyr itself.

Acute Dermal Toxicity: Median Lethal Dose in rabbits:

Triclopyr >2,000 mg/kg
Slightly Toxic (Category III).

All listed formulations have been tested and found to be no more toxic than triclopyr itself.

Primary Skin Irritation: tests in rabbits:

Triclopyr
Slight to moderate irritant (Toxicity Category III to IV).

All formulations may cause skin irritation from prolonged or repeated exposure. Garlon 3A®may cause a burn. Garlon 4®and Pathfinder®are considered potential skin sensitizers (DowElanco c, 1990).

Primary Eye Irritation: tests in rabbits:

Triclopyr
Slight eye irritant (Category III).

Garlon 4®and Pathfinder®are slightly irritating to eyes. Undiluted Garlon 3A®is severely irritating and injurious to eyes (Category I).

Acute Inhalation: In tests in rats, exposure to 5.34 ppm of triclopyr for one hour caused no adverse effects (Toxicity Category III).

Garlon 4®caused nasal irritation but no deaths in rats exposed to 0.82 mg/l concentration for four hours.

Chronic Toxicity:

These data are also based on tests in laboratory animals. EPA requires these tests only for the active ingredient triclopyr. No tests of formulations for chronic toxicity have been reported. Please refer to Section X for an explanation of how NOEL (No Observable Effects Level) is calculated.

The Pacific Northwest Region FEIS risk assessment evaluated the quality of the testing that had been done on triclopyr up to 1988. Quality considerations for individual studies included: ranges of doses and species that were tested; length of test; identification of the most sensitive effect. Additionally, the degree of quantitative agreement among all tests for an effect was considered.

Please refer to Section X for an explanation of qualitative ratings in this section.

SYSTEMIC TOXICITY:

NOEL for triclopyr: 2.5 mg/kg/day (dog tests).

Toxic effects have been observed on liver and kidney functions.

The PNW Region FEIS rated the quality of testing as Marginal-Inadequate.

CARCINOGENICITY/MUTAGENICITY:

Laboratory tests in mice and rats fed up to 30 mg/kg per day for 2 years did not show any evidence of carcinogenicity.

Triclopyr was negative in several laboratory tests for mutagenicity (the ability to cause genetic damage), but was weakly positive in one test in rats. A more recent study, accepted by EPA, was negative for this same effect (DowElanco e, 1992).

The PNW Region FEIS rated the quality of testing as Marginally Adequate for these effects.

REPRODUCTION/DEVELOPMENTAL:

Reproduction: A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 30 mg/kg per day.

Developmental: Laboratory studies with triclopyr in pregnant rats (at dose levels up to 200 mg/kg per day) and rabbits (at dose levels up to 100 mg/kg per day) indicated no evidence of teratology (birth defects). In pregnant rats at the 200 mg/kg per day dose level, there were signs of mild toxicity to the fetus.

The PNW Region FEIS evaluated the testing as Marginally Adequate for these effects.

OTHER POSSIBLE HEALTH EFFECTS

There was insufficient information available to evaluate the potential for effect to the nervous or immune systems. Toxicity to nervous system components was not observed in DowElanco studies of systemic health effects (DowElanco e, 1992). No studies of triclopyr formulation effects were reported.

The metabolite TCP was not shown to be neurotoxic, carcinogenic, mutagenic, or to cause birth defects in studies of chlorpyrifos reviewed by EPA (EPA, 1984).

VI. HUMAN HEALTH EFFECTS

FOREST SERVICE EVALUATION OF HUMAN HEALTH RISKS

The Pacific Northwest Region evaluated a range of triclopyr health effects data, including laboratory studies cited in Section V. Both quantitative (numerical) estimates of toxicity, and the quality of data used to make numerical estimates were evaluated.

The FEIS Quantitative Risk Assessment predicts the amount of human exposure—both to project workers and to the public—from typical forestry operations, and also from a large accidental spill. The Risk Assessment used this information to assess health risks from typical uses. These risks were compared to EPA standards of acceptable risk for human health effects. The FEIS risk assessment identified as "Moderate" or "High" any predicted risks from Forest Service operations that were greater than EPA standards. Specific mitigation measures were designed to reduce human exposure from these operations; they are mandatory for every applicable project on National Forest lands.

The complete set of risk ratings is displayed in Section X.

The quality of the existing data affects the reli-

ability of these risk ratings. The FEIS judged the overall quality of available data on triclopyr toxicity to be "Marginal to Inadequate." There were some studies of marginal quality that provided useful information, but studies were inconsistent and some contained flaws. It is likely that new studies would change estimates of health effects. Very cautious assumptions were made in characterizing risk.

Potential for Health Effects to the Public

Forest visitors and nearby residents could be exposed to herbicide drift, to vegetation with herbicide residues, and to accidental spraying. They also could eat food or drink water containing herbicide residues. No studies of public exposure were available; public doses were estimated based on the behavior of the herbicide in the environment. The "Routine Application" situation estimates maximum possible public exposure under normal operating conditions. The "Large Spill" situation models the highest doses that could be reasonably be expected to occur. Typical public exposures and risks would be much lower than either situation.

Mitigating Measures to Reduce Triclopyr Risks to Public

"Moderate" risk of general health effects, and of reproductive health effects for people who receive multiple exposures from a large (400 acre) aerial application project. "Low" risk for smaller (40 acre) aerial projects, and for all ground-based applications:

> Consider potential for public exposure when designing contact procedures, posting and signing needs in the Herbicide Application Plan.

"High" risk of general health effects, and "High" risk of reproductive effects if exposed to concentrated triclopyr from a large spill:

> Prevent all public contact with accidental spills (emergency spill notification system, restrict public access to spill site).

Probability of a Worker Receiving a Dose Which Affects General Health or Reproduction

Worker exposure and dose are estimated for typical forestry applications. Studies are available that measure actual worker doses of herbicide for some typical forestry applications. Worker doses do not account for any reduction in exposure from following safety precautions or mitigating measures (such as wearing protective clothing).

Mitigating Measures to Reduce Identified Triclopyr Risks to Workers

The probability of worker exposure to a toxic concentration for either general health or reproductive effects was rated "Low" or "Negligible" for all application methods except for backpack sprayers, for which risk was rated "Moderate."

In the PNW Region FEIS, Mitigating Measure 13 requires workers applying any herbicide to wear protective clothing. Mitigating Measure 23 requires worker exposure monitoring for all herbicide application projects.

The 1992 Amendment to the PNW Record Of Decision requires workers to review this Information Profile before agreeing to apply triclopyr herbicides. The worker may request reassignment without penalty. Additional personal protective equipment must be available at the worksite for workers who want to reduce their exposure to the herbicide.

Acute Toxicity (Poisoning)

Reported Effects: Cases of eye and skin irritation have been reported in workers exposed to triclopyr formulations. Absorption and excretion of triclopyr was measured in human volunteers. Both oral and skin exposures were studied. Orally administered triclopyr was rapidly absorbed and rapidly excreted as unchanged triclopyr in the urine. Triclopyr was slowly and poorly absorbed through human skin. The authors concluded that the potential for triclopyr to bioaccumulate, and the potential to be ab-

sorbed through skin to acutely toxic levels are both low. Medical examinations of the volunteers after each test found no treatment-related health effects (Carmichael et al., 1989).

Triclopyr was reported to have been detected in the urine of a Forest Service employee who was mixing herbicides. No health effects were reported (Hoglund, 1985).

LONG TERM HUMAN HEALTH EFFECTS:

Reported Effects: There are no reported cases of long term health effects in humans due to triclopyr or its formulations.

Potential for Adverse Health Effects from Inert Ingredients Contained in the Formulated Product: The manufacturer has revealed the identity of some inert chemicals in triclopyr formulations; other inerts are not identified. Specific toxicity information is not available for every inert ingredient. Kerosene, an ingredient of Garlon 4®, was categorized by EPA to have suggestion of toxic effects. All other triclopyr inert ingredients were categorized as either: low priority for health effects testing based on absence of data or a chemical structure suspected to cause toxic effects (List 3); or generally recognized to be safe (List 4).

Garlon 3A®contains one percent ethanol (ethyl alcohol). Pure ethanol causes adverse health effects if swallowed, including neurologic effects, liver effects, toxic effects, birth defects, and reduced male fertility. Information is inadequate to determine potential cancer-causing and mutagenic effects. Exposure to ethanol from triclopyr would be very low in typical forestry operations.

Garlon 4®contains kerosene. Kerosene may cause lung damage or death if inhaled in liquid form. It may affect the central nervous system (DowElanco c, 1990). Kerosene is a skin irritant. It did not damage DNA or chromosomes in tests, or cause cancer in laboratory animals. Kerosene does contain small amounts of other petroleum compounds that are known to cause cancer. The PNW Region FEIS did not find adequate information to evaluate the risk of health effects from kerosene in
Garlon 4®in forestry operations.

Pathfinder®contains a petroleum-like solvent. This solvent may cause lung damage or death if inhaled in liquid form. Excessive exposure may cause neurologic, blood, and lung effects (DowElanco c, 1990).

Health Effects Associated with Contaminants: No known contaminants. The potential to form a dioxin-related compound during the manufacture or burning of triclopyr has been speculated. DowElanco reports that this compound has not been detected in triclopyr products, and is not produced upon heating of triclopyr (Rohrer, 1984). A consortium of state extension services found there is no possibility of dioxin-family contaminants occurring in triclopyr (Extoxnet, undated).

Health Effects Associated with Other Formulations: Some formulations contain triclopyr mixed with the herbicides 2,4-D or picloram. Information Profiles for 2,4-D or Picloram describe the properties and potential effects of the other herbicide ingredients. None of these profiles fully describe the potential for health or environmental effects from these formulations containing multiple herbicides. Additional information on properties and potential effects of these formulations will be prepared before they are used in the PNW Region.

SOCIETAL PERCEPTIONS:

Public opinion about herbicide use in general ranges from a perception that herbicides are completely safe, to a perception that they are very hazardous. A full range of opinion is available in the FEIS. The PNW Region has contracted to produce a bibliography of recent anecdotal and scientific accounts, and an analysis of reported worker health effects. This information profile will be updated to reflect the results of these

reviews as needed.

VII. Safety Precautions

Signal Word and Definition:

Pathfinder®- CAUTION: Harmful if swallowed, inhaled or absorbed through skin. Causes eye irritation.

Garlon 4®- CAUTION - Harmful if swallowed, inhaled or absorbed through skin.

Garlon 3A®- DANGER - Corrosive. Causes irreversible eye damage. Harmful if swallowed, inhaled, or absorbed through the skin. Prolonged or frequently repeated skin contact with herbicide concentrate may cause an allergic skin reaction in some individuals.

Protective Precautions for Workers: Avoid contact with eyes, skin, or clothing. Avoid contamination of food. Avoid breathing mists or vapors. Wash thoroughly after handling. Remove and wash contaminated clothing before reuse. For Garlon 3A®, wear goggles, face shield, or safety glasses, and rubber gloves when handling.

Medical Treatment Procedures (Antidotes): There is no specific antidote known; treat the symptoms. If swallowed, get medical attention. For exposure to skin, wash with plenty of soap and water. Get medical attention if irritation persists.

For eye exposure to Garlon 3A®, flush with plenty of water for at least 15 minutes. Get medical attention.

For Garlon 3A®, if swallowed, promptly drink a large quantity of milk, egg whites, gelatin solution, or if these are not available, drink large quantities of water. **Avoid alcohol.** Call a physician. Do not induce vomiting.

In case of emergency, call your local poison control center for advice.

Handling, Storage, and Disposal: Avoid contact with eyes, skin or clothing. Do not ship or store with food, animal feeds, drugs or clothing. Triclopyr formulations are combustible. Do not use or store near heat or open flame. Do not cut or weld container. Triclopyr is stable for at least two years under normal storage conditions. Do not contaminate water by disposal. Dispose of this pesticide according to federal, state, or local procedures.

Emergency (Spill) Hazards and Procedures: Dike large spills. Keep the spill out of streams and water supplies. Absorb small spills with kitty litter or other inert material. Bury material from small spills of Garlon 3A®in non-crop area away from water suppiies. For large spills, contact the manufacturer for instructions. Observe all local, state, and federal rules for disposal. In case of a large spill, call CHEMTREC at 1-800-424-9300 for advice.

VIII. Definitions

acute toxicity - the amount of a substance, as a single dose, to cause poisoning in a test animal

adsorption - the process of attaching to a surface

basal treatment - applied to the stem of a plant just above the soil

bioaccumulate - the uptake of a chemical by an organism from its environment.

broadcast application - applied over an entire area

carcinogenicity - ability to cause cancer

chronic toxicity - toxic effect produced in test animals exposed for long periods to a chemical

dermal - of, or related to, the skin

EC50 - the concentration in air or water which will cause a toxic effect in 50% of the subjects

formulation - the form in which the pesticide is supplied by the manufacturer for use

half-life - the time required for a chemical to be

reduced by natural processes to one half its original amount

herbicide - a substance used to destroy plants or to slow down their growth

LC50 - the concentration in air or water which will kill 50% of the subjects

LD50 - the dose which will kill 50% of the subjects

leach - to dissolve out by the action of water

mg/kg - milligrams of the substance per kilogram of weight. Equals ppm.

mg/l - milligrams of dissolved substance per liter of water. Equals ppm.

microorganisms - living things too small to be seen without a microscope

mutagenicity - ability to cause genetic changes

non-target - animals or plants other than the ones which the pesticide is intended to kill

persistence - tendency of a pesticide to remain in the environment after it is applied

ppb - parts per billion parts

ppm - parts per million parts. Equal to mg/kg, and mg/l

residual activity - the remaining amount of activity as a pesticide

sensitizer - a delayed allergic response to a substance; symptoms usually resemble an acute toxic response

teratogen - a compound having the property of causing birth defects

volatility - the tendency to become a vapor at relatively low temperature

IX Information Sources:

Pacific Northwest Region, Forest Service, U.S. Department of Agriculture. 1988. ***Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation.***

Chapter IV, Environmental Consequences: Human Health Effects, Characterization and Management of Risk

Appendix C: Herbicide Use and Efficacy

Appendix D: Quantitative Risk Analysis

Appendix H: Qualitative Risk Analysis

Appendix J: Herbicide Review with Wildlife-oriented Effects

Forest Service, U.S. Department of Agriculture. 1984. ***Pesticide Background Statements. Volume I. Herbicides.*** Agriculture Handbook No. 663.

U.S. Environmental Protection Agency, Office of Ground-Water Protection. 1986. ***Pesticides in Ground Water: Background Document,*** p. 42.

U.S. Environmental Protection Agency, Office of Pesticide Programs. 1984. ***Guidance for the Reregistration of Pesticide Products Containing Chlorpyrifos as the Active Ingredient,*** p. 8.

DowElanco Publications:

a. ***Ingredient Lists for Products Containing Triclopyr***, 1992.

b. ***Product Labels: Garlon 3A®; Garlon 4®; Pathfinder®***

c. ***Material Safety Data Sheets: Garlon 3A®; Garlon 4®; Pathfinder®;*** 1990.

d. ***Triclopyr Technical Information Guide.*** Undated.

e. ***Personal communication***, V. Carrithers—DowElanco Technical Representative, 1992.

Bentson, K., and L. Norris. 1989. ***Baseline Concentration measurements of herbicides in the Air of Southwest Oregon***. FIR Report Vol. 10, #4: pp. 7-8.

Bush, P., D. Neary, C. McMahon, and J. Taylor. 1987. ***Suitability of Hardwoods treated with Phenoxy and Pyridine Herbicides for Use as Firewood.*** Arch. Environ. Contam. Toxicol 16: pp. 333-341.

Carmichael, N., R. Nolan, J. Perkins, R. Davies, and S. Warrington. 1989. ***Oral and Dermal Pharmacokinetics of Triclopyr in Human Volunteers.*** Human Toxicology 8: pp. 431-437.

Chapman, R. 1980. ***Persistence of Chlorpyrifos in a Mineral and An Organic Soil.*** J. Environ. Sci. Health, B15(1): pp. 39-46.

Dupuy, Aubry E. Jr. 1986. ***Memo: Analytical Results for August Sampling of Cape Cod Golf Course Groundwater Monitoring Study.*** U.S. Environmental Protection Agency Environmental Chemistry Laboratory.

Extension Toxicology Network, undated. ***Triclopyr Pesticide Information Profile.*** Oregon State University Extoxnet.

Hoglund, G. 1985. ***Urinalysis Test, Part III.*** NCAP News, Spring: p. 20.

Janz, D, A. Farrell, J. Morgan, and G. Vigers. 1991. ***Acute Physiological Stress Responses of Juvenile Coho Salmon to Sublethal Concentrations of Garlon 4®, Garlon 3A®, and Vision Herbicides.*** Environmental Toxicology and Chemistry 10: pp. 81-90.

Johansen, J., and G. Geen. 1990. ***Sublethal and Acute Toxicity of the Ethylene Glycol Butyl Ether Ester Formulation of Triclopyr to Juvenile Coho Salmon.*** Arch. Environ. Contam. Toxicol 19: pp. 610-616.

McMahon, C. K., and P. B. Bush. 1990. ***Evaluation of Worker Exposure to Herbicide Residues in the Smoke from Prescribed Fires in the South.*** U.S.D.A, Forest Service NAPIAP Project SO-30.

Morgan, J., G. Vigers, A. Farrell, D. Janz, and J. Manville. 1991. ***Acute Avoidance Reactions and Behavioral Responses of Juvenile Rainbow Trout to Garlon 4®, Garlon 3A®, and Vision Herbicides.*** Environmental Toxicology and Chemistry, Vol. 10: pp. 73-79.

Norris, L. C, M. L. Montgomery, and L. E. Warren. 1987. ***Triclopyr Persistence in Western Oregon Hill Pastures.*** Bull. Environ. Contam. Toxicol 39: pp. 134-141.

Rohrer, T. 1984. ***Letter to D. Hebert.*** Environmental Services Division, Michigan Department of Natural Resources.

Servizi, J., R. Gordon, and D. Martens. 1987. ***Acute Toxicity of Garlon 4® and Roundup Herbicides to Salmon, Daphnia, and Trout.*** Bull. Environ. Contam. Toxicol 39: pp. 15-22.

Timchalk, C, M. Dryzga, and P. Kastl. 1990. ***Pharmacokinetics and metabolism of triclopyr in Fischer 344 rats.*** Toxicology 62: pp. 71-87.

Wan, M., D. Moul, and R. Watts. 1987. ***Acute Toxicity to Juvenile Pacific Salmonids of Garlon 3A®, Garlon 4®, Triclopyr Ester, and Their Transformation Products: 3,5,6-Trichloro-2-pyridinol and 2-Methoxy-3,5,6-trichloropyridine.*** Bull. Environ. Contam. Toxicol 39: pp. 721-728.

For more information on triclopyr, contact your local Forest Service office.

October 1992

This Triclopyr Information Profile is based on the "Triclopyr Pesticide Fact Sheet" developed by Information Ventures, Inc., under USDA Forest Service Contract Number 53-3187-104.

X. Toxicity and Risk Categories

Estimates of Health Risks to the Public and to Workers from Forest Service Operations

The FEIS predicts levels of human exposure (dose) for project workers and for the public, for both a typical field project and for a large accidental spill. These dose levels are compared to the highest dose level in animal tests that showed no health effect (No Observed Effects Level). The risk is ranked from "Negligible" to "High" based on the margin between the expected human dose and the highest NOEL—"no effect" dose. A "High" risk rating means that the highest NOEL dose is not more than ten times larger than predicted human dose under the specified conditions. A "Moderate" risk rating means that the highest NOEL dose is between 10 and 100 times larger than the expected human dose.

Estimated Health Risks To The Public

Situation	General Health	Reproduction
Routine Large Aerial Application	Moderate	Moderate
Routine Application Other	Low	Low
Large Spill	High	High

Estimated Health Risks To Project Workers

Situation	General Health	Reproduction
Aerial Mixer/Loader	Low	Low
Backpack Sprayer	Moderate	Moderate
Right-of-way Mixer/Loader	Negligible	Negligible
Hack-and-Squirt	Low	Low

Ecotoxological Categories

Mammalian (Acute Oral):	
mg/kg	*Risk Category*
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Avian (Acute Oral):	
mg/kg	*Risk Category*
<10	very highly toxic
10-50	highly toxic
51-500	moderately toxic
501-2000	slightly toxic
>2000	practically non toxic

Avian (Dietary):	
ppm	*Risk Category*
<50	very highly toxic
50-500	highly toxic
501-1000	moderately toxic
1001-5000	slightly toxic
>5000	practically non toxic

Aquatic Organisms:	
ppm	*Risk Category*
<0.1	very highly toxic
0.1-1	highly toxic
>1-10	moderately toxic
>10-100	slightly toxic
>100	practically non toxic

TABLE OF CATEGORIES OF TOXICITY

Human Hazards				
		Route of Administration		
Risk Category	Signal Word	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (mg/kg)
I	DANGER--Poison	0-50	0-200	0-0.2
II	WARNING	>50-500	>200-2000	>0.2-2.0
III	CAUTION	>500-5000	>2000-20,000	>2.0-20
IV	NONE	>5000	>20,000	>20

	Hazard	
Category	Eye Irritation	Skin Irritation
I	Corrosive: corneal opacity not reversible within 7 days	corrosive
II	corneal opacity reversible within 7 days; irritation persisting for 7 days	severe irritation at 72 hours
III	no corneal opacity; irritation reversible within 7 days	moderate irritation at 72 hours
IV	no irritation	mild or slight irritation at 72 hours

Categories of Quality of Health Effects Data	
Inadequate:	Inadequate information available for evaluating toxicity. There were too few studies of sufficient quality to yield useful or reliable information.
Marginal-Inadequate:	Some useful information exists for evaluating toxicity. There were studies of marginal quality that provided useful information, but studies were inconsistent and some contained flaws. It is likely that new studies would change estimates of health effects.
Marginal:	Marginal but useful information available for evaluating toxicity. There were studies of adequate quality, and results did not vary greatly, but more information would increase reliability. Although new studies may change estimates of health effects, the results are considered moderately reliable.
Adequate:	Adequate information is available. Studies are of sufficient quality and quantity that estimates of human health are considered reliable. New studies are unlikely to change estimates of health effects.

APPENDIX D: Analysis File

United States Department of Agriculture
Forest Service
541-386-2333
Columbia River Gorge National Scenic Area
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BIOLOGICAL ASSESSMENT

for

Wildlife species listed as threatened and endangered

Section 7 of the Endangered Species Act

July 5, 1996

Vegetation Removal Project

Bonneville-Midway Corridor
& Hanford-Ostrander Corridor

Columbia River Gorge National Scenic Area

Prepared by: Richard Larson, Fish and Wildlife Biologist
Columbia River Gorge National Scenic Area

Richard J Larson Date: 7/8/96

I. PROJECT AREA and SPECIES CONSIDERED.

This biological assessment addresses the potential effects of the proposed **Vegetation Removal Project** for the Bonneville-Midway Corridor & Hanford-Ostrander Corridor on the peregrine falcon (Falco peregrinus), northern bald eagle (Haliaeetus leucocephalus) and the northern spotted owl (Strix occidentalis).

The gray wolf (Canis lupus) is listed as federally endangered but will not be considered in this analysis. Although historical records occur in the National Forest within which this proposed project occurs, a recovery plan for this species has not been initiated for Oregon and Washington. In addition, recommendations from Region 6 of the USDA Forest Service is to consider project effects on this species only in the north Cascades and Selkirk Mtns. of Washington.

The grizzly (Ursus arctos horribilis) is listed as federally endangered for the state of Washington and a recovery plan has not been completed. This species has not been found in southern Washington in recent years therefore this species will not be considered as within the range of this project area.

This project area does not contain habitat for and does not encompass the range of other proposed, endangered, or threatened wildlife species. Threatened and endangered plants, fish and invertebrates will not be addressed in this document.

The project is within the Columbia River Gorge National Scenic Area (CRGNSA) in the state of Washington. The CRGNSA was established in 1986.

The project area legal description is:

Township 3 N., Range 9 E., Sections 5-8, 11, 12, 17, 18, 20, & 21.
Township 3 N., Range 8 E., Sections 13-17, & 24.

The most pronounced landmark in the project area is Dog Mountain, a 2,505 foot peak just north of and overlooking the Columbia River, and approximately 6 miles east of the town of Carson and the Wind River.

Table 1. Threatened and Endangered Species to consider [1]

Species Name	Status
Peregrine falcon	Fed. Endangered WA State End.
N. Bald eagle	Fed. Threatened WA State Thr.
N. spotted owl [2]	Fed. Threatened WA State Thr.
Gray wolf	Fed. Endangered WA State End.
Grizzly bear	Fed. Threatened WA State End.

1 List of possible threatened and endangered species with geographic ranges included within the project area.

2 Project area occurs within an HCA (W-1; Thomas, et al. 1990) and within a CHU (Critical Habitat; Fed. Register 56(87):20816-21016).

II. Project Description.

This project analyzed five strategies for the management of vegetation in the Bonneville-Midway Corridor & Hanford-Ostrander Corridor ROW. These strategies were; prevention, early treatment, maintenance, correction, and no action. Prevention was the preferred long term strategy for managing competing and unwanted vegetation on the BPA ROW. However due to the presence of target tree species above the height threshold level and the presence of noxious weeds, a corrective action to remove tall growing trees and noxious weeds was needed.

There were five primary methods of treating unwanted vegetation considered. They were; manual, mechanical, prescribed fire, biological, and herbicides. The Right-Of-Way Management Plan provides more detail on the specifics of each option.

III. RISK ASSESSMENT PROCESS

This Biological Assessment covers a 6-step process to identify threatened and endangered wildlife species that may be associated with the project area and to evaluate any potential impacts the project may have on those species. The six steps are as follows:

1. Review of existing documented information.
2. Field reconnaissance of the project area for evidence of species or habitat
3. Evaluation of the impacts of the project to suspected or known local populations of TE&S species.
4. Analysis of the significance of the project's effects on local and entire populations of TE&S species.
5. If step 4 cannot be completed due to lack of information, a biological investigation is done*
6. Conferencing or informal/formal consultation with FWS is initiated at appropriate stage as outlined in FSM 2673.2--1, or is otherwise arranged through formal channels.

* Step #5 pertains only to listed species and will not be shown in the table except when applicable.

Table 2. The biological assessment process for wildlife species which may occur on the Columbia Gorge National Scenic Area is summarized below. Step #5 (BIOLOGICAL INVESTIGATION) was not required for any species, and it is not displayed. Blanks indicate steps not needed to complete the analysis. (Under "Survey Completed," a NO* indicates standardized surveys were not required because the proposed alternatives would avoid impacts to potential habitat (FSM ID 2672.43, 1992). Wildlife surveys are not required if potential habitat is not present.

	Step #1		Step #2	Step #3	Step #4	Step #6
	PREFIELD REVIEW		FIELD RECONN.	CONFLICT DETERMINATION	ANALYSIS OF SIGNIFICANCE	FWS REVIEW
SPECIES	Habitat present?(1)	Survey completed?	Species present?	Conflict?	Important?	(FOR T&E)
T & E						
N. bald eagle	YES	NO*	NO	NO		
Peregrine falcon	YES	NO*	NO	NO		
Northern spotted owl	YES	NO*	NO	NO		
Gray wolf	NO	NO	N/A	NO		
Grizzly	NO	NO	N/A	NO		

The area considered in the prefield review included the general area proposed for the vegetation removal and an area surrounding this area. The radius of this area varied by species (the expected area used by a breeding individual) but was always less than 1/2 mile.

IV. AFFECTED WILDLIFE

A discussion of the affects of the proposed project alternatives on federally threatened and endangered (T&E) species follows. All species on the R-6 T&E List for the Mt. Hood and Gifford-Pinchot National Forests were considered. If it was determined that their habitats (foraging, nesting/denning, roosting/loafing, wintering) do not exist in the area considered for effects to wildlife they are not discussed below.

The vegetation removal proposed with this project has the potential to affect threatened and endangered wildlife in several ways. Vegetation removal can create a disturbance, especially if it occurs near nests or dens during the breeding season. Vegetation removal can remove habitat for some species. The presence of humans during the vegetation removal process can create a disturbance to some wildlife species, especially if it occurs near nests or dens during the breeding season.

A. SPOTTED OWL:

1. HABITAT RELATIONSHIPS

Northern Spotted Owl (*Strix occidentalis caurina*)
Status: Federal: Threatened

State: Threatened

This report will address management plan compliance, direct, and cumulative effects of the proposed alternatives on spotted owls.

The project area is within a Habitat Conservation Area (HCA) W-1 (Thomas, et al. 1990) and Critical Habitat Unit (CHU) CHU-41 (Fed. Register 56(87):20816-21016). The project area is totally encompassed by both the HCA and CHU.

Spotted owl habitat as referred to in this document is divided into 3 types for analysis and planning purposes. Reproductive habitat refers to stands which exhibit moderate to high canopy closure (60 to 80 percent); a multi-layered, multi-species canopy dominated by large overstory trees (> 30 inches in diameter at breast height); a high incidence of large trees with various deformities (e.g. large cavities, broken tops, dwarf-mistletoe infections, and other evidence of decadence); numerous large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly (Thomas et al. 1990). Foraging habitat consists of mature stands that have at least 2 canopy layers; overstory trees greater than 21" DBH; snags and down woody material present; and a 60-80% canopy closure (Thomas et al. 1990). Dispersal habitat includes stands that have at least an 11" DBH average tree diameter and at least 40% canopy closure (Thomas et al. 1990). Stands are delineated as dispersal habitat if they meet the 11 inch dbh minimum and 40 % canopy closure minimum (Thomas et al. 1990).

In general, owl activity is expected to occur primarily in the interior of older forests. These habitats provide the structural characteristics required by the owls for food, cover, nest sites, and protection from weather and predation.

2. EXISTING HABITAT AND OWL ACTIVITY CENTERS

Total acreage of spotted owl habitat was not calculated for this project. Reproductive and foraging habitat was identified from Gifford-Pinchot NF (Mt. Adams Ranger District) maps, identified from aerial photographs, and verified by field reconnaisance. Adequate dispersal habitat is currently available in the project area, although individual stands which meet the criteria for this designation were not delineated.

The spotted owl is a known inhabitant of the Gifford-Pinchot National Forest. The closest known occurrence of spotted owls to the project area is the upper Little Wind River drainage (Wind River RD files).

3. CONFLICT DETERMINATION

On 9/28/90, the USDA Forest Service vacated the 1989 Spotted Owl Final Environmental Impact Statement (FEIS) and elected to manage spotted owl habitat in a manner "not inconsistent with" the Interagency Scientific Committee's (Thomas et al. 1990) conservation strategy. This decision abolished the Spotted Owl Habitat Area (SOHA) management strategy. At the time this BA was written, a Record of Decision (ROD) for a new Spotted Owl FEIS had been signed (March 1992). This ROD selected an alternative that implements the conservation strategy.

Implementation of the FEIS (1992) and conservation report (Thomas et al. 1990) includes the following requirements: 1) No timber harvest in HCA's without oversite committee approval and 2) 50-11-40 rule compliance.

Felling of trees within HCAs and CHUs is permitted with small projects such as trail construction and reconstruction if the structure and the function of the habitat is not changed with regard to spotted owls (PETS committee, Mt. Hood National Forest). This conclusion was reached during interpretation of the ISC Report (Thomas et al., 1990) and Critical Habitat Direction (Fed. Register 56(87):20816-21016) during technical assistance conversations between Mt. Hood National Forest and US Fish and Wildlife Service personnel. This assumes that the constituent elements of reproductive, foraging and dispersal habitats are not changed, removed or degraded: canopy closure, average size of trees (dbh), canopy layers, amount of standing and downed wood. For instance, if overstory trees are not felled and the canopy closure and thermal regulation of the stand remain unchanged and if understory trees (smaller than the size normally used for spotted owl nesting; < 21" dbh; PETS committee, Mt. Hood National Forest) are removed in small numbers (approximately 10 or fewer per acre) and left on the ground the structure/function of the stand for spotted owl reproductive, foraging and dispersal habitats have not changed and the project is consistent with the FEIS, ISC report and Critical Habitat directions as long as a case-by-case analysis is completed.

No harvest of trees other than that described in the previous paragraph will occur within stands within the CHU that meet at least the criteria for dispersal habitat for any option proposed with this project.

Northern spotted owls are relatively insensitive to disturbance due to human presence, therefore potential conflicts during vegetation removal will result in little disturbance to spotted owls and is not a conflict.

4. **EFFECTS ANALYSIS** - spotted owls.

This project transects spotted owl dispersal habitat. Some of the project area transects spotted owl reproductive and foraging habitats.

Mitigation: No mitigation is required at this time.

"No Effect" to spotted owls or their habitat will occur.

5. **CUMULATIVE EFFECTS**

There are expected to be No cumulative Effects, either spatially or temporally, on spotted owls or their habitat with the implementation of this project. Spotted owls are relatively insensitive to human presence within their territories and near their nests (PETS committee, Mt. Hood National Forest), therefore the removal of vegetation on the edge of spotted owl territories is not expected to affect spotted owls.

The habitat surrounding the powerline Right of Way is not expected to change due to the removal of this vegetation.

6. **CONSULTATION**

Consultation with the USFWS is not recommended.

7. **SUMMARY** for northern spotted owl.

At the time this document was written, a final Recovery Plan for the spotted owl had not been published by the Dept. of the Interior. Final Critical Habitat Units (CHU) had been designated. Consultation is required

with the USFWS for projects that may affect listed species without Recovery Plans in place and activities that adversely affect final Critical Habitat.

Implementation of this project will not adversely affect spotted owls or Critical Habitat.

B. PEREGRINE FALCON:

1. American Peregrine Falcon (Falco peregrinus anatum)
Status: Federal: Endangered
State: Endangered

2. CONFLICT DETERMINATION

The Recovery Plan for Peregrine Falcon (Pacific population) (USDI Fish and Wildlife Service 1982) objectives includes "providing adequate conditions to maintain all existing wild peregrines." The definition of adequate conditions includes maintaining suitable food supplies near nest sites, in part by eliminating sources of pesticides contamination, and preventing human disturbance near nests.

3. EFFECTS ANALYSIS - peregrine falcon.

No nesting peregrines have been located within the project area (Columbia River Gorge NSA).

An old peregrine hack site is near the project area and potential peregrine nesting habitat occurs in the vicinity of the hack site. No vegetation removal is planned within 1/4 mile of this site. Additional peregrine nesting habitat is near the project area in Section 19 (T3N R9E) between Dog-Auguspurger Mtn. saddle and the Larson Lakes Rd.

No additional suitable peregrine nesting habitat was located within 1/2 mile and within direct view of any proposed trail. Therefore surveys for breeding peregrine falcons or their eyries was not conducted.

Mitigation: No mitigation is required at this time.

A No Effect determination is made for this project.

4. CUMULATIVE EFFECTS to peregrines

There are No cumulative Effects with the implementation of this project.

5. CONSULTATION

Consultation with the USFWS is not recommended.

6. SUMMARY for peregrines

Implementation of this project will not adversely affect peregrine falcons.

C. N. BALD EAGLE:

1. Northern Bald Eagle (Haliaeetus leucocephalus)
Status: Federal: Endangered
State: Threatened

2. CONFLICT DETERMINATION

The Recovery Plan for Bald Eagle (Pacific states) (USDI Fish and Wildlife Service 1986) objectives includes providing adequate conditions to maintain all existing bald eagles, both breeding and winter roosting populations. The definition of adequate conditions includes maintaining nesting habitat and preventing human disturbance near nests.

2. EFFECTS ANALYSIS - bald eagles

The northern bald eagle is found within the Columbia River Gorge during breeding and wintering months, although no nesting or winter roosting bald eagles have been located within the project area (Gifford-Pinchot NF).

Bald eagle nesting habitat within the project assessmemt area occurs outside the usual foraging distance from foraging habitats (lakes, rivers). Old-growth trees occur in the saddle between Dog and Augspurger Mtns. and provide good structure for bald eagle nests but occurs outside of the usual foraging distance of breeding bald eagles (approx. 2 miles; Stalmaster 1987) to consider this stand as suitable for bald eagle nesting. Foraging habitat for bald eagles in the vicinity of the project area is the Columbia River. It is not likely that bald eagles have the potential to nest within the project area.

Habitat for bald eagle winter roosting may occur near the project area especially in mature and old growth stands of the project area.

It is not likely that communal roosts of bald eagles occur in this area based on the lack of communal roosts located during previous surveys of the Columbia Gorge and based on the lack of a concentrated food source in the winter (Dr. Richard Frenzel, Sandy, OR).

Mitigation: No mitigation is required at this time.

A No Effect determination is made for this project on nesting and winter roosting bald eagles.

3. CUMULATIVE EFFECTS to bald eagles

There are No cumulative Effects with the implementation of this project.

4. CONSULTATION

Consultation with the USFWS is not recommended at this time.

5. SUMMARY for bald eagles

The action or no action alternatives of this project will not adversely affect bald eagles under any option.

IV. CONCLUSIONS

A No Effect determination was made for northern spotted owl, American peregrine falcon and northern bald eagle for this project.

LITERATURE CITED

Stalmaster, M. V. 1987. The bald eagle. Universe Books. NY, NY 227pp.

Stalmaster, M.V. and J. R. Newman. 1979. Perch-site preferences of wintering bald eagles in Northwest Washington. J. Wildl. Manage. 43(1):221-224.

Thomas, J. W., E. D. Forsman, J. B. Lint, E. C. Meslow, B. R. Noon, and J. Verner. 1990. A conservation strategy for the Northern spotted owl. USDA Forest Service and USDI Bureau of Land Management, Portland, OR. 427pp.

USDI Fish and Wildlife Service. 1982. Recovery plan for peregrine falcon (Pacific population). The Pacific coast American peregrine falcon recovery team. 87pp.

USDI Fish and Wildlife Service. 1987. Pacific bald eagle recovery plan. Portland, OR. 163pp.

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File Code: 2670

Date: June 6, 1996

Richard Stone
Bonneville Power Administration
Portland, Oregon

Dear Mr. Stone

I have evaluated the Right-of-Way Management Plan for the Hanford-Ostrander Line and North Bonneville-Midway Line ROW to determine if there would be any potential impacts to sensitive fauna. My determination is that there will be no negative impacts to any sensitive fish and wildlife species due to the implementation of this management plan. The attached list identifies the fish and wildlife species which are known to occur within the Columbia River Gorge National Scenic Area and documents my findings.

If you have any questions concerning my findings please feel free to give me a call at (541) 386-2333.

Richard J Larson

Fish & Wildlife Biologist
Columbia River Gorge NSA

SENSITIVE SPECIES BIOLOGICAL EVALUATION
SUMMARY OF CONCLUSION OF EFFECTS**

Project Name: Hanford-Ostrander Line and North Bonneville-Midway Line ROW

Species	No Impact	May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Loss Of Viability To The Population Or Species	Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Viability To The Population Or Species*	Beneficial Impact
1. Bull Trout	No Impact			
2. Cope's giant salamander	No Impact			
3. Larch mountain salamander	No Impact			
4. Painted Turtle	No Impact			
5. Western pond turtle	No Impact			
6. California Mountain kingsnake	No Impact			
7. Columbia gorge neothremman caddisfly	No Impact			

Prepared by: Richard J Lisson
Fish & Wildlife Biologist
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* TRIGGER FOR A SIGNIFICANT ACTION AS DEFINED IN NEPA.

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SENSITIVE SPECIES BIOLOGICAL EVALUATION
SUMMARY OF CONCLUSION OF EFFECTS**

Project Name: Vegetation Mnagement for the Hanford-Ostrander and North Bonneville-Midway transmission Line Rights-of-way .

SPECIES	Habitat NOT Present	ALT. 1	ALT. 2	ALT. 3	ALT. 4
1. Agroseris elata		MIIH	MIIH		
2. Artemesia campestris spp borealis	X				
3. Bolandra oregana	X				
4. Botrichium spp.		MIIH	MIIH		
5. Calachortus longeberbe var. longeberbe	X				
6. Carex interupta		NI	NI		
7. Chrysolepis chrysophylla		MIIH	MIIH		
8. Cimicifuga elata	X				
9. Collinsia sparaiflora var. bruciae		MIIH	MIIH		
10. Corudalis aqua-gelidae		NI	NI		
11. Cryptantha rostellata	X				
12. Cyperus rivularis	X				
13. Cypripedium fasiculatum		MIIH	MIIH		
14. Draba douglasii var. douglasii	X				
15. Epipactis gigantea		NI	NI		
16. Erigeron howellii		MIIH	MIIH		
17. Erigeron oreganus	X				
18. Eryngium petiolatum	X				
19. Githopsis specularioides	X				
20. Hackelia diffusa var. diffusa		MIIH	MIIH		

Species	Habitat NOT Found	Alt. 1	Alt. 2	Alt. 3	Alt. 3
21. Heuchera grossularifolia var. tenuifolia	X				
22. Howellia aquatilis	X				
23. Linanthus bakeri	X				
24. Liparis loeselii		NI	NI		
25. Lomatium laevigatum	X				
26. Lomatium suksdorfii	X				
27. Lycopodiella inundata		MIIH	MIIH		
28. Machaerocarpus californicus	X				
29. Meconella oregana	X				
30. Montia diffusa		MIIH	MIIH		
31. Navaretia tagetina	X				
32. Ophioglossum pusillum		MIIH	MIIH		
33. Orobanche pinorum		MIIH	MIIH		
34. Parnassia frimbriolata		NI	NI		
35. Penstemon barrettiae	X				
36. Plantanthera sparsiflora		NI	NI		
37. Pleurocospora frimbriolata		MIIH	MIIH		
38. Poa laxiflora		MIIH	MIIH		
39. Polemoneum careum		MIIH	MIIH		
40. Ranunculus reconditus	X				
41. Rorippa columbiae	X				
42. Sisyrinchium sarmentosum		NI	NI		
43. Spiranthes porrifolia		NI	NI		
44. Sullivantia oregana	X				
45. Utricularia intermedia		NI	NI		
46. Veratrum insolitum		MIIH	MIIH		

Prepared by: _____ _____ Robin Dobson

Approved by: _____ _____ _____

Wildlife Biologist Fisheries Biologist Botanist
Robin Dobson

NI = No Impact
MIIH = May impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing or Loss Of Viability To The Population Or Species
WIFV* = Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population Or Species
BI = Beneficial Impact

* TRIGGER FOR A SIGNIFICANT ACTION AS DEFINED IN NEPA.
** NOTE: RATIONALE FOR CONCLUSION OF EFFECTS IS CONTAINED IN THE NEPA DOCUMENT.

Sensitive Flora, including endemics,
within the Columbia River Gorge National Scenic Area

OR	WA	NAME	LOCATION	HABITAT	Occurrence OR	WA
2	S	Agoseris elata Tall agroseris	W/E	Meadows, open woods. Low/mid elevations. June-Aug.	S	S
2	-	Agrostis howellii Howell's bentgrass	W	Moist rocky areas	D	D
3		Ammannia coccinea Scarlet ammannia	E	Muddy shores of the Col. R. Sept.	D	
2		Arabis sparsiflora var atrorubens Sickle-pod rockcress	E/W	Open, rocky or gravelly areas Generally at high elevations April-May.	D	
1	E	Artemisia campestris ssp. borialis Northern wormwood	E	Rocky, gravelly areas along Col.R. April.		D
2		Astragalus hoodianus Hood River milkvetch	E	Open or lightly wooded habitats April-May.	D	D
1		Astragalus howellii Howell's milkvetch	E	Sagebrush and bunchgrass hillsides. April-May	S	
1	S	Bolandra oregana Oregon Bolandra	W/M	Waterfalls and moist cliffs June.	D	D
2		Botrichium lanceolatum Grape-fern moonwort	W/M	Moist, wet areas in forest Low/mid elevation. July-Aug.	S	S
2		Botrichium lunaria Moonwort	W/E	Moist, wet areas in forest. Low/mid elevation. July-Sept.	S	S
2		Botrichium montanum Mountain moonwort	W/M	Moist,wet areas July-Aug.	S	S
2		Botrichium pinnatum St. John's moonwort	W/M	Moist,wet areas. Mid-high elevation. June-Sept.	S	S
2		Calachortus longebarbatus var. longebarbatus Long-bearded mariposa lily	E	Open or lightly wooded. June.		S
Endemic		Calamagrostis howellii Howell's reedgrass		Rocky banks and crevices of cliffs.	D	D
	S	Carex interupta Green-fruited sedge	W/M	Rocky banks and beds of streams Low wet places along Col.R. April-July.		
2	S	Carex macrochaeta Large-awned sedge	W/M	Moist open places near coast and along Col.R. up CRG.	D	D
3		Castilleja rubicola Cliff painbrush	W	Vertical basalt cliffs. April-May.	D	

OR	WA	Name	Location	Habitat	Occurrence OR	Occurrence WA
	S	Chrysolepis chrysophylla Golden chinquapin	M/E	Open area within the forest April-June.		D
1	Th	Cimicifuga elata Tall bugbane	W	Moist to dry wooded areas. June	D	D
	S	Collinisia sparsiflora var. bruciae Few-flowered collinsia	E	Moist open slopes. April.		D
2		Coptis trifolia Three leaf goldthread		S S		
1	Th	Corydalis aqua-gelidae Corydalis	W	In and besides small perennial streams in wooded areas. May-July		D
2	S	Cryptantha rostellata Beaked cryptantha	E	Barren south facing slopes. April-May		D
3	S	Cyperus rivularis Shining flatsedge	W/E	Wet places, lowlands.		D
1	Th	Cypripedium fasiculatum Clustered lady-slipper	M/E	Open conifer forest. April-July.		S
3		Delphinium nuttallii Nuttall's larkspur	W/M	Open, moist grassy slopes and meadows. June	D	D
3		Douglasia laevigata Smooth-leafed douglasia	W/M	Basalt cliffs and rock outcrops April		D
	S	Draba douglasii var douglasii Douglas' draba	E	Open gravelly flats. April.		D
	S	Epipactis gigantea Giant helleborine	M/E	Low elevation streambanks. July. (April-July).		D
1	Th	Erigeron howellii Howell's daisy	W	Rocky slopes. May-July.	D	D
1	S	Erigeron oreganus Gorge daisy	W	Moist, overhanging basalt cliffs. June.	D	D
	Th	Eryngium petiolatum Oregon coyote-thistle	W/E	Low ground, areas submerged in spring. WV up CRG. ??		D
	S	Githopsis specularioides Common bluecup	E	Dry, open or lightly wooded slopes. May.	D	D
1	S	Hackelia diffusa var. diffusa Diffuse stickweed	W	Shaded cliffs and talus slopes. May-June.	D	D
4	S	Heuchera grossularifolia var. tenuifolia Gooseberry-leafed alumroot	E	Shady cliffs and talus slopes. May.	D	D

OR	WA	Name	Location	Habitat	Occurrence OR	Occurrence WA
Endemic		Hieracium longiberbe Long-beard hawksweed	M/W	Dry cliffs, rocky banks, low elevation. June-July.	D	D
1	E	Howellia aquatilis Howellia	W	Ponds and lakes.	S	S
2		Huperzia occidentalis (=Lycopodium selago) Fir club-moss	W/E	Exposed cliffs, talus, moist dense woods. June-Oct.	D	
3		Lesquerella douglasii Columbia bladderpod	E	Sandy, gravelly open places near shores of the Col. R. April.		D
2		Lewisia columbiana spp columbiana Columbia lewisia	W	Open rocky areas. June-July.	D	
3	S	Linanthus bakeri Baker's linanthus	E	Barren, generally south-facing slopes. April.	D	
	E	Liparis loeselii Liparis	E	Springs and bogs.		S
Endemic		Lomatium columbianum Columbia desert parsley	E	Open slopes. Low (Mid) elev. March-May.	D	D
4	S	Lomatium laevigatum Smooth desert parsely	E	Basalt cliffs and open rocky areas. March-April.	D	D
1	S	Lomatium suksdofii Suksdorf's lomatium	E	Grasslands or open woods. April-June.	D	D
2		Lomatium watsonii Watson's lomatium	E	Open hillsides with sagebrush April-May??	S	
Endemic		Lupinus latifolius var. thompsonianus Col. Gorge broad-leaf lupine	E	Open woodland, grasslands. April-May.	D	D
2	S	Lycopodiella inumdata (=Lycopodium inundatum) Marsh clubmoss		Wet places, esp. sphagnum bogs.	S	S
3	S	Machaerocarpus californicus Star waterplantain	E	Vernal ponds near T.D. June.		D
1	Th	Meconella oregana White meconella	E	Open areas or lightly wooded. April.	D	D
1		Mimulus jungermannioides Columbia monkeyflower	E	Damp cliffs. Summer.	D	
4	S	Montia diffusa Branching montia	W	Often disturbed areas in forest or open areas. May-June.	D	D
3	Th	Navaretia tagetina Marigold navarretia	E	Open, rocky areas. June.		D

OR	WA	Name	Location	Habitat	Occurrence OR	Occurrence WA
2	Th	Ophioglossum pusillum (=O. vulgatum) Adder's tongue	W/E	Meadows and woods.	S	S
	S	Orobanche pinorum Pine broomrape	M/E	Woods and brushy areas. July.		D
	S	Parnassia fimbriolata var. hoodiana Fringed grass-of-Parnassus	W/E	Bogs, streams, wet meadows in in mountains (north OR Casc.). July-Sept.	S	
3	Th	Penstemon barrettiae Barrett's penstemon	E	Rocky areas, cliffs, talus slopes. May.	D	D
3	S	Penstemon deustus var.variabilis Variable hot-rock penstemon	E	Open ridges of the Col Hills. June-July.		D
	S	Platanthera sparsiflora Canyon bog-orchid	W	Wet to boggy areas.	S	
	S	Pleuricospora frimbriolata Fringed pinesap	W	Deep forest. June-Aug.		D
Endemic		Poa gracillima Pacific bluegrass	W	Rocks, shaded cliffs, near waterfalls.	D	D
	S	Poa laxiflora Loose-flowered bluegrass	W	Moist woods to rocky open slopes.	S	
	Th	Polemonium careum Great polemonium	W	Brushy areas and forest openings at middle elevations. June.		D
1	Th	Ranunclus reconditus Obscure buttercup	E	Open grasslands. March.	D	D
1	E	Rorippa columbiae Columbia watercress	W/E	Muddy, cobble shores of the Col. River. Sept.	D	D
2		Scheuchzeria palustris Scheuchzeria	W/E	Bogs and lake margins.	S	
2		Scirpus cyperinus Wool grass	W	Wet lowlands.	D	
		Scribneria bolanderi Scribner's grass	E	Dry sandy,rocky soils. Along roadsides. Foothills/lower mts.		D?
1	Th	Sisyrinchium sarmentosum Pale blue-eyed grass	E	Moist meadows. June.	S	S
3	S	Spiranthes porrifolia Western ladies-tresses	E	Meadows, riverbanks, intermittant streams. July.	D	D
2		Streptopus streptopoides Kruhsea	W	Dense conifer forest.	S	

OR	WA	Name	Location	Habitat	Occurrence OR	Occurrence WA
2		Suksdorfia violacea Violet suksdorfia	E	Moist cliffs at low elevations. April.		D
1	Th	Sullivantia oregana Oregon sullivantia	W	Wet cliffs near waterfalls July.	D	D
Endemic		Sythyris stellata Columbia kittentails	W	Shaded banks, cliffs, ridges. March-April.	D	D
	S	Utricularia intermedia Flat-leafed bladderwort		Slow moving water		S
	S	Veratrum insolitum Siskiyou false-hellebore	W	Open prairies, thickets, forests, to rocky, open slopes.	S	

VISUAL IMPACT SCALE

Construction, operation, and maintenance of transmission facilities can affect visual resources for both the long and short term.

Facilities can be visible, for instance, from potential viewpoints such as private residences, highways and roads, parks, and commercial areas. Any part of the facility can contribute to visual impacts--structures, conductors, insulators, spacers, aeronautical safety markings, right-of-way clearing, access roads, clearing for structures and pulling sites. Facility location in areas where soils are highly erodible or have poor potential for revegetation contributes to visual impact.

Landscape characteristics--differences in landforms, vegetation, and land use patterns -- influence facility visibility and intensity of visual impact. Landscapes that are relatively flat forested areas are typically better for hiding or screening a transmission line than are steep hillsides with forest cover. On steep hillsides, right-of-way clearing and access road construction can make the facility highly visible, contributing to visual impact. Hillsides where forests are more open, compared to those where the forest is uniformly dense, can better absorb a right-of-way and reduce visibility of the facility, though structures may still be visible.

Factors that contribute to considerable impact include viewer locations near the proposed facility and sensitivity to change in existing views and settings. Viewers who value existing views and settings may "see" a transmission line as an unwanted intrusion. This sensitivity to change can affect the intensity of impact, especially when many viewers near a proposed facility value an existing setting highly. Viewer sensitivity to change affects the degree of impact.

Impact Measures

Impacts would be **considerable** where

1. A large number of people see the line in foreground and middle ground views and when they are highly sensitive to their surroundings; or

2. The lines dominate views and/or appear uncoordinated and chaotic. This may occur when two or more lines are visible and they are not similar in size, configuration, color and/or spacing

Impacts would be **moderate** under the following conditions:

1. When the line would be visible to large numbers of people but because of competing visual factors is not a dominant element in the landscape:
   - electrical facilities are already commonplace in the area,
   - views are partially screened,
   - large segments of the line may be visible but of short duration,
   - most views are in the middle ground;
2. When scarring from access roads or clearing swaths is evident but not severe or extensive;
3. When the line would conflict with prevailing land patterns but be visible to few people or for short duration;

Impacts would be **slight** in one or more of the following circumstances:

1. Few viewers would see the line because it is isolated, it is screened, or it is seen at a distance.
2. Existing conditions (transmission lines) have already established impacts. The incremental change from existing conditions would not be distracting to the casual viewer
3. Access roads scars, clearing swaths would not significantly detract from the setting.
4. Views would be of short duration.
5. No visually sensitive resource would be affected.

APPENDIX E: Public Comments Received

WASHINGTON STATE DEPARTMENT OF
Natural Resources

April 5, 1996

Mr. Richard Stone
BPA Project Environmental Lead
P.O. Box 3621
Portland, Or 97208

Dear Mr. Stone:

I have a few comments concerning the proposed maintenance of the BPA transmission line right-of way in Skamania county. It is not necessary, from our stand point, to address these comments in the Environmental Assessment and are submitted only as recommendations to provide uniformity with adjacent operations on private and state lands in an area of high fire risks.

The Department of Natural Resources (DNR) is the responsible agency for forest fire protection on private and state lands in Washington State. Where BPA's transmission line passes through our protection areas we are interested in your right-of-way maintenance operation for a number of reasons. First, spark emitting equipment like tractors, power saws and passenger vehicles are a definite source for starting fires under the right conditions. Second, the DNR would normally be the responding firefighting agency to a fire on BPA right-of way when that fire threatens our protection area. Third, all logging, land clearing and other industrial operations under DNR protection follow the industrial fire precaution levels (IFPL) which regulate operating time of day and shutdowns in relation to fire danger. This would include operations on both sides of BPA's right-of-way.

The DNR would like to encourage the BPA to require its contractors to comply with the state's fire protection regulations for spark emitting equipment during closed fire season of April 15 to October 15. We also recommend keeping an one hour fire watch following operation of spark emitting equipment during the closed season as well as providing a pump truck or pump trailer on location. I have enclosed copies of "Forest Fire Protection-Requirements for Operations on or near Forest Lands" that provides specific information on pump trucks and spark emitting equipment.

SOUTHWEST REGION ▮ 601 BOND RD ▮ PO BOX 280 ▮ CASTLE ROCK, WA 98611-0280 ▮ *FAX: (360) 274-4196* ▮ *TEL: (360) 577-2025*

Lastly, we recommend your contractor follow the IFPL standards. The daily IFPL is available during the closed season by phoning our toll free 1-800-527-3305 number after 4pm the day before. Use fire weather zone 660S and follow the operational requirements listed for the class of day in the enclosed material..

If you have any questions or if I can be of further help please contact me at (360) 577-2025.

Sincerely,

Neil Smith
Southwest Regional Assistance Manager

enclosures

cc: Jim Shank
Seth Mackie
Kirk Willis
r.f.
C: 4/8 KW

Richard Stone - ECN
BPA Project Environmental Lead
P.O. Box 3621
Portland, OR 97208

Dear Mr. Stone:

Thank you for providing the opportunity to comment on your proposed use of integrated vegetation management (IVM) along transmission line rights-of-way.

It is not clear from your letter regarding the use of IVM in the Columbia River Gorge transmission line areas as to the vegetation goal and operational objectives that are expected from the IVM process. Are you planning to develop a specific type of vegetation community within the right-of-way? If so what is that community, a 200 ft. swath of grass, a mixed community of grass, shrubs and small trees? Once this vegetative goal is known, it will be easier and more appropriate for the WSDOT to comment on the IVM process.

Regardless of BPA's long term IVM goals, the WSDOT feel that the environmental assessment must address the following issues at a minimum:

- long term maintenance needs and the decrease of herbicide use over time as the desired plant community becomes established.
- visual quality of the right-of-way to allow for blending with the adjacent landscape.
- environmental concerns including erosion control, runoff from the cleared areas, and invasive noxious weeds.
- wildlife habitat and corridor concerns.

Once again thank you for providing this opportunity, and we look forward to working with you in the future on vegetation management issues.

David W. Rodin
Region Landscape Architect

Washington State Department of Transportation
Southwest Region Landscape Architecture Office
4200 Main Street
PO Box 1709
Vancouver, WA 98668
360-905-2085
Fax 360-905-2211

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

MAR 1 3 1996

To: People Interested in Columbia River Gorge Vegetation Management

Bonneville Power Administration (BPA) needs to maintain its transmission line rights-of-way without tall-growing vegetation threatening the reliability of the system or preventing maintenance access. BPA is proposing to control vegetation on its Hanford-Ostrander 500 kilovolt (kV) and North Bonneville-Midway 500-kV transmission line corridors (in the State of Washington) using herbicides, as well as hand and mechanical clearing, in a process called integrated vegetation management (IVM). BPA is preparing an Environmental Assessment, in cooperation with the U.S. Forest Service (USFS) to determine whether IVM poses any significant environmental impacts. We are seeking your ideas and opinions on the subject.

Background

The corridors being proposed for integrated vegetation management are located on the Washington side of the Columbia River Gorge, northeast of Bonneville Dam, in Skamania and Klickitat counties. They cross mostly USFS land, and a small amount of private and state land. (See attached map.). These corridors have tall-growing trees that could grow or fall into the lines, as well as shrubs and other vegetation that limit access to roads needed to maintain the lines.

IVM uses a wide range of techniques to control vegetation. The mechanical clearing used in integrated vegetation management involves tractors equipped with mowers, chippers, and tractors with brush rakes. Hand tools and chain saws are used for manual clearing. Using chemicals to control vegetation includes land-based broadcast application, high- and low-volume foliage (leaf) treatment, application of chemical to the base of the plant, application to cut stumps, spot foliage treatment, cut stubble, and base injection. All chemicals used in this method are approved by the Environmental Protection Agency. The use of helicopters is *not* being considered in this project.

Opportunity for Involvement

BPA and the USFS want your comments and opinions on the subjects and issues that should be covered in the Environmental Assessment. This information will help determine the scope of the study. (This letter also serves as a scoping notice for the USFS.) Please send written comments by **Monday, April 1, 1996**, to Richard Stone - ECN, BPA Project Environmental Lead, P.O. Box 3621, Portland, OR 97208, or call me at (503) 230-3797. If you would like a copy of the Environmental Assessment when it's complete, please call our toll-free document request line 1-800-622-4520.

Richard Stone

Richard Stone
Project Environmental Lead

cc:
Ms. Cynthia Swanson, US Forest Service

Dear Friends -
Thank you for your letter. I think keep it clean of brush is good I do not approve of spraying unless it is Environmental approved

Sincerely
M. Kulinski

352 Bush St So #63
Salem, OR 97302

FORESTRY DEPARTMENT
KENNETH GALLOWAY, JR.
FOREST MANAGER
918 18th STREET
HOOD RIVER, OREGON 97031
PHONE: (503) 386-6323

March 15, 1996

To: Richard Stone

Subject: BPA Pesticide Program

First of all, we support the use of pesticides and an Integrated Pest Management Program (IPM). If done correctly it provides a more effective job, less expensive and faster.

Second, I don't know why the Federal Government Agencies, and apparently you, insist on creating new names for old programs. What you call Integrated Vegetation Management (IVM) every person in the field, training sessions and land managers of public and private land, have called IPM for several years. I cannot support your new name for a standard practise used in planning and in the field.

Sincerely,

Kenneth Galloway, Jr.
County Forest/Park Mgr.

cc: Cynthia Swanson

SDS Lumber Company

P.O. Box 266
Bingen, Washington 98605
(509) 493-2155

March 15, 1996

Richard Stone - ECN
BPA Project Environmental Leader
P.O. Box 3621
Portland, OR 97208

Dear Mr. Stone:

Thank you for the opportunity to provide input on your Environmental Assessment on transmission line maintenance.

SDS Company owns lands transected by the transmission line segments proposed for maintenance. We have identified the following issues of concern which we would appreciate your addressing in the assessment:

1. Chemical Maintenance: Off right-of-way mortality - i.e, how will BPA insure that no impacts will result to vegetation and property off BPA's designated R/W?
2. Mechanical Clearing: Fire hazard - i.e., how will adjacent property be protected from increased fire hazard during operations and as a result of the operations?
3. Manual Clearing: Fire hazard (as posed above) and ownership - i.e., who is legal owner of merchantable trees severed from the stump in BPA's maintenance operations, within R/W and outside R/W (e.g. danger trees)? What opportunities does the landowner have to receive value of, or be compensated for, merchantable trees cut by BPA within and outside of R/W?

We appreciate your consideration of these comments. Please send us a copy of the E.A. when it is complete. If you have any questions related to our issue, please contact me at (509) 493-2155.

Very Sincerely,

Jason S. Spadaro
Assistant Forest Manager

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

MAR 13 1996

To: People Interested in Columbia River Gorge Vegetation Management

Bonneville Power Administration (BPA) needs to maintain its transmission line rights-of-way without tall-growing vegetation threatening the reliability of the system or preventing maintenance access. BPA is proposing to control vegetation on its Hanford-Ostrander 500 kilovolt (kV) and North Bonneville-Midway 500-kV transmission line corridors (in the State of Washington) using herbicides, as well as hand and mechanical clearing, in a process called integrated vegetation management (IVM). BPA is preparing an Environmental Assessment, in cooperation with the U.S. Forest Service (USFS) to determine whether IVM poses any significant environmental impacts. We are seeking your ideas and opinions on the subject.

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No mono culture?
Please - no chemicals!
Use mechanical removal!
Sounds good! Thank you!
E. ZAHN

Richard Stone

Richard Stone
Project Environmental Lead

cc:
Ms. Cynthia Swanson, US Forest Service

manual clearing!
Please

Eleanor S. Zahn
295 Fleet Dr.
Port Ludlow, WA 98365

Klickitat County
Noxious Weed Control Board

228 W. Main Street, Room 210
Goldendale, Washington 98620

(509) 773-5810

March 25, 1996

Richard Stone - ECN
BPA Project Environmental Lead
P.O. Box 3621
Portland, OR 97208-3621

Dear Mr. Stone:

I am writing in response to your request for comments regarding IVM along the Hanford-Ostrander and North Bonneville-Midway power transmission line R-O-W.

I fully support the IVM concept as it utilizes several methods of dealing with vegetative growth. I have had personal experience with IVM managing woody species on Klickitat County roadside R-O-W and with the PUD of Klickitat County powerline R-O-W.

Mechanical or manual brush clearing followed by cut stump, basal bark or high volume foliar selective herbicide applications and in some cases a grass seeding has been extremely effective in preventing regrowth and eliminating undesirable plant species.

I think it is critical to follow-up a second and possibly third year with spot herbicide treatments for escapes and new growth in order to obtain maximum effectiveness.

I have seen excellent results from this type of program. The use of selective herbicides has enabled grass species to dominate the R-O-W which aids in preventing reinvasion.

Again, I am supportive of the IVM that BPA is proposing.

Sincerely,

Marty Hudson

Marty Hudson
Weed Coordinator

MH:lm

BPA F 1325.09e
(09-92)
(Previously OF 271)

U.S. DEPARTMENT OF ENERGY
BONNEVILLE POWER ADMINISTRATION
CONVERSATION RECORD

Electronic Version Approved
by CGIR- 04/29/94

TIME	DATE (MM/DD/YY)
10:30	03/26/96

LOCATION OF VISIT/CONFERENCE: phone

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Fred Slates

TYPE:
- ☐ Visit
- ☐ Conference
- ☒ Telephone
  - ☐ Incoming
  - ☐ Outgoing
- ☐ Other (Specify)

ROUTING

NAME	ORG. CODE	INITIALS

ORGANIZATION/OFFICE	TELEPHONE NUMBER
Land Owner	505-829-3502

SUBJECT

Columbia Gorge Scenic Area Integrated Vegetation Management EA

SUMMARY

A letter was sent out in Mid March informing interest persons about BPA's intention to do an EA for this project. Mr Slates called the next week and asked that Herbicides not be used on his property. He left a number and today I called him back for details on his concern. The following is a summary of this conversation:
(need to change mail list to accommodate this change in ownership)
Mr. Slate owns 10 acres on Wind River Rd. on which BPA has an easement. Our property owners list list this property under the name of George Aker. Mr. Slate says that his uncle, Mr. Aker, has passed away and left the property to Mr. Slate and his brother.

Mr. Slates concerns:
1 - the land is used for agriculture (Apple trees and livestock grazing) by neighbors the Mosers. He is concerned that the herbicides will damage the apple trees or cover the apples and endanger the people who eat them. He is also concerned about horses and other livestock that may use the fields for grazing in that they may be endangered. While he believe the US forest service and EPA have the best intentions to use herbicides that are safe, he is reluctant to trust their long term viability on this issue. They have historically changed their list, deleting chemicals which just a year ago they declared safe and now have found are have problems. Also he may use the land for X-mas trees in the future and is concerned about the quality of the soil for this use if it has been chemically treated. A lawn mower would be OK. And hand cutting if it didn't damage his apples trees (correct pruning was important)
2 - He is part of a water co-op at the present time and is concerned with long term impacts to ground water and run off to the river.
3.- During hand cutting several years ago, BPA cut down a number of his apple trees without any notice. He couldn't see how Apple trees could be a threat to the power line (they don't get that tall) and didn't like the idea that someone thought they were brush. Mowing around them would be fine, see comment above.
4. - doesn't want herbicides used on his land - for all of the above reasons, was interested in making sure this didn't happen. Wants to get copy of the EA to comment on. Also wants his neighbors the Mosers on the mail list. I gave him the number to call so the Mosers to call to get on the list.

ACTION REQUIRED

Add this comment to the comment responses for this project and circulate as appropriate.

SIGNATURE	TITLE	DATE (MM/DD/YY)
[signature]	Public Affairs Sp.	3-26-96

ACTION TAKEN

forwarded form to J. Pennington and Note to G. Kuhen for mail list update

SIGNATURE	TITLE	DATE (MM/DD/YY)

FRIENDS OF THE COLUMBIA GORGE

March 28, 1996

Richard Stone
ECN BPA Project Environmental Lead
PO Box 3621
Portland, OR 97208

RE: Columbia River Gorge Vegetation Management

Dear Mr. Stone,

The Friends of the Columbia Gorge has become very concerned by prior BPA vegetation management practices within the Columbia River Gorge National Scenic Area.

The Friends recognizes the necessity of the BPA to maintain its existing right of way without tall growing vegetation threatening the system or preventing maintenance access. However past vegetation management practices have indiscriminately cleared large swathes of vegetation without any apparent regard to necessity or resource impacts.

A recent example is the BPA right of way across Catherine Creek in western Klickitat County. The Catherine and Major Creek area has been designated as Open Space pursuant to the National Scenic Area Act and possesses outstanding natural, scenic and recreational values including threatened species habitat and many rare plants. Over the past few years the USFS has sponsored a public process to determine how the open space area will be managed to protect and enhance these values.

Last year, virtually every Ponderosa Pine, oak tree and shrub within the right of way in this area was cut. Oak trees in the area attain an average height of 20 to 30 feet, far from reaching the powerlines. Such indecriminate vegetation destruction appears to be unnecessary and lacking in consideration of sensitive resources and the public's interest.

The Friends strongly encourages the BPA to explore and implement vegetation management techniques that are less impactive on resources within the National Scenic Area and are truly necessary to prevent threats to the reliability to the system and will allow reasonable access to transmission facilities.

PO Box 4082, Portland 97240-0820

In closing, the Friends of the Columbia Gorge appreciates this opportunity to comment and looks forward to working with the BPA to reduce the resource impacts resulting from vegetation management along transmission lines.

Sincerely,

Michael Lang
Forest and Land Use Coordinator

F. STUART CHAPIN, JR.

40 S.W. Eyrie Road, White Salmon, WA 98672
464

July 12, 1996

JUL 19 1996

Gorge Vegetation Management Project
Public Invovement
Bonneville Power Administration
P.O. Box 12999
Portland, OR 97212

The opportunity to comment on the Preliminary Environmental Assessment, DOE/EA-1162, for the Columbia River Gorge Vegetation Management Project is appreciated.

In reviewing this document a question arises - what about other segments of the two corridors that traverse the Columbia River Gorge National Scenic Area? Understandably the National Scenic Area office of the Forest Service has been involved in the assessment of the segments of corridors that cross National Forest Lands. Under terms of the Scenic Area Legislation, I understand the Forest Service has responsibilities for reviewing projects of this kind for their consistency with provisions of the Columbia River Gorge Management Plan for the entire Scenic Area. Some introductory material is needed to indicate how this Environmental Assessment ties in with the review of vegetation management proposals in the rest of these corridors for their consistency with the Columbia River Gorge Management Plan. Presumably there would be an opportunity for public input on these corridor segments of proposals for vegetation management.

The information sources cited in the reference section and in the appendices are extensive on health, safety and environment effects of herbicides and properly so, but carry little information on the visual effects. I suggest you check with the Gorge Commission or the USFS Scenic Office on the report of an interagency Gorge Vegetation Management Task Force made in November 1990.

Sincerely,

Stuart Chapin

F. Stuart Chapin, Jr.

cc: Arthur Carroll
Jonathan Doherty

Klickitat County
Noxious Weed Control Board

228 W. Main Street, MS-CH-23
Goldendale, Washington 98620

(509) 773-5810

July 25, 1996

Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208-3621

Dear Sirs;

I have a few comments regarding the proposed Preliminary Environmental Assessment (EA) for the Columbia River Gorge Vegetation Management Environmental Assessment Project.

Alternative I: No Action as stated in the EA seems to pose more environmental impacts and has already proven to be costly and inefficient.

Alternative II: Integrated Vegetation Management as described in the proposed action and alternatives. It has been my experience that no single method works alone in vegetation management as there are many variables involved. The use of all available methods including labeled use of EPA registered herbicides is a more effective approach to manage unwanted vegetation and promote desirable species.

I wish to state my support of Alternative II the Integrated Vegetation Management Plan and hope that control action can begin soon.

Sincerely,

Marty Hudson

Marty Hudson. Coordinator

Bonneville Power Administration

PO Box 3621 Portland, Oregon 97208-3621

DOE/BP-2927 SEPTEMBER 1996 1C