AUGUST 1999

TRANSMISSION SYSTEM VEGETATION MANAGEMENT PROGRAM

Draft Environmental Impact Statement

DOE/EIS-0285

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BONNEVILLE POWER ADMINISTRATION

Bonneville Power Administration Transmission System Vegetation Management Program Draft Environmental Impact Statement (DOE/EIS-0285)

Responsible Agency: Bonneville Power Administration (Bonneville), U.S. Department of Energy

Cooperating Agencies: U.S. Forest Service (USFS), U.S. Department of Agriculture; Bureau of Land Management (BLM), U.S. Department of Interior

Title of Proposed Action: Transmission System Vegetation Management Program

States Involved: California, Idaho, Montana, Oregon, Utah, Washington, and Wyoming

Abstract: Bonneville is responsible for maintaining a network of 24,000 kilometers (km) or 15,000 miles (mi.) of electric transmission lines and 350 substations in a region of diverse vegetation. This vegetation can interfere with electric power flow, pose safety problems for us and the public, and interfere with our ability to maintain these facilities. We need to (1) keep vegetation away from our electric facilities; (2) increase our program efficiency and consistency; (3) review herbicide use (under increased public scrutiny); and (4) maximize the range of tools we can use while minimizing environmental impact (Integrated Vegetation Management). This DEIS establishes Planning Steps for managing vegetation for specific projects (to be tiered to this EIS). In addition to No Action (current practice), alternatives are presented for Rights-of-way, Electric Yards, and Non-electric Facilities (landscaping, work yards). Four vegetation control methods are analyzed: manual, mechanical, herbicide, and biological. Also evaluated are 24 herbicide active ingredients and 4 herbicide application techniques (spot, localized, broadcast, and aerial). For rights-of-way, we consider three sets of alternatives: alternative management approaches (time-driven or establishing low-growing plant communities); alternative method packages; and, if herbicides are in a methods package, alternative vegetation selections (noxious weeds, deciduous, or any vegetation). For electric yards, one herbicide-use alternative is considered. For non-electric facilities, two method package alternatives are considered. For rights-of-way, the environmentally preferred alternative(s) would use manual, mechanical, and biological control methods, as well as spot and localized herbicide applications for noxious and deciduous plant species; the BPA-preferred alternative(s) would add broadcast and aerial herbicide applications, and would use herbicides on any vegetation. Both would favor a management approach that fosters low-growing plant communities.

Public comment is being accepted through October 9, 1999.

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Summary

In this summary:

- **Purpose, Need, and Issues**
- **Methods and Their Impacts**
- **Planning Steps**
- **Program Alternatives and Their Impacts**

Purpose, Need, and Issues

Need

Bonneville Power Administration (Bonneville) is responsible for maintaining a network of 24,000 kilometers (km) or 15,000 miles (mi.) of electric transmission lines and 350 substations. This electric transmission system operates in seven states of the Pacific Northwest. (See Figure S-1.)

Those states offer a great diversity of vegetation (from trees to brush to grasses), which can interfere with electric power flow, pose safety problems for us and neighboring members of the public, or interfere with our ability to maintain our system. **We need to keep vegetation a safe distance away from our electric power facilities.** Bonneville's vegetation management program is the policy and direction for managing vegetation throughout our service area.

Our electric facilities include the following:

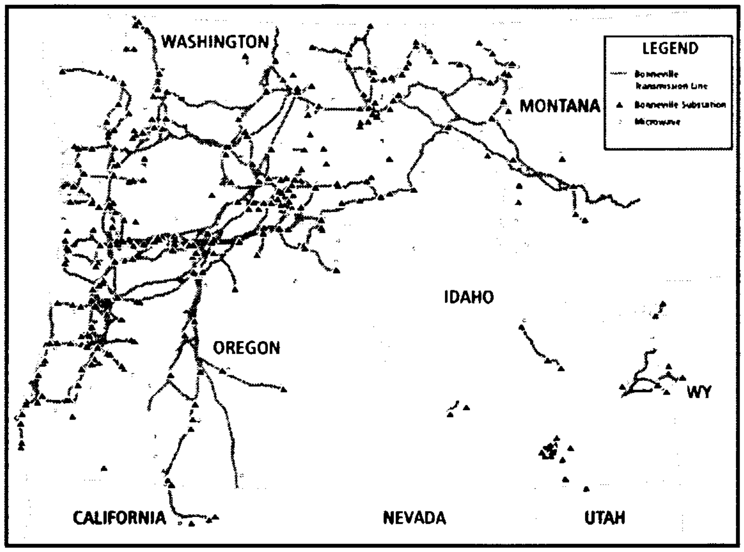
- **rights-of-way** (transmission lines and access roads),
- **electric yards** (such as substations), and
- **non-electric facilities** (such as maintenance facilities).

Purposes

While managing vegetation around our facilities, we must also balance other **purposes** or objectives. These purposes are to

- minimize adverse environmental impacts,
- achieve cost and administrative efficiency, and
- comply with laws and regulations.

Figure S-1 Bonneville Service Territory



Reasons for This EIS

In 1983 we prepared an environmental impact statement (EIS) on our vegetation management program. Since that time some important things have occurred:

- We need to increase our program efficiency and consistency.
- Herbicide use is under increased public scrutiny.
- There is more emphasis on using Integrated Vegetation Management (IVM) approaches.

This EIS proposes various alternatives that respond to these factors.

Efficiency and Consistency

This EIS represents an "umbrella" document: it sets forth a framework of Planning Steps and mitigation measures to increase efficiency and consistency when we undertake a specific project in, say, eastern Oregon or northern Idaho. It also explores, identifies, and discloses many of the commonly occurring environmental issues or impacts expected from vegetation management.

When we plan a **specific** project, we would then "tier" the site-specific environmental analysis to this EIS by

(1) using the Planning Steps to ensure consideration of all potential issues,

(2) consulting with this EIS to determine whether impacts had been previously considered, and

(3) applying the appropriate established mitigation measures.

We would document our findings in a *Supplement Analysis*. If anticipated impacts, project components, knowledge, or circumstances were to differ substantially from those evaluated in this EIS, we would undertake more, broader environmental analysis.

Herbicide Use

Herbicide use is an important focus in this EIS. Scrutiny of chemicals used to control insects or vegetation has increased through the years. In the late 1980s, we drastically reduced herbicide use on rights-of-way. However, it has since been very difficult to keep up with the growth of deciduous trees, which resprout and grow quickly, multiplying our maintenance work.

This EIS describes the advantages and disadvantages of herbicide use. The alternatives were designed to help determine, among other things, whether to use herbicides and, if so, to what extent.

Integrated Vegetation Management (IVM)

Integrated Vegetation Management (IVM) is a strategy to cost-effectively control vegetation with the most benign overall long-term effect on public health and safety and the ecosystem. IVM tries to maximize favorable effects and minimize potential negative effects.

The utility industry has had continuing success in applying an IVM strategy for managing rights-of-way vegetation. **All of our right-of-way alternatives will use the IVM concept: we will use an array of control methods, choosing methods or combination(s) of methods based on the vegetation needing control, cost-effectiveness, and the environmental conditions present**.

The ultimate goal for IVM right-of-way management is to convert the right-of-way to low-growing plant communities that keep tall-growing vegetation out. Low-growing plants can often "out-compete" trees and tall-growing brush for sunlight and nutrients.

Decisions to Be Made

Several decisions will be made through this EIS document and process:

1. Which management approach should Bonneville adopt for maintaining rights-of-way? *(Bonneville proposes to adopt an approach that promotes low-growing plant communities.)*
2. What methods should Bonneville have available for use for managing right-of-way vegetation? *(Bonneville proposes to have a full range of methods available for use: manual, mechanical, biological, and herbicide [spot, localized, broadcast, and aerial].)*
3. If Bonneville decides to use herbicide methods, on what kinds of vegetation should they be applied? *(Bonneville proposes to be able to apply herbicides to all vegetation types.)*

4. Should we continue to manage electric-yard vegetation as we do currently? *(Bonneville proposes to continue current practice of using herbicide.)*
5. What methods should Bonneville use for managing non-electric-facility vegetation? *(Bonneville proposes to continue with the current practice of using a range of methods, including manual, mechanical, biological, and herbicides.)*

We will base our decisions on the findings contained in this EIS (weighing how each choice meets our need and purposes) and the consideration of public comments and recommendations. The Bonneville Administrator will decide which alternatives to adopt. The decision, the reasons behind it, and the conditions for it will be presented in a document called the *Record of Decision (ROD).*

Cooperating Agencies

The U.S. Forest Service (USFS; U.S. Department of Agriculture) and the Bureau of Land Management (BLM; U.S. Department of the Interior) are cooperating agencies in the development of this EIS. About 2,300 km (1,400 mi.) of Bonneville's transmission-line corridors and a number of Bonneville substations are located on lands managed by either the USFS or BLM. We all have strong interests in how vegetation and land along these corridors is managed. Agency cooperation should help Bonneville analyze or coordinate vegetation management work on BLM or USFS land in an effective, efficient, consistent, and timely way.

The Methods and Their Impacts

Bonneville is considering four **general control methods** that can be used individually or in combination to control vegetation:

- manual (chainsaws, pulling, etc.)
- mechanical cutting (heavy equipment such as mowers and choppers),
- biological control agents (for noxious weeds), and
- herbicides and growth regulators.

For herbicides, we are considering 24 **herbicide active ingredients** (including 4 growth regulators) and 4 **application techniques: spot, localized, broadcast, and aerial.**

These methods and techniques, in various combinations, make up the alternative vegetation management programs.

Manual Control Methods

Manual techniques can be highly selective, cutting only targeted vegetation. The short-term impact of chainsaw noise can disturb wildlife and neighbors.

Worker health and safety issues center on the safety impacts of hiking along the right-of-way, carrying and using chainsaws and other tools, and felling trees. It is hard to control vegetation manually where the vegetation is dense, in remote locations, or in steep terrain. This method also creates lots of debris.

When deciduous trees are cut, they usually resprout with *more* stems than before, creating even more dense vegetation. Successive cuttings significantly increase the amount and difficulty of labor needed to complete vegetation control.

Manual vegetation control costs from $70 to $700 per acre.

Mechanical Control Methods

Mechanical methods are very effective for completely removing thick stands of vegetation. Most mechanical techniques are non-selective: they tend to clear or cut all vegetation within the path. They are not desirable for selective vegetation removal.

In general, mechanical methods that disturb soil (heavy equipment or scraping actions) are not appropriate to use near water bodies or wetlands, on steep slopes, or in areas of soft soils. Soil can be compacted and eroded. Subsurface cultural artifacts can be disturbed or destroyed.

Heavy machinery noise, exhaust, and dust associated with many mechanical methods can disturb wildlife and neighbors. As with manual methods, cutting deciduous trees produces resprout problems, creating more dense vegetation and more work. Health and safety issues of using heavy equipment include vehicle accidents and flying debris.

Mechanical vegetation control costs from $100 to $600 per acre.

Biological Control Methods

Biological control methods (insects or pathogens) are used to weaken or destroy noxious weeds. Most noxious weeds originate in other countries and gain a competitive advantage over native plants because they have no natural enemies in the new location. With biological controls, selected natural enemies of a weed are introduced and managed to control weed spread.

Biological controls cause little potential environmental impact. Insects eat or stress weeds so they die without disturbing soil or other plants. The use of insects also does not create the intrusive human presence that mechanically or manually clearing noxious weeds does; insect use also does not have the potential contamination issues of herbicides. However, biological control is a slow process, and its effectiveness varies widely.

Health and safety impacts are limited to transporting insects to the site, hiking along the right-of-way, and potential helicopter accidents with aerial release of insects.

Biological vegetation control costs range from $80 to $150 for ground applications of insects to noxious weed areas, and $150 to $275 for aerial drop.

Herbicide Control Methods: Active Ingredients

Herbicides kill or damage plants by inhibiting or disrupting basic plant processes. Herbicides are most often applied in mixtures with water or oil carriers, various adjuvants (wetting or sticking agents, stabilizers or enhancers, etc.), and/or dyes needed for application or environmental monitoring.

As with all herbicides sold in the United States, Bonneville uses only those herbicides that have been approved by the Environmental Protection Agency (EPA). All those who use such chemicals are required by law to follow the label directions on the manufacturer's herbicide container— "the label is the law." Bonneville's herbicide treatments comply with the EPA-reviewed and -approved manufacturers' instructions printed on the label.

Bonneville is considering the following 24 different active herbicide ingredients to be available for use in those Program Alternatives that use herbicides.

Benefin	Glyphosate	Paclobutrazol
Bromacil	Halosulfuron-methyl	Pendimethaline
Chlorsulfuron	Hexazinone	Picloram
Clopyralid	Imazpyr	Sulfometuron-methyl
2,4-D	Isoxaben	Tebuthiuron
Dicamba	Mefluidide	Triclopyr
Dichlobenil	Metsulfuron-methyl	Trifluralin
Diuron	Oryzalin	Trinexapac-ethyl

- Fifteen of these herbicides could be used for rights-of-way (Program R).
- Seven herbicides for electric yards (Program E).
- Twelve herbicides for non-electric facilities (Program NE).

Some of the herbicides have multiple uses and can be used in more than one program. EPA uses a human-health toxicity rating system for herbicides, from "Category I" (highly toxic) to "Category IV" (practically non-toxic). Most of the herbicides' active ingredients proposed for use in this EIS fall into Category III or IV.

Herbicide Control Methods: Application

Herbicides can be applied in different ways, depending on the plants that are targeted, the density of the vegetation, and site circumstances. They fall into the following four categories:

- **Spot** (herbicide applied to individual plants—stump treatment, injection into tree),
- **Localized** (treatment of individual or small groups of plants - backpack spray, granular, or all terrain vehicle [ATV]),
- **Broadcast** (treatment of an area with truck, or ATV, granular), and
- **Aerial** (treatment of an area with a helicopter or plane).

Depending on the type of herbicide and the application technique, herbicides can be **selective** (affecting only the targeted vegetation) or **non-selective** (affecting all the vegetation in its path),

Because herbicides tend to kill the roots of the vegetation, there is less chance for resprouting to occur; therefore, the treatment is effective for a longer term than with plain cutting. Short-term effectiveness is not always apparent (as with mechanical or manual methods). Often an area must be reviewed months later to see whether the target vegetation was treated and affected (sometimes dyes are used to help determine whether a plant was treated). In other cases, the effects are visible in days.

After most herbicide treatments, dead vegetation is left standing, so there is no debris disposal. Standing dead vegetation can provide both an eyesore (where it is seen) and some wildlife cover.

Environmental concerns of herbicide treatments include the potential of herbicide drift, leaching to and affecting non-targeted vegetation or water sources, and potentially affecting fish and wildlife. Along the right-of-way there is usually little potential for herbicides to affect these resources because the amount of herbicide active ingredient actually used is small and because there is a long time span between treatments (3 to 10 years). In electric yards, herbicides are used more often (once a year), so there is more potential for spills, leaching, or surface runoff. No-spray buffer zones are necessary so that herbicides will not reach water bodies. Care must be taken not to apply granular herbicide in areas where surface runoff is likely to occur. Herbicides should not be used next to organic farming.

Health and safety issues include the toxicity and potential long-term affects of the inert and active ingredients, carriers, and adjuvants. Workers—who are most likely to be exposed to large quantities and repeatedly—need to take precautions when handling herbicides (as specified on labels: that is, they should wear gloves, change clothes after use and before eating, and so on). Public health and safety issues include the potential effects of exposure, particularly one-time exposure. Although there is some public use of the right-of-way, only rarely might someone be accidentally sprayed or water sources be contaminated.

Spot and localized herbicide treatments work well in treating deciduous stumps to keep them from resprouting or in small areas needing vegetation control along a right-of-way or around a non-electric facility. Because of the selective nature of spot applications, vegetation in environmentally sensitive areas can be treated with less impact than other application methods.

Broadcast herbicide treatment is more appropriate for densely vegetated areas that are accessible by truck (such as along access roads). Broadcast methods are also appropriate in electric yards where total vegetation management is desirable.

Aerial spraying is appropriate in remote areas that are difficult to access by hiking (although there needs to be an accessible landing site for both the helicopter and the water-herbicide mix truck). Aerial herbicide treatment is also well-suited for areas of dense tall vegetation, where it is difficult to walk through and the foliage is high and not accessible by broadcast or backpack spray.

The costs of **spot and localized** herbicide treatments methods are $35 - $140/per acre. The cost of **broadcast** herbicide treatments are $150 - $250/per acre. The costs of **aerial** herbicide treatment are $20 - $160/per acre.

Debris Disposal

Managing vegetation includes clean-up—the treatment of slash and debris disposal. There are four basic methods:

- **Chipping:** a machine chips vegetation and spreads it on the right-of-way, piles chips, or hauls them off-site ($175 - $250/acre);
- **Lopping and Scattering:** branches are cut off a tree so the trunk lies flat on the ground in 1-to-2-m (4-to-8-ft.) lengths; cut branches and trunks are then scattered on the ground ($75 - $125/acre);
- **Mulching:** produces bigger pieces than chipping, smaller than lop-and-scatter – scattered on ground ($175 - $275/acre); and

- **Pile Burning:** vegetative debris is piled *off* the right-of-way (burning is a hazard in the right-of-way) and burned in small piles ($90-$125/acre).

Reseeding and Replanting

Reseeding and replanting are done for several reasons:

1. to control soil erosion,
2. to prevent the establishment of noxious weeds,
3. to help establish low-growing vegetation,
4. to promote wildlife habitat,
5. to mitigate visual impacts.

Approving New Techniques for Use

As part of an IVM strategy, Bonneville would adopt new techniques or herbicides for vegetation control that are more effective, safer or more environmentally benign, as appropriate.

To do this, we would review the effectiveness of the technique/herbicide, the cost to use it, and the potential environmental impacts it might cause. This information would be gathered in a *Supplement Analysis*. We would compare the impacts of the technique or herbicide with those disclosed here. If the impacts were equivalent to, and safer or more environmentally benign than the ones discussed in this EIS, then the new technique/herbicide would be added as a tool for use in our program.

If the impacts were substantially *different* from those discussed in this EIS, we would either not approve its use or conduct further environmental review in order to make an informed decision as to whether we should approve and add the tool to our program.

Public notification and comments on the new technique would be solicited through the *Bonneville Journal*, a publication used to announce projects, as appropriate.

Methods Eliminated from Consideration

Two vegetation control methods were eliminated from further consideration for Bonneville's vegetation management program:

- **Grazing** (using livestock to eat the vegetation) is only "somewhat" effective, and logistics (supplemental feed, water, containment, and predators) limit the usefulness of this method.
- **Prescribed fire** (burning an area to control vegetation) is dangerous because smoke and hot gases from a fire can create a

conductive path for electricity, and electric arcs can endanger people and objects, and cause the line to go out.

Site-specific Planning Steps & Mitigation Measures

Site-specific Planning Steps will be a tool for ensuring that environmental aspects are considered as part of an integrated vegetation management strategy and under the National Environmental Policy Act (NEPA).

The **Planning Steps** are as follows:

1. **Identify facility and the vegetation management need.**
2. **Identify surrounding land use and landowners/managers.**
3. **Identify natural resources.**
4. **Determine vegetation control methods.**
5. **Determine debris disposal and revegetation methods, if necessary.**
6. **Determine monitoring needs.**
7. **Prepare appropriate environmental documentation.**

Each Planning Step has a set of **mitigation measures** used to avoid or reduce potential environmental impacts. Those measures include consultations, when appropriate, for species identified as threatened or endangered under the Endangered Species Act, applying herbicide-free buffer zones near water bodies, contacts with landowners along the rights-of-way, following herbicide label requirements (safety, weather restrictions, drift reduction measures, etc.), limiting mechanical use on steep or wet soils, and others.

Program Alternatives and Their Impacts

Bonneville is considering three different programs, each with its own set of alternatives.

- **Right-of-way Program Alternatives** (Management Approaches MA1 & MA2; Method Packages R1, R2, R3, & R4; Vegetation Selection's VS1, VS2, & VS3).
- **Electric Yard Program Alternative** (E1)

- **Non-electric Program Alternatives** (NE1 & NE2)

Right-of-way Program Alternatives

The right-of-way program includes vegetation management on transmission-line rights-of-way and access roads, and along microwave beam paths. This program has three sets of alternatives that can be combined in different ways to create an overall right-of-way program.

Alternative MA1 – Time-Driven *(current practice)*

This management approach maintains right-of-way vegetation in repetitive maintenance cycles. Each cycle, we would clear or treat the right-of-way to try to ensure that no vegetation would threaten the transmission line or block access until the next cycle of treatment. This approach could use herbicides, or not.

Impacts with this approach include saplings growing within the corridor between each cycle, requiring the same or increasingly intensive maintenance with each maintenance cycle. The right-of-way would be repeatedly disturbed: this would include habitat, noise, and soil and non-target plant disturbance. Method-specific impacts would depend on the methods used. This alternative does not *require* the use of herbicides, and therefore could eliminate potential impacts associated with herbicide use.

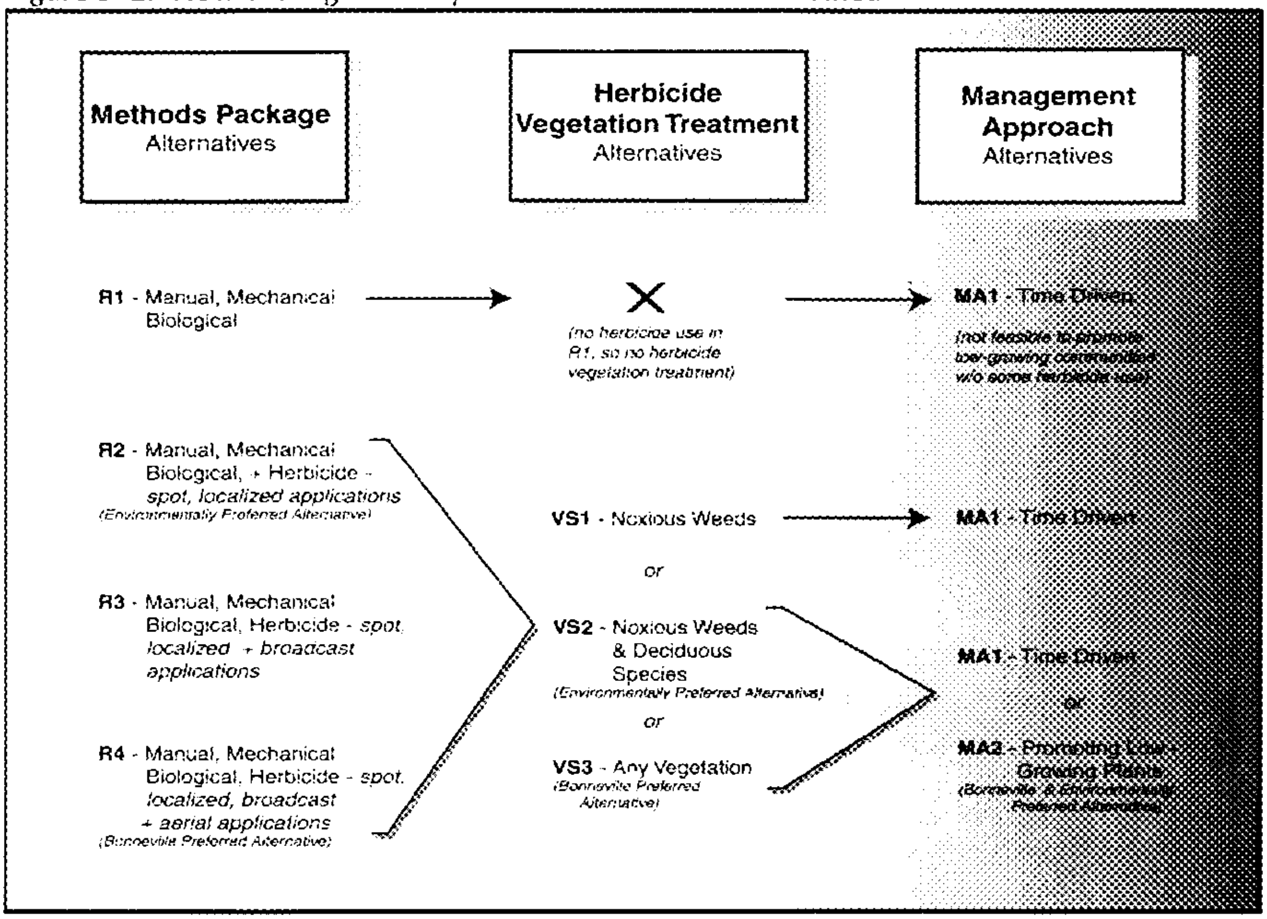
This alternative would cost less than MA2 (Promotion of Low-growing Plant Communities) initially, but more in the long term.

Alternative MA2 – Promotion of Low-growing Plant Communities *(Bonneville preferred & environmentally preferred alternative)*.

MA2 seeks to promote the establishment of low-growing plant communities on the right-of-way to "out-compete" trees and tall-growing brush.

Promoting low-growing plant communities would be done by protecting low-growing plants from disturbance during maintenance and from competing tall-growing vegetation so that low-growers can establish and propagate. This alternative requires the use of at least spot-herbicide treatment to treat deciduous species to prevent resprout.

Figure S–2: How the Right-of-way Alternatives Can Be Combined



Impacts associated with this approach would decrease over time: less intensive maintenance and right-of-way disturbance would be required. Method-specific impacts would depend on the methods used. Because at least some herbicides would be used to help control the resprouting of deciduous species, impacts include potential herbicide impacts.

This alternative would probably cost more than Alternative MA1 in the short term, but would be less expensive in the long term.

Alternative R1 – Manual, Mechanical, Biological

With this methods package alternative, most of the right-of-way would be managed manually, through chainsaw cutting of tall-growing vegetation. Mechanical control would be used in areas where vegetation was extremely dense, possibly on access roads where low brush can be a hindrance, and around tower structures. Many noxious weed areas could not be treated with this alternative;

those areas that could treated would have biological, manual, and a small amount of mechanical means used.

Impacts of this alternative include those for manual, mechanical, and biological methods. In the long term, increased impacts would occur as vegetation resprouted.

Environmental impacts are more drastic when densely vegetated areas are cleared, compared to the selective removal of trees or brush. More habitat is affected, more soil is disturbed, non-target plants that have grown in shade-tolerant situations are suddenly exposed, human presence on the right-of-way is increased, and visual impacts are more sudden and more dramatic.

This alternative would cost more to implement than Alternatives R2, R3, or R4.

Alternative R2 – Manual, Mechanical, Biological + Herbicide – *spot and localized application*. *(Environmentally preferred alternative)*

With R2, as with all of the alternatives, most of the right-of-way would still be managed manually: we would use chainsaws to cut tall-growing vegetation. About half of those areas manually cut would receive follow-up spot herbicide treatments on deciduous vegetation. *Herbicide use for tall-growing vegetation depends on the selection of Alternatives VS2 (noxious weeds and deciduous), or VS3 (any vegetation).*

Localized herbicide treatments, a relatively small amount of spot treatment (not used in conjunction with cutting), and some mechanical methods would also be used. By adding herbicide methods, manual methods would be used somewhat less than with R1.

Noxious weeds would be treated mainly via localized herbicide applications (backpack or ATV-mounted sprayers), with some biological methods, and little to no manual and mechanical methods. There would still be some areas or weeds that could not be treated.

Environmental impacts of this alternative include those for manual, mechanical, biological, and herbicide use (spot and localized techniques). In the long term, this alternative could be able to control resprouting of deciduous plants, reducing the amount of regrowth along rights-of-way.

This alternative would cost less to implement than Alternative R1 and more than R3 and R4.

R3 – Manual, Mechanical, Biological, Herbicide – *spot, localized + broadcast application*

This alternative varies only slightly from R2: most of the right-of-way would still be managed manually. Nearly half of those areas manually cut could receive follow-up spot herbicide treatments (deciduous vegetation). *Herbicide use for tall-growing vegetation depends on the selection of Alternatives VS2 (noxious weeds and deciduous), or VS3 (any vegetation).*

Localized herbicide treatments, a relatively small amount of broadcast herbicide, spot herbicide treatment (not used in conjunction with cutting), and mechanical methods would also be used. Half of the mechanical treatments could also receive a subsequent broadcast herbicide treatment.

Noxious weeds would still mostly be treated with localized herbicide applications, with some broadcast application being used instead of localized or spot treatments. There would still be untreatable areas.

Environmental impacts of this alternative include those for manual, mechanical, biological, and herbicide use (spot, localized and broadcast techniques). In the long term, this alternative could be able to control resprouting of deciduous plants, reducing the amount of regrowth along rights-of-way.

The costs of this alternative would slightly less than those of R2.

R4 – Manual, Mechanical, Biological, Herbicide – *spot, localized, broadcast + aerial application*. *(Bonneville preferred alternative)*

Under R4, most of the right-of-way would still be managed manually. Nearly half of those areas manually cut could receive follow-up spot herbicide treatments (deciduous vegetation). *Herbicide use is dependent on the selection of Alternatives VS2 (noxious weeds and deciduous), or VS3 (any vegetation).*

Localized herbicide and aerial herbicide treatments, some spot treatment (not used in conjunction with cutting), broadcast herbicide applications, and mechanical methods would also be used. Half of the mechanical treatments would also receive a subsequent broadcast herbicide treatment. The addition of aerial spraying would reduce reliance on manual methods, manual-with-spot-herbicide treatments, and localized treatments.

This program alternative offers the widest range of choices for methods to be used—the greatest number of "tools" in the tool box—when determining the appropriate method to manage the vegetation along any given right-of-way.

Environmental impacts of this alternative include those for manual, mechanical, biological, and herbicide use (spot, localized, broadcast and aerial techniques). In the long term, this alternative could be able to control resprouting of deciduous plants, reducing the amount of regrowth along rights-of-way.

The costs of this alternative would be quite a bit less than those for R1, R2 and R3.

Alternative VS1 – Noxious Weeds

With this vegetation selection alternative, we would treat only noxious weeds with herbicides. This alternative would allow us to keep in compliance with controlling noxious weeds (it is difficult to control noxious weeds without herbicides).

The environmental impacts from herbicide use would be limited to *only* those areas treated for noxious weed invasion. Because herbicides would not be used on deciduous species, there would be environmental impacts associated with the increased maintenance needed to clear resprouting vegetation.

Alternative VS2 – Noxious Weeds & Deciduous *(Environmentally preferred alternative)*

With this alternative, only noxious weeds and deciduous resprouting/suckering-type plant species could be treated with herbicides. Noxious weeds could be adequately addressed, as could the major issue of treating deciduous resprouting vegetation. We would therefore be able to promote low-growing plant communities along the right-of-way.

The environmental impacts of this alternative would include those associated with the use of herbicides in areas with deciduous species. There would be fewer general maintenance impacts (compared to VS1), because deciduous vegetation would be treated.

Alternative VS3 – Any Vegetation *(current practice —Bonneville prefered alternative)*

With VS3, we would be able to choose to treat any target vegetation with herbicides. Noxious weed issues could be addressed, deciduous species could be controlled, and there would be added flexibility in how a right-of-way would be managed. Being able to treat any vegetation allows for the option to injection-treat a stand of conifers in the right-of-way and leave the dead trees standing for habitat, while also eliminating the costs and the impacts on non-target plants from felling trees, chopping them up, and disposing of them.

There would be more potential environmental impacts associated with herbicide use and fewer potential impacts associated with other methods. The extent of maintenance needed would be the same as those under VS2 and less than those under VS1.

Electric Yard Program Alternative

The Electric Yard Program includes substations, electric yards, and sectionalizing switches.

Alternative E1 – Herbicide Treatment *(current practice, Bonneville preferred)*

To control vegetation in electric yards we would mostly use pre-emergent herbicides, which are applied to the ground to keep vegetation from germinating. Herbicides would be applied about once a year. For the few cases where vegetation *is* able to grow within the electric yard, we would use a follow-up post-emergent herbicide, weed burners, steamers, or selective hand-pulling. These post-emergent methods have potential safety issues, but are necessary in cases of sprouted vegetation.

Any potential environmental impacts associated with keeping an electric yard free of weeds would be those resulting *if* any herbicides were to migrate off-site.

Eliminated from Consideration

For safety reasons, we eliminated from consideration the alternative of *not* relying on pre-emergent herbicides in electric yards. If we did not use pre-emergent herbicides, people would have to treat all vegetation after it has sprouted. A plant in an electric yard has to grow up through a metal ground mat and could provide another grounding path for electricity. If a person were to come in contact with a plant in the yard during a fault in or near the substation, he or she could be electrocuted.

Non-electric Program Alternatives

The Non-electric Program includes facilities that have landscaping and gravel work yards or parking lots.

Alternative NE1 – Mixed Methods with Herbicides *(current practice, Bonneville preferred alternative)*

This alternative maintains landscaping manually, uses herbicides to suppress weeds, and applies fertilizers.

The associated potential environmental impacts would come from possible herbicide movement off lawns, gravel yards, and general landscaping; and noise and pollution from lawn movers, weed whackers, and leaf blowers. There is no potential environmental impact from hand hoeing, clipping, or weed pulling.

This alternative would cost less than NE2.

Alternative NE2 – Non-herbicide Methods *(Environmentally preferred alternative)*

This alternative would manage vegetation landscaping and vegetation at other non-electric facilities without using any herbicides. We would use manual methods (hoes, saws, clippers), mechanical methods (lawn mowers), and fertilizer.

Environmental impacts would include the potential spread of noxious weeds, visual impacts, noise and pollution.

This alternative would cost more than NE1.

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Chapter I
Purpose and Need

In this chapter:

- **Need**
- **Purposes**
- **Reasons for the EIS**
- **Decisions**
- **Public Involvement Process**
- **Cooperating Agencies**

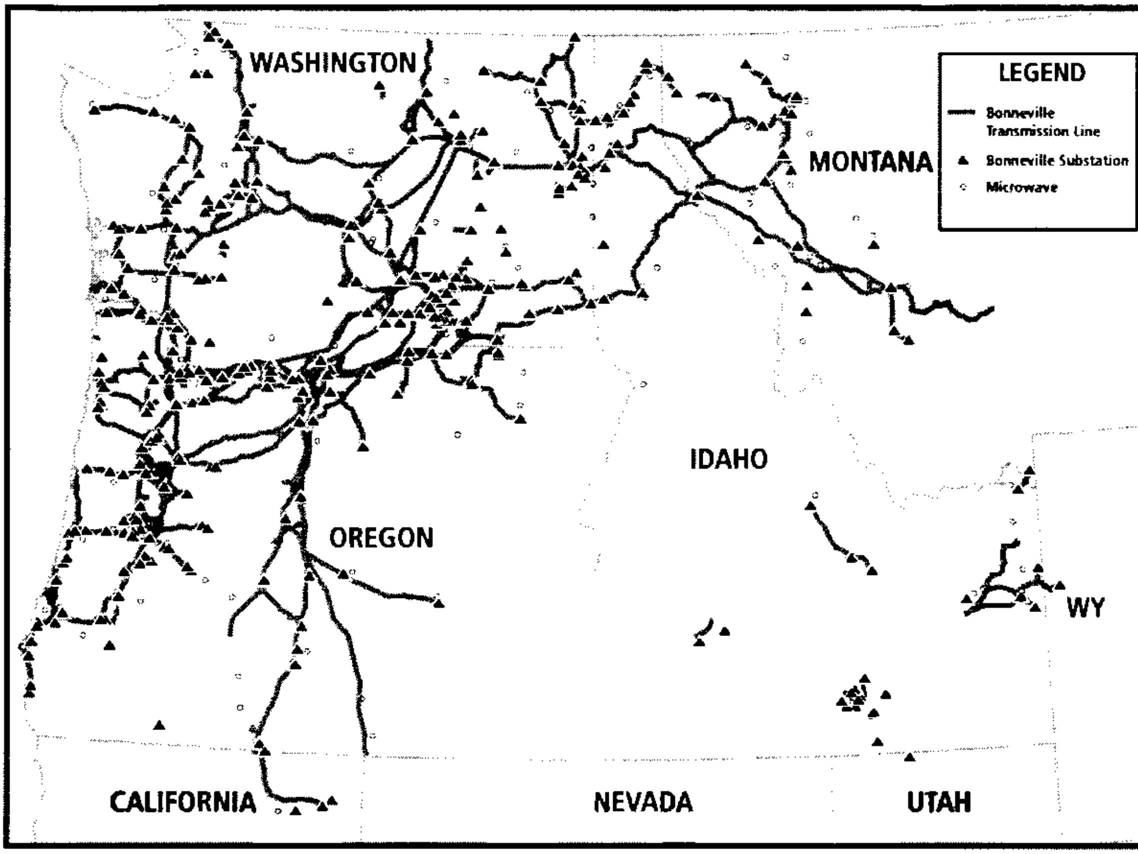
Purpose and Need for a Program

Need

Bonneville Power Administration (Bonneville) is responsible for maintaining a network of 24,000 kilometers (km) or 15,000 miles (mi.) of electric transmission lines and 350 substations. This electric transmission system operates in seven states of the Pacific Northwest. (See Figure I-1.)

These seven states offer a great diversity of vegetation. This vegetation can interfere with electric power flow, pose safety problems for us and neighboring members of the public, and interfere with our ability to maintain these facilities. **We need to keep vegetation a safe distance away from our electric power facilities.** Bonneville's vegetation management program is the policy and direction for managing vegetation at specific sites.

Figure I-1 Bonneville Service Territory



Our electric power facilities include rights-of-way (transmission lines and access roads), electric yards, and non-electric facilities.[1] We must be able to get to these facilities to carry out routine and emergency maintenance activities, and we must make sure that nothing falls into or grows too close to our power lines. We must also manage vegetation at our maintenance storage yards and administrative office complexes. (For more details, please see **Managing Vegetation at Bonneville Facilities**, later in this chapter.)

Bonneville is a major provider of electricity throughout the Pacific Northwest. Our transmission system makes up three-quarters of the Pacific Northwest's high-voltage transmission grid. Because the electric power transmission systems throughout the area are interconnected, our system can greatly affect transmission flow in the rest of the western United States.

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[1] Please see the Glossary for useful definitions.

For example, on August 10, 1996, a major power outage occurred. The outage was caused by a number of factors, including abnormally high temperatures that cause transmission lines to stretch and sag near trees. When a transmission line sags too close to (not even touching) the tree, an electrical arc can occur, taking the line out of service. The August 10th outage affected parts of Canada and ten Western states, including New Mexico and Texas. Over 7-1/2 million customers (residents and businesses) lost power for a period of from several minutes up to nine hours.

We need to make sure that vegetation does not contribute to such an outage in the future.

> ***In accordance with the Federal Columbia River Transmission System Act of 1974, "... the Administrator shall operate and maintain the Federal transmission system ... (to) maintain the electrical stability and electrical reliability of the Federal (transmission) system ...." [Section 838b]***
>
> ***In order to ensure safe and reliable power, Bonneville must control the vegetation on land around the electrical facilities that make up the Federal transmission system.***

Purposes

While managing vegetation around our facilities, we also have other **purposes** or objectives. Our vegetation management program must balance these purposes, while meeting the mission to ensure the transmission of safe and reliable power. These purposes are to

- minimize adverse environmental impacts,
- achieve cost and administrative efficiency, and
- comply with laws and regulations.

Bonneville will use these to help determine which alternatives will be chosen for our Transmission System Vegetation Management Program.

Reasons for This EIS

Preparation of this document is intended to fulfill the requirements of the National Environmental Policy Act (NEPA) for Bonneville. In 1983 we prepared an environmental impact statement (EIS) on our vegetation management program. As part of our compliance with NEPA, the EIS analyzed the possible methods used to mange vegetation and their potential environmental impacts. The program and methods we selected have formed the basis for our vegetation management ever since.

Since that time, some important things have occurred:

- We need to increase our program efficiency and consistency.
- Herbicide use is under increased public scrutiny.
- There is more emphasis on using Integrated Vegetation Management approaches. [2]

This EIS proposes various alternatives that respond to these factors.

Efficiency and Consistency

At present, Bonneville looks at all vegetation management choices and environmental impacts each time we undertake an individual (site-specific) project. This approach is inefficient: we must readdress many common issues over and over. This reiteration does not foster consistency across projects or jurisdictions, or over time.

To increase efficiency and consistency, this 1999 draft EIS (DEIS) establishes Planning Steps and mitigation measures (**Chapter III**) to provide a framework to address potential site-specific environmental impacts and issues. The EIS also explores, identifies, and discloses many of the commonly occurring environmental issues or impacts expected from vegetation management.

The site-specific environmental analysis would "tier" to this EIS by (1) using the Planning Steps to ensure consideration of all potential issues, (2) consulting with the EIS to determine whether impacts had been previously considered, and (3) applying the appropriate established mitigation measures. Site-specific analysis would be in the form of a *Supplement Analysis*. Additional broad environmental analysis would be required if anticipated impacts, project components, knowledge, or circumstances were to differ substantially from those evaluated in this EIS. See Figure I-2, next page.

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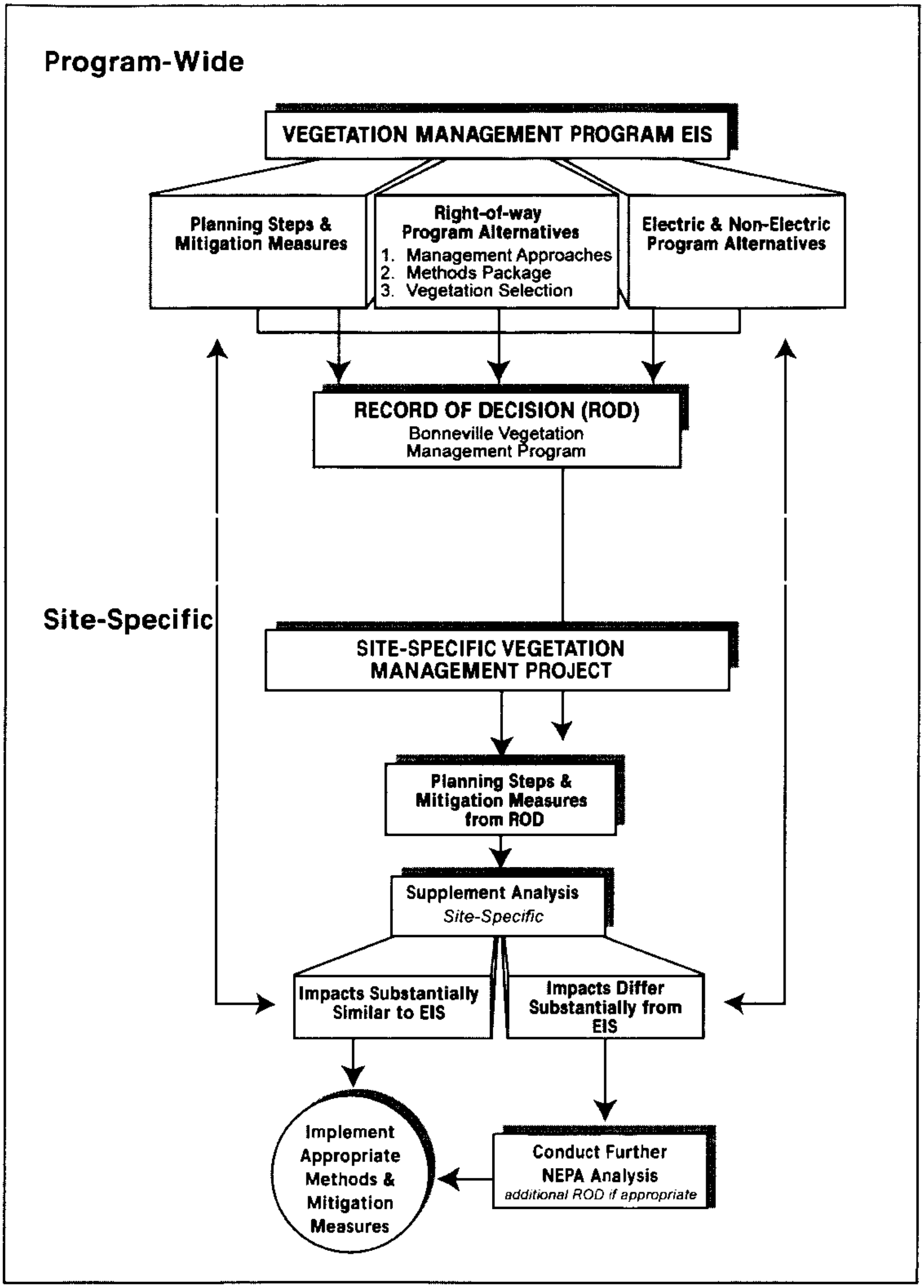
[2] More information on Integrated Vegetation Management (IVM) is provided on pages 6 - 7.

Figure I-2 Tiering Site-Specific Analysis to the Program EIS



Herbicide Use

Scrutiny of chemicals used to control insects or vegetation has increased through the years. In 1984, the U.S. Forest Service (USFS; US Department of Agriculture) and the Bureau of Land Management (BLM; US Department of Interior) stopped using herbicides to control vegetation on their lands in Oregon and Washington, in response to an injunction against herbicide use. Bonneville accordingly stopped using herbicides to control vegetation on those lands, and drastically lessened herbicide use on rights-of-way across private lands. However, we have found that, without at least some herbicide use, it has been very difficult to keep up with the growth of deciduous trees, which resprout and grow quickly, multiplying maintenance work.

This EIS describes the advantages and disadvantages of herbicide use. The alternatives were designed to help determine whether to use herbicides and, if so, to what extent.

Integrated Vegetation Management (IVM)

Integrated Vegetation Management (IVM) is a strategy to cost-effectively control vegetation with the most benign overall long-term effect on public health and safety and the environment (ecosystem). IVM tries to optimize favorable effects, while minimizing potential negative effects.

The utility industry has had continuing success in applying an IVM strategy for managing rights-of-way vegetation. IVM controls unwanted vegetation by considering the use of all suitable control methods within the context of the whole ecosystem. Methods are chosen, based on the vegetation needing control and the environmental conditions present. The study and development of new vegetation management techniques as well as the analysis and incorporation of newly developed and approved herbicides is also a major focus of IVM.

All of our right-of-way alternatives will use the overall IVM concept: we will use an array of control methods, choosing those methods or combination(s) of methods based on the vegetation needing control, cost-effectiveness, and the environmental conditions present.

IVM was developed by the utility industry from the strategy of Integrated Pest Management (IPM). IPM is the strategy for using timing and a combination of methods to control insects, diseases, and weeds that affect crops or plants. Because the "pests" for rights-of-way are strictly vegetation, not insects or diseases, the name of the strategy was changed to Integrated Vegetation Management (IVM) for utilities.

> *". . . [IPM] is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. . . . Federal agencies shall use [IPM] techniques in carrying out pest management activities and shall promote [IPM] through procurement and regulatory policies, and other activities."*
>
> *— The Food Quality Protection Act of 1996, Sec. 303 Integrated Pest Management*

The ultimate goal for IVM right-of-way management is to convert the right-of-way to low-growing plant communities that keep tall-growing vegetation out. As discussed in the Alternatives chapter (**IV**) low-growing plants can often "out-compete" trees and tall-growing brush for sunlight and nutrients. This approach can allow utilities to manage tall-growing vegetation with the least possible amount of control.

Some of the Right-of-way Program alternatives are more supportive of the IVM strategy than others. The management approach alternative—**MA1: Promoting Low-growing Plant Communities**—uses the IVM concept to the maximum by managing vegetation so that low-growing plant communities can develop as much as possible.

Decisions to Be Made

Several decisions will be made through this DEIS document and process. Those decisions are framed by considering alternative ways of managing vegetation.

Bonneville has decided to undertake planning through a series of Planning Steps (see **Chapter III**) for site-specific projects, rather than continue under the project-by-project approach we follow now.

Given the umbrella of the Planning Step approach, the decisions to be made are as follows:

Rights-of-way

1. **Management Approach** - Which management approach should Bonneville adopt for maintaining rights-of-way (Alternatives MA1, MA2)?

2. **Methods Package** - What methods should Bonneville have available for use for managing right-of-way vegetation (Alternatives R1, R2, R3, R4)?
3. **Herbicide Vegetation Selection** - If Bonneville decides to use herbicide methods, on what kinds of vegetation should they be applied (Alternatives VS1, VS2, VS3)?

Electric Yards

4. **Current Practice** - Should we continue to manage electric yard vegetation as we do currently (Alternative E1)?

Non-electric Facilities

5. **Methods** - What methods should Bonneville use for managing non-electric facility vegetation (Alternatives NE1, NE2)?

Decisions will be based on the findings contained in this DEIS (based on how each choice meets our need and purposes) and the consideration of public comments and recommendations. The Bonneville Administrator will decide which alternatives to adopt. The decision, the reasons behind it, and the conditions for it will be presented in a document called the *Record of Decision (ROD).*

Public Involvement: Scoping

Early in a project, Bonneville contacts people who may be interested in or affected by the project, to learn what issues should be studied in the EIS. Because those issues help define the scope of the EIS, this process is called "scoping."

In "scoping" this EIS, we contacted people throughout the Northwest, including Federal and state land management agencies; state and local governments; and Indian Tribes and special interest groups like the Sierra Club. Comments were sought and received in several ways.

- Published Notice of Intent to prepare an EIS, June 1997;
- Mailed letter, fact sheet (*fyi*), and comment form to about 1,500 people, June 1997;
- Held scoping meeting in Portland, July 10, 1997;
- Conducted one-on-one meetings, June-August, 1997;

- Researched public comments from earlier, similar Bonneville projects.

In all, we received about 650 comments. The focus was on what vegetation management methods to consider, what resources need to be protected, which vegetation is particularly troublesome to electric facilities, and how to coordinate with other public agencies when Bonneville facilities cross their lands. As expected, the comments were diverse and even contradictory. Here is a summary of the issues raised. (**Appendix A** offers more detail.)

- When selecting among methods, consider manual, mechanical, fire, herbicide, biological, grazing, selective cutting, herbicides, and the promoting of low-growing plant communities. (See **Chapters II and IV**.)
- When analyzing impacts, consider these resources: cultural resources, fish and wildlife, rare plants, aquatic communities, terrestrial communities, water quality, native plants and their ecological communities, wildlife habitat, hydrology, soil, soil microbes, historic and archeological resources, cultural/ traditional use plants, human and wildlife health, recreation, cost, visual resources, timber, fisheries, downstream resources and use, watersheds, and fuel management areas. (See **Chapter VI**.)
- Other advice: Fit the technique to the resource; our area (Pacific Northwest) is diverse, so the techniques must be diverse. Be sensitive to the seasonal needs of wildlife (such as nesting, giving birth, and feeding). Be sensitive to the seasonal activities of humans (such as outdoor recreation, and farming). Limit pesticide use to the extent practical through implementation of IVM. Convey the values behind the alternatives. We know you need to consider cost, but balance cost with other needs such as resource protection. (See **Chapters III, IV, and VI**.)

Cooperating Agencies

The USFS and BLM are Federal agencies that manage publicly owned lands to meet the diverse needs of people for resources such as timber, recreation, range, and minerals, and for environmental values such as wilderness and wildlife.

About 2,300 km (1,400 mi.) of Bonneville's transmission-line corridors and a number of Bonneville substations are located on lands managed by either the USFS or BLM. Because we all have strong interests in how vegetation and land along these corridors is managed, these agencies are cooperating agencies with Bonneville in developing this vegetation management program EIS.

Their cooperation should help Bonneville to analyze or coordinate vegetation management work on BLM or USFS land in an effective, efficient, consistent, and timely way.

Managing Vegetation at Bonneville Facilities

To operate our facilities safely, the vegetation around them must be controlled. Some facilities require only minimal control; others require that no vegetation at all be allowed. This section gives details on our need, outlines the requirements for safe operation, and identifies our current vegetation management program.

Where

We manage vegetation in three main areas.

- **Rights-of-way** - We manage vegetation on our rights-of-way (along transmission lines, microwave beam paths, and access roads). Here is where our vegetation management program is most visible.
- **Electric yards** - We manage vegetation in our electric yards (substations, switching stations, and around line sectionalizing switches).
- **Non-electric facilities** - We manage vegetation around "non-electric" facilities (microwave sites, parking lots, and building landscaping).

How

We use four different methods—alone or in combinations—to manage vegetation:

- **Manual cutting** (for instance, cutting brush or tree limbs with chainsaws),
- **Mechanical cutting** (such as using tractors or large mowers to remove brush),
- **Biological agents** (insects or pathogens for noxious weed control only), and

- **Herbicides** and growth regulators (using chemicals that will check or regulate vegetation growth).

The next sections describe vegetation management requirements for each facility to ensure safe and reliable operation, and what we are doing now to meet those requirements.

Rights-of-way

Transmission Lines

Transmission-line rights-of-way make up the largest area of land where we manage vegetation. As noted earlier, we deliver electric power over a network of more than 24,000 km or 15,000 mi. of transmission lines. Each line is located on a right-of-way that varies in width from a few feet (ft.) for a pole line easement[3] up to 305 meters (m) or 1000 ft. for a corridor where several transmission lines are built side-by-side. The Bonneville system contains about 93,078 hectares (ha) or 230,000 acres (ac.) of rights-of-way.

Requirements. When transmission lines are built, we clear the corridors of brush and trees in order to build the line safely. We then manage the corridors over time to limit tall-growing vegetation.

As required by law, we use the National Electrical Safety Code (NESC, 1997) as the basis for tree clearing: it defines the minimum safe distances between objects or workers and energized lines. There are two NESC requirements: vegetation must not interfere with workers maintaining, upgrading, or repairing the line; and vegetation must not create a safety hazard.

If vegetation is too close to a line, electricity can "arc over" and can create a fire or injure or kill anyone nearby. This can also happen when a line heats up on a hot day or when it is carrying a high power load and, as a result, stretches and sags closer to the vegetation below. The NESC requires us to remove any trees or other vegetation that is a hazard to the power system or that *could* become a hazard to the system.

Past Practices. Beginning in 1937, when Bonneville was created by Congress, and for the next 30 years, our vegetation maintenance program reflected the clearing we did to build new lines. This clearing was called "clean and green": all trees (and just about

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[3] Pole line easements are generally used just for electric lines strung on wood poles. The easement is just for the land the pole is on, not for the strip of land under the line. These easements also include a general right to prevent obstructions to the transmission of electricity.

everything else) were cut in a straight swath to create the right-of-way. The edges of that swath are called the "backline." Any trees that later grew in this right-of-way swath were cut when maintenance personnel could no longer see over them.

Original clearing for Vancouver-Eugene transmission line

Beginning in the late 1960s/early 1970s, we were more selective in what we cut for construction. We created curved backlines by using the natural curves of the land (topography), the differing tree heights, and the swing of the line (conductor) back and forth in the wind. (This swing area helps determine how far trees can be from the line.) The curved backlines produced a "scalloped" right-of-way. Bonneville also "feathered" the rights-of-way by leaving some trees in the right-of-way. Individual, hand-marked "save trees" were left in the right-of-way. These trees were relatively short and did not pose a near-term threat to the transmission line. In general, trees in the rights-of-way may not grow over 3 m (10 ft.) tall, unless they are in a deep canyon so they could not possibly grow into the line.

Using these techniques meant that the rights-of-way no longer had the harsh straight-line look. However, the trees then grew too close to the conductors. We often found that we had to come back and reclear the right-of-way or start our first regular maintenance clearing earlier than planned.

Up until the mid-1980s, Bonneville (and the USFS and BLM) used herbicides, including some aerial and high-volume spraying, as well as manual cutting to control vegetation on rights-of-way. We used only those herbicides approved by the Environmental Protection Agency (EPA). However, as noted earlier, in 1984 an injunction against herbicide use halted USFS and BLM use of herbicides on their lands in Washington and Oregon, including herbicide use by Bonneville on those lands. Bonneville also voluntarily cut back on our use of herbicides on other rights-of-way, including our infrequent use of aerial spraying to control noxious weeds. Instead, we hand-cut most vegetation during maintenance cycles, and used very limited amounts of herbicides to keep stumps from re-sprouting or to control weeds. As a result, however, the effectiveness of our vegetation program declined to a point that the safety and reliability of the power grid were threatened. Even with increased funding, we were unable to keep up with the growth of vegetation along many of our rights-of-way.

Current Practice. On our rights-of-way now, Bonneville currently balances the use of all four vegetation control methods: manual cutting, mechanical cutting, herbicide controls, and biological agents (for noxious weeds).[4] We are also working to inform and educate the public on our need to keep vegetation away from our facilities.

When we build a new line, we still design backlines that take into consideration the lay of the land, tree heights, tree growth, and conductor swing and sag. When necessary, we scallop and/or feather the right-of-way, depending on the trees on the site, the design and type of the transmission line, and the visual sensitivity of the area. We scallop and feather less than in the past because of the difficulty in maintaining those rights-of-way.

In special circumstances, we still leave shorter "save trees," but only when they are *not* under the conductors of the transmission line.

Once a line is in place, we routinely patrol the rights-of-way to monitor tree and shrub growth along the powerlines and access roads. We schedule maintenance *before* vegetation is inside the minimum safe distance for a non-electric worker to cut next to or under the energized line—as required by the Occupational Safety and Health Administration (OSHA). We control vegetation on the rights-of-way to achieve a maintenance-free period, which tends to be 2 - 8 years on the West side of the Cascades, and 10 - 15 years on the East side of the Cascades.

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[4] Biological agents are sometimes used to control noxious weeds. For example, working with the Oregon Department of Agriculture, Bonneville has used helicopters to drop spider mites over gorse-infested areas. These insects feed on gorse and may be able to keep these noxious weeds from forming impenetrable thickets under power lines.

We also selectively remove "danger trees"—trees that could potentially grow, fall, or bend into the lines—from the area *next to* the right-of-way. We select them for removal based on the overall condition of the tree: the stability of the ground around the tree, the tree species, and any other defect that might cause the tree to be "unstable" and likely to fall into the transmission line. If a tree is healthy and stable, it is usually not designated for removal, even if it is tall enough to fall into the transmission line. Sometimes we trim the limbs of trees adjacent to the right-of-way so those branches will not grow into the conductors.

The rights-of-way are maintained using mostly manual cutting—by chainsaws—and occasionally mechanical cutting. We also spray herbicides on smaller trees or do follow-up herbicide treatments on stumps. Noxious weed control is usually done in conjunction with other agencies, using either herbicides or biological agents.

Access Roads

We have over 13,680 km (8500 mi.) of access road to maintain. Maintenance crews use access roads to get to the transmission-line towers, substations, and other facilities.

Requirements. Access roads have to be sufficiently free of vegetation so that our crews and their necessary machinery and vehicles can safely and efficiently travel over them to the electric facility for emergency and routine maintenance work.

Access roads—no woody-stem vegetation is allowed to grow.

Current Practice. Access roads that we maintain are generally `unimproved dirt or gravel roads. We keep them clear of trees and brushy vegetation, using manual cutting tools, machines on wheels or tracks, and herbicide sprayed with backpack sprayers and truck-mounted booms. Some roads are public, some are private. Some are maintained by Bonneville, some by the underlying landowner. Some are open to public use, while others are available for use only by Bonneville and the underlying landowners.

Microwave Beam Paths

Microwave stations are used to send information quickly from point to point to help us control and regulate the flow of power across the system. Microwave stations are generally located on a series of hilltops or mountain peaks.

Requirements. Sending these signals requires that nothing obstruct the beam's path or line-of-sight.

Current Practice. Maintenance crews cut trees with chainsaws when they are found to be growing into the beam path.

Electric Yards

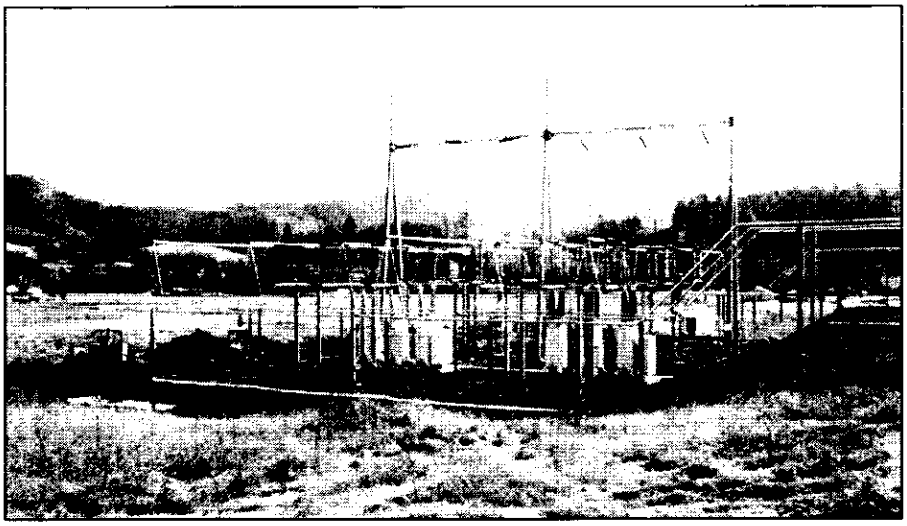
Substations

Bonneville owns and operates more than 350 substations or electric yards throughout our service area. Substations are facilities that connect transmission lines, direct electricity, and convert voltage as needed to meet customer requirements. Many of our customers supply power to businesses and residents through a distribution system. To meet our customer requirements, we need to convert or "step-down" the voltage that travels over our transmission lines to a level appropriate for their distribution system.

For safety reasons, a fence surrounds substations. Inside the fence the land is graveled and graded flat. The fenced area can range from less than 0.2 ha (0.5 ac.) up to about 16 ha (40 ac.), depending on the size of the substation. Altogether, we have about 930 ha (2300 ac.) of substation yards.

Outside the substation fence, there is typically a 3-m (10-ft) buffer of rock/gravel. Beyond that buffer, the substation property may range in size from less than an acre to over about 283 ha (700 ac.). That property may be forest, field, or landscaped shrubs.

Requirements. Vegetation is not allowed to grow in electric yards or in the 3-m (10-ft.) buffer around the yard because it could interfere with the operation of the ground mat. A ground mat is a metal grid buried under the soil to "ground" the electrical equipment of the substation. A plant growing up through the ground mat could provide another grounding path for electricity. If a person were to touch the plant during a fault in or near the substation, he or she could be electrocuted.



Substations and electric yards—no vegetation is allowed to grow inside the area, so that electrical "grounding" of equipment and the safety of workers are maintained.

Current Practice. Currently, we control vegetation inside a substation fence and in the 3-m (10-ft.) buffer zone beyond, using herbicides and occasionally using steamers or burners. In addition, trees or other vegetation that could fall across the fence and into the substation are manually cut.

Line Sectionalizing Switches

Line sectionalizing switches are located on transmission towers that redirect electricity on the right-of-way. Generally there is a metal grated platform on the tower where a worker stands to operate the switching equipment.

Requirements. Just as in a substation (and for the same reasons), the area below the sectionalizing switch platform needs to be kept completely clear of vegetation. The function of the ground mat in the substation is identical to that of the platform on the tower. If a plant grows up through or near the platform, it can create a difference in the potential. If there is a fault in the area, and a worker touches or comes close to that plant while on the platform, the worker could be injured or killed.

Current Practice. Current practice is to remove all vegetation by herbicides, usually with a backpack sprayer or hand-applied granular method.

Non-electric Facilities

Radio/Microwave Stations

Bonneville operates about 381 microwave or radio stations with antennae or repeaters; about 146 of these stations are co-located at Bonneville substations. Together, they form the backbone of our communication system, carrying information from substation to substation for the protection and control of the Bonneville transmission system as well as for voice communication for Bonneville's radios and telephones.

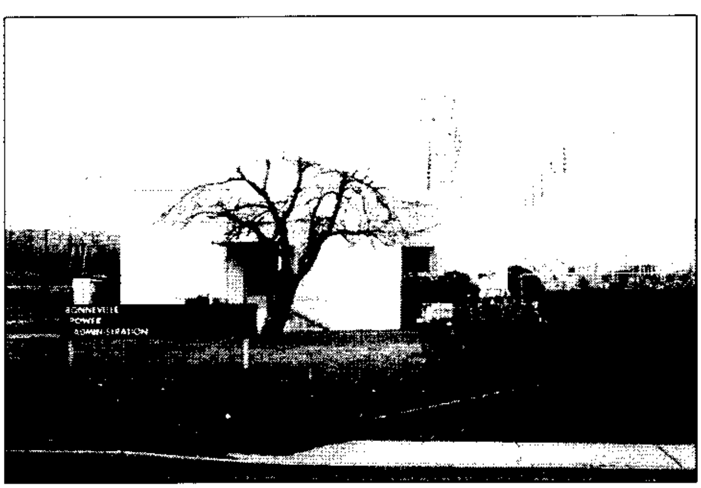
These fenced stations are typically located at prominent points in the landscape, on hilltops or mountaintops.

Requirements. In order to access the towers and buildings easily, the area within the station fence is graveled and kept clear of most vegetation.

Current Practice. We use herbicide to keep the fenced area clear.

Landscaping Maintenance Buildings and Yards

Landscaping is in place outside many of our substation yards and buffers, as well as at many of our maintenance buildings and other "yard" facilities. Depending on their function, these maintenance facilities vary in size from 0.8 – 8 ha (2 – 20 ac.). Typically, most of the land has been developed with buildings, landscaping, and pavement with few or no natural features.



Landscape vegetation outside St. Johns substation in Oregon.

Requirements. Vegetation is managed in these areas for aesthetics, ease of handling equipment, maintenance of a firebreak, and prevention of the spread of noxious weeds.

Current Practice. We maintain landscaping by manual and mechanical cutting, as well as by spraying herbicide on turf, shrub beds, and gravel or dirt work yards and parking lots.

Related Projects and Planning Activities

The following Bonneville documents or projects are related to managing vegetation in the Bonneville transmission service area.

Bonneville Documents/ Projects

- **Transmission Facilities Vegetation Management Program Environmental Impact Statement (1983)** - This is our most recent program-wide vegetation management EIS. (USDOE/Bonneville, 1983)
- **Columbia Gorge Vegetation Management Project Environmental Assessment (July 1996)** (USDOE/Bonneville, 1996)
- **Bonneville-Hood River Vegetation Management Environmental Assessment** (USDOE/ Bonneville,1998a)

Forest Service and Bureau of Land Management Documents/ Projects

The following USFS and/or BLM documents or projects are related to managing vegetation in the Bonneville transmission service area.

- **Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (Northwest Forest Plan) (April 1994)** - This USFS/BLM plan was developed to help find strategies to manage Federal forestlands west of the Cascade Range in Oregon and Washington. (USDA/USFS and USDOI/BLM, 1994b)
- **Interior Columbia Basin Ecosystem Management Project East Draft Environmental Impact Statement (May 1997)** - This draft statement was developed by four Federal land management agencies to help select an ecosystem-based management strategy for the lands that the agencies administer east of the crest of the Cascade Range in Oregon and Washington. (USDA/USFS and USDOI/BLM, 1997a)

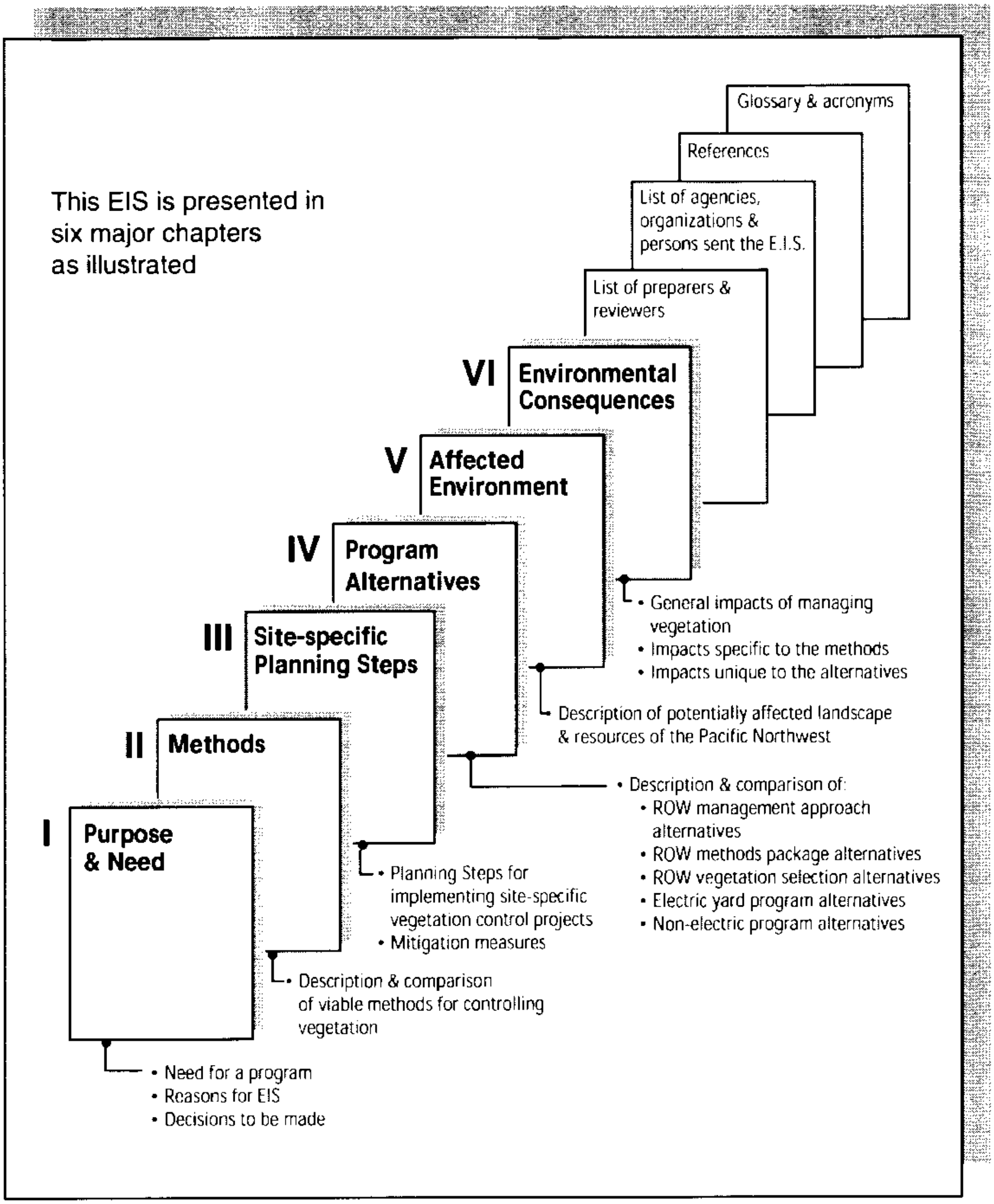
- **Interior Columbia Basin Ecosystem Management Project Upper Columbia River Basin Draft Environmental Impact Statement (May 1997)** - This draft statement was developed by four Federal land management agencies to help select an ecosystem-based management strategy for the lands that the agencies administer in the upper Columbia River Basin. (USDA/USFS and USDOI/BLM, 1997b)
- **Vegetation Treatment on BLM Lands in Thirteen Western States (May 1991)** - This BLM document analyzes the environmental impacts of vegetation treatment on BLM lands, using integrated pest management methods. (USDOI/BLM, Wyoming, 1991b)
- **A Guide to Conducting Vegetation Management Projects in the Pacific Northwest Region (1992)** - This USFS document is the guide for implementing vegetation management on Forest Service land in Washington and Oregon. It summarizes information contained in the 1992 Amended ROD for Managing Competing & Unwanted Vegetation (FEIS) published in 1988 (USDA/USFS Pacific Northwest Region, 1998b) and the Mediated Agreement from 1989. (USDA/USFS, 1992a)
- **Western Oregon Program-Management of Competing Vegetation (August 1992)** - This document presents the provisions to govern the BLM's integrated management treatment program for undesirable plants and competitive levels of vegetation on public lands in western Oregon. (USDOI/BLM, 1992c)
- **Northwest Area Noxious Weed Control Program (December 1985)** - This BLM document covers a five-state program for the control of noxious weeds on BLM-administered lands. (USDOI/BLM, 1987a)

How This DEIS Is Organized

An EIS follows a guide[5] for what must be covered and (generally) in what order. Because this EIS covers so many different choices and alternatives (including different techniques), the figure on the next page shows what kind of information is provided, and where. Some people like to go straight to particular topics of interest; others like to read through chapter by chapter. In either case, Figure I-3 will help you find what you want to know.

[5] The National Environmental Policy Act (NEPA) specifies the need for environmental studies of major Federal actions that might affect the environment; the Regulations of the Council on Environmental Quality spell out the approach and content.

Figure 1-3: How This DEIS Is Organized



ROW = Right-of-way

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Chapter II
The Methods

In this chapter:

- **Vegetation Control Methods**
- **Debris Disposal, Replanting & Reseeding**
- **Approving New Techniques**
- **Methods Eliminated from Consideration**

Methods Overview

Bonneville is considering four[1] **general control methods** that can be used individually or in combination to control vegetation:

- manual cutting,
- mechanical cutting,
- biological control agents, and
- herbicides and growth regulators.

For herbicides, we are considering 24 **herbicide active ingredients** (including 4 growth regulators) and 4 **herbicide application techniques:**

- spot,
- localized,
- broadcast, and
- aerial.

These methods and techniques, in various combinations, make up the alternative vegetation management programs discussed in

[1] Bonneville also conducts Public Information and Education to create an awareness of the need to keep vegetation away from electric facilities. Public Information and Education can also be considered a "control method." It is discussed at the end of this chapter.

Chapter IV. The information presented below is used to help compare those alternatives.

To assist the reader, we provide three tables to show each of the types of methods in the context of where they might be used, and what their impacts would be. See page 27 for Table II-1 (Control Methods Appropriate to the Facility), page 30 for Table II-2 (Methods Appropriate by Right-of-Way Vegetation Types), and page 33 for Table II-3 (Impacts Specific to the Methods).

Manual Control Methods

Description

Vegetation can be managed by pulling or cutting with hand tools. Here is a list of manual techniques.

- **Pulling** – physically pulling vegetation from the soil.
- **Cutting** – using shears, clippers, chainsaws, brush saws and axes to sever aboveground vegetation.
- **Girdling** – cutting a ring around the trunk of the tree deep into the cambium layer, killing the tree but leaving it standing.
- **Steaming/Burning** – using a hand-held hot device that kills vegetation with steam or by burning (used in electric yards only).

Hand-pulling and hoeing are most appropriate for landscaping at non-electric facilities. These techniques are too labor-intensive and ineffective for weed control on the rights-of-way or for wood-pole protection.

The most commonly used manual method in the right-of-way is **cutting** with chainsaws. This method is used particularly when cutting down larger trees within the right-of-way or danger trees next to the right-of-way.

Chainsaws are also used in the rare cases where we **top** or **prune** trees.

Topping is removing the top portion of a tree without felling the whole tree. On an evergreen, one-third or less of the top would be cut (if we cut any more off, the tree would be likely to die). Deciduous trees can often be cut back more severely without killing the tree. Topping can delay the tree's growing into transmission lines or microwave beam paths, but it will need constant treatment to keep it from threatening the line. Severe topping can also be done purposely to kill the tree, leaving a snag for wildlife habitat.

Pruning is the removal of selected branches from tree trunks, without felling the whole tree.

Bonneville uses or allows topping and pruning, which are highly labor-intensive, only in special situations—for instance, where it is necessary to leave trees in place as visual screens or where other options are not available.

Girdling means manually cutting a ring around a selected tree trunk deep into the growth layer. Girdling kills conifer species; deciduous trees, however, will frequently resprout below the girdle unless the cut is treated with herbicide. If girdling kills the tree, it can be left standing as a snag to decompose and fall on its own. We rarely use this practice, but it may be appropriate where the snag would offer high-quality habitat for wildlife.

Bonneville has used **steamers** and **burners** as an experimental control method for vegetation within a few substations. The hand-held steamer uses that steam to kill the vegetation it contacts. Burners are machines that resemble a large riding lawn mower that burns the vegetation. Very little smoke is produced because the vegetation must be dry to achieve the best results. (Burning is not used as a vegetation control method on Bonneville rights-of-way because of safety problems. Please see **Methods Eliminated from Consideration**.)

Advantages and Disadvantages

Manual techniques—mainly using a chainsaw—can be used in many circumstances, with relatively low environmental impacts. One or two trucks, carrying equipment and workers, drive along the access road to the appropriate site. Crews of 8 –10 people with chainsaws then hike along the right-of-way, cutting target vegetation.

Manual techniques can be highly selective, cutting only targeted vegetation. The short-term impact of chainsaw noise can disturb wildlife and neighbors.

Worker health and safety issues center on the safety impacts of hiking along the right-of-way, carrying and using chainsaws and other tools, and felling trees. Manual vegetation control is difficult to carry out in areas where the vegetation is dense, in remote locations, or in steep terrain. This method also creates lots of debris.

This method works only in the short term for deciduous trees, which often resprout. Resprouting trees grow back with more stems than the original cuts, creating more dense vegetation than existed *before* the manual cut. Successive cuttings significantly increase the amount and difficulty of labor needed to complete vegetation control.

Manual vegetation control can be used under many weather and site conditions. However, sometimes chainsaw use is not allowed during hot summer dry spells when fire potential is high and sparks are a concern. Due to the noise and potential disturbance, chainsaw use may also be restricted at certain times in areas with threatened and endangered species.

Please see Tables II–1 (following), and II-2 (page 30) for a list of methods and their appropriate use for various facilities and vegetation types. Please see Table II-3 (page 33) for the impacts specific to each method.

Cost

As with all methods, the cost of implementing manual vegetation control varies: the taller and more dense the vegetation, the costlier the control. Other factors contributing to cost variations include the remoteness of work locations and length of the work performance period.

Manual vegetation control costs from $70 to $700 per acre.

In the best of circumstances, the low-cost manual figure is *less* than the costs for mechanical methods or broadcast herbicide techniques. This difference is due to the lower costs associated with the use of manual equipment compared to the heavy equipment involved in the other methods.

The manual cost figure is two to five times as much as spot and localized herbicide costs. This cost difference is because (1) manual control may require debris cleanup, while herbicide-sprayed vegetation is usually left in place; (2) it is less labor-intensive to walk through an area spraying vegetation (spot and localized treatments) than it is to walk through an area cutting down vegetation; and; (3) for aerial applications, they can be done much more quickly than manual.

The high-end cost of manual control reflects the difficulty of using manual control in remote areas or in areas where the tree density is thick: in these areas the costs can be as high as $700/per acre. That cost is exceeded only by high-end costs for mechanical methods.

Please see Table II-5, on page 44, for the cost comparisons of the methods.

Table II-1: Control Methods Appropriate to the Facility

Vegetation Control Method	Rights-of-Way	Electric Yards	Non-electric Facilities
Manual	**YES** Manual methods are appropriate for selective veg. removal, & may be used in most circumstances.	**YES *in a few cases*** Steamers, burners, or hand pulling maybe needed for emergent veg. (but can be dangerous).	**YES** Manual methods are appropriate for selective veg. removal at non-electric facilities.
Mechanical	**YES *in some cases*** Mechanical methods are appropriate where thick stands of veg. must be controlled.	**NO** Mechanical methods are not appropriate for veg. control in graveled electric yards.	**YES** Lawnmowers appropriate for landscaping. Mechanical not suitable at microwave/radio sites.
Biological Agents	**YES** Biological agents are appropriate for controlling noxious weeds on ROWs or access roads, if immediate control not required.	**NO** Biological agents work too slowly to be useful at these facilities; they reduce but do not eliminate unwanted veg.	**NO** Biological agents work too slowly to be useful here; they reduce but do not eliminate unwanted veg.
Herbicide *Spot*	**YES** Spot treatments are appropriate where selective elimination of species is desirable.	**YES *in some cases*** Spot treatments appropriate where plants re-appear in a previously treated electric yards.	**YES *in some cases*** Spot treatments appropriate for individual plant treatments around a non-electric facility.
Herbicide *Localized*	**YES** Localized treatment is appropriate on ROWs with low to medium target plant density.	**YES** Localized applications are appropriate bare-ground treatments in small-to-medium-sized electric yards.	**YES *in some cases*** Localized treatments may be appropriate for small areas of veg. around a non-electric facility.
Herbicide *Broadcast*	**YES *in some cases*** Broadcast suitable for treating large/dense areas of right-of-way veg., especially where access by truck is readily available.	**YES** Broadcast application (spray/ granular) is appropriate for large-scale treatment of an electric yard.	**YES** Broadcast bare-ground treatments are appropriate for non-electric facilities (esp. parking lots, work-yards).
Herbicide *Aerial*	**YES *in a few cases*** Aerial spraying is appropriate in remote areas (difficult to reach by vehicle & hiking) & areas of high veg. density or noxious weeds.	**NO** Aerial application is not appropriate for electric yards; applications would coat electric equipment & might not reach the soil.	**NO** Aerial spray is not appropriate for non-electric facilities (unless, perhaps, a large property needed noxious weed control).
Other	**YES *in some cases*** Reseeding is appropriate in areas of steep slopes or erodable soils & little potential natural reveg.	**YES *in some cases*** Black plastic may be laid down in smaller switching stations to stop veg. growth.	**YES *in some cases*** Black plastic appropriate in microwave/ radio & landscaping. Reseeding & plantings appropriate for landscaped grounds.

Key: **YES** = Appropriate in most circumstances; often used. **YES *in some cases*** = Often appropriate, but not in every circumstance **YES *in a few cases*** = Rarely used **NO** = Not appropriate for this type of facility.

Mechanical Control Methods

Description

We can manage vegetation by cutting it with mowing-type equipment mounted on rubber-tired or tracked-type tractors. This equipment consists of the following:

- **Chopper/shredders.**
- **Mowers** with a rotary head piece (usually mounted on an articulated arm) that is driven by a track or rubber-tired vehicle.
- **Walking brush controllers** with booms, dippers, and others means to manipulate equipment and control vegetation with minimal soil disturbance.
- **Feller-bunchers,** machines that grab the trees, cut them at the base, pick them up, and move them to a pile or onto the back of a truck. The tree is always under the machine's control.
- **Roller-choppers,** rotating drums, towed by a variety of vehicles, that roll and chop vegetation and forest debris. A series of blades, steel chains, or other protuberances attached to the drum obliterate the target vegetation/debris.
- **Blading,** a steel blade or steel fork attachment on a tracked or rubber-tired vehicle that removes vegetation through a combination of pushing and/uplifting motions.

Of the mechanical methods identified above, mowers are the most often used for utility work. On access roads, we have used mowers to mow both grasses and small woody-stemmed shrubs. Mowers can also be used around tower legs or poles and in the rights-of-way where stems are small. Regular lawnmowers are used for grounds-keeping at most of Bonneville non-electric facilities.

Advantage and Disadvantages

Mechanical methods are very effective for completely removing thick stands of vegetation. These methods clear thick stands of vegetation more quickly than manual cutting. Some mechanical equipment can also mulch or lop and scatter vegetation debris as the equipment moves through an area, so debris disposal is taken care of all in one step.

Most mechanical techniques (e.g., using mowers or troller-choppers) are non-selective or much less selective than manual methods: they tend to clear or cut all vegetation within the path. Mechanical methods that affect all vegetation in the path of the machine are undesirable for selective vegetation removal.

Some mechanical methods (walking brush controllers and feller-bunchers) can selectively remove target vegetation with little disturbance to surrounding plants.

In general, mechanical methods that disturb soil (heavy equipment or scraping actions) are not appropriate to use near water bodies or wetlands, on steep slopes, or in areas of soft soils. Soil can be compacted and eroded. Subsurface cultural artifacts can be disturbed or destroyed.

Heavy machinery noise, exhaust, and dust associated with many mechanical methods can disturb wildlife and neighbors. Due to the noise and potential disturbance, heavy machinery use may be restricted at certain times in areas with threatened and endangered species. There is also some possibility of oil spills, using mechanical equipment.

As with manual methods, the mechanical methods can also often be limited in effectiveness to the short term: deciduous trees can often resprout after being cut, growing back with more stems and creating a denser cover that takes more work to remove. Sometimes mechanical methods shake or pull the roots, so the plant does not resprout.

Health and safety issues of using heavy equipment include vehicle accidents and flying debris.

Please see Tables II–1 (page 27), and II-2 (following) for a list of methods and their appropriate use for various facilities and vegetation types. Please see Table II-3 (page 33), for the impacts specific to each method.

Cost

Mechanical vegetation control costs from $100 to $600 per acre.

The relatively high costs of mechanical clearing reflect the need to use heavy machinery and the transport of that equipment.

Please see Table II-5 (page 44), for the cost comparisons of the methods.

Table II-2: Methods Appropriate by Right-of-Way Vegetation Types

Vegetation Control Method	Agricultural Areas	Forest Areas	Grassland & Shrub	Noxious Weeds	Danger Trees *Along rights-of-way*
Manual	**YES** ***in a few cases*** Usually not many trees needing control.	**YES** Manual methods appropriate for tree removal.	**YES** ***in a few cases*** Usually not many trees needing control, brush on access roads.	**NO** Manual methods wouldn't control roots, would spread seed.	**YES** Manual methods are appropriate for selective removal of danger trees.
Mechanical	**YES** Underlying agricultural landowner often uses mechanical methods.	**YES** ***in some cases*** Appropriate for dense stands of vegetation.	**YES** ***in some cases*** Appropriate for clearing brush on access roads, or around towers.	**NO** Mechanical methods tend to disturb ground and spread seeds.	**NO** Mechanical methods tend to be non-selective and used for smaller tree heights (use of feller-buncher machine may be appropriate).
Biological Agents	**NO** Noxious weeds are usually taken care of through agri-cultural practices.	**YES** ***in a few cases*** Appropriate if noxious weeds are also in areas adjacent to right-of-way.	**YES** Appropriate for noxious weed control.	**YES** Biological agents are appropriate only for controlling noxious weeds.	**NO** Not appropriate for target vegetation other than noxious weeds.
Herbicide	**YES** Underlying agri-cultural landowner often uses herbicide methods – localized treatments of weeds around tower legs.	**YES** Appropriate for target vegetation control (including noxious weeds), stump treatments of deciduous.	**YES** Appropriate for use on access roads, around tower sites, or for noxious weed control.	**YES** Appropriate for con-trolling noxious weeds.	**YES** ***in a few cases*** Growth regulator appropriate to stunt growth of potential danger trees, injection treatment to allow dead standing tree.

Key: **YES** = Appropriate in most circumstances; often used. **YES** ***in some cases*** = Often appropriate, but not in every circumstance **YES** ***in a few cases*** = Rarely used **NO** = Not appropriate for this type of facility/circumstance

Biological Control Methods

Description

The biological methods discussed here are biological agents: **plant-eating insects or pathogens** (agents such as bacteria or fungus that can cause diseases in target plants) that weaken or destroy noxious weeds.[2] Because most noxious weeds originate in other countries, they can gain a competitive advantage over native plants because the natural enemies found in their homelands are often missing. With biological controls, selected natural enemies of a weed are introduced and managed to control weed spread.

Biological control agents affect noxious weeds both directly and indirectly.

Direct impact destroys vital plant tissues and functions.

Indirect impact increases stress on the weeds, which may reduce their ability to compete with desirable plants.

Agents released in our area have been tested to ensure they are host-specific: that is, they will feed *only* on the target plant and will not switch to crops, native flora, or endangered plant species when the target vegetation becomes scarce. Testing is an expensive and time-consuming task that must be done before the agents are introduced into the United States. The agents are not allowed into the United States if they are not host-specific (Pacific Northwest Weed Control Handbook, 1997). Please see **Appendix B** for a list of biological weed control agents.

Bonneville works with local or state weed control agencies to control noxious weeds along the rights-of-way.

Advantages and Disadvantages

Insect biological controls are used exclusively to control noxious weeds. At present, scientists have not identified insect biological controls for all noxious weeds; this depends on the testing and approval of insects for this use.

Using insects causes little potential environmental impact. Insects eat or stress weeds so they die without disturbing soil or other plants. The use of insects also does not create the intrusive human presence that mechanically or manually clearing noxious weeds does; insect use also does not have the potential contamination issues of herbicides.

[2] Grazing (not included here) is also considered a biological method; see **Methods Eliminated from Consideration** at the end of this chapter.

Biological control is a slow process, and its effectiveness varies widely. It is often stated that this type of noxious weed control is highly unlikely to eradicate noxious weeds. For example, scotch broom seed weevils (*Apion fuscirostre*) will feed on the broom seeds. This feeding will limit the broom's spread, but the seed weevils will not kill the *existing* plants. This is because the agents depend for survival on the density of the "host" weeds. As populations of the host weeds decrease (leaving less to feed on), populations of the biological control agent will correspondingly decrease. Therefore, a resurgence of weed populations may occur due to seed reserves in the soil, missed plants, and lagging populations of agents.

Health and safety impacts are limited to transporting insects to the site, hiking along the right-of-way, and potential helicopter accidents with aerial release of insects.

Since biological control agents are living entities and require specific conditions to survive, the ability to use insects may be affected by weather and other site conditions.

Please see Tables II-1 (page 27), and II-2 (page 30) for a list of methods and there appropriate use for various facilities and vegetation types. Please see Table II-3 (following) for the impacts specific to each method.

Costs

Biological vegetation control costs range from $80 to $150 for ground applications of insects to noxious weed areas, and $150 to $275 for aerial drop.

The relative high cost of this method reflects the availability of appropriate insects, as well as the coordination and expertise involved in dealing with the particular insects and with treating noxious-weed-infected areas in general. The higher costs of aerial application reflect the use of the helicopter, although this method is probably more feasible for large areas or areas that are difficult to access.

Please see Table II-5 (page 44), for the cost comparisons of the methods.

Table II-3: Impacts Specific to the Methods

Vegetation Control Method	Vegetation	Soils	Water	Fish	Wildlife	Agri-culture	Timber	Rec-reation	Resi-dential	USFS/ BLM Tribes	Cultural Resources	Worker Health & Safety	Public Health & Safety	Visual
Manual	Can be selective with little/no impact on adjacent non-target vegetation. Encourages resprout of deciduous species.	Little impact, duff layer disturbed in small area.	Little erosion potential for erosion, minor chance oil/fuel spill.	Minor potential for chainsaw oil/fuel spill to affect fish.	Short-term chainsaw noise disturbance, habitat changes if dense resprouting.	No impact.	No impact on adjacent timber lands.	Chainsaw noise may disturb recreation.	Chainsaw noise annoying.	Impacts could occur if USFS, BLM, or Tribal representatives are not consulted *(measures mitigate)*	No impact on subsurface artifacts, cultural plants could be disturbed *(measures mitigate).*	Impacts if accidents with felling trees, chainsaw, due to rough terrain.	Impacts if accidents of the public near tree felling.	Cut stumps can be unsightly.
Mechanical	Some mechanical is not selective, can destroy non-target vegetation, may encourage resprout of deciduous, may expose soils for noxious weed invasions.	Some mechanical can expose or compact soils.	Can cause erosion, increasing sediments *(buffers mitigate).*	If sediments from soil-disturbing equipment, fish feeding affected, oxygen depleted. *(buffers mitigate).*	Noise may disturb; non-selective habitat changes, may harm soil-dwelling species.	If terrain grade changed, potential drainage impact on adjacent agricultural areas.	No impact on adjacent timber lands.	Noisy, in a few cases, shredded slash may be difficult to traverse.	Noise and dust could disturb residents.		If soil disturbance, subsurface artifacts and cultural plants could be disturbed *(avoidance measures mitigate).*	Potential heavy machinery accidents.	Potential flying debris if nearby public.	Can leave swaths of scarified land.
Biological Agents	May encourage growth of non-target and native species.	Slight potential for increased soil erosion *(reseeding mitigates).*	No impact.	Insects may provide food source.	Insects may provide forage.	Variable positive impact on production	Variable positive impact on production	Insects may not be aesthetically pleasing.	Slight potential to affect susceptible, privately grown plants.		May encourage growth of cultural plants.	Potential accidents in rough terrain, or helicopter.	No impact.	No impact.
Herbicides	If non-selective applications or herbicides used, non-target plants affected. Use can encourage low-growing plants.	Slight potential that soil micro-organisms could be affected; slight potential for increased soil erosion.	If spill, drift, or leaching water could be affected *(buffers mitigate).*	If certain herbicides reach water; fish could be harmed (buffers mitigate).	Slight potential that direct spray or spill would affect wildlife. Use can create low-growing habitat.	Impact if drift on adjacent crops/ organic farming, grazing animals *(buffers mitigate).*	Slight possibility of drift or over-spray affecting timber trees	Standing dead vegetation may reduce aesthetics.	Potential drift/spill smell, health impacts *(measures mitigate).*		Slight potential to affect unknown cultural plants *(measures mitigate).*	Impacts of repeat exposure if herbicide handled carelessly *(safety measures mitigate).*	Contact through drift, leach, or spill could cause reactions *(measures mitigate).*	Areas of browned vegetation can be unsightly. Can help create low-growing plant community.
Debris Disposal	Non-target plants can be damaged when debris dispersed.	Can decrease nitrogen until decomposed, add nutrients after de-composition.	Debris in streams can clog *(measures mitigate).*	Leafy debris in stream depletes oxygen (measures mitigate).	Debris piles change habitat.	Impact on cows if conifer debris eaten *(measures mitigate).*	No impact	Difficult to traverse lop & scatter, smoke from slash piles.	Impacts of noise and dust.		Cultural plants could be affected if presence unknown *(measures mitigate).*	Care must be taken with chipping & burning.	Impacts if flying debris.	Lop & scatter looks unkempt.

Herbicide Control Methods: Active Ingredients

Description

Herbicides kill or damage plants by inhibiting or disrupting basic plant processes. Different herbicides affect plants in different ways: they may keep plants from manufacturing the food they need to live and grow (inhibit photosynthesis), alter hormonal balances, distort normal plant growth, or inhibit seed germination. Herbicides are most often applied in mixtures with water or oil carriers, various adjuvants (wetting agents, sticking agents, stabilizers or enhancers, thickening agents, etc.), and/or dyes needed for application or environmental monitoring.

Growth regulators are also discussed in this section. Growth regulators *slow* the growth of vegetation rather than killing it.

Note: This EIS offers alternatives on whether or under what conditions to use herbicides. The active ingredients discussed in this section are the herbicides we are considering when referring to herbicide use.

Bonneville uses only those herbicides that have been approved by the Environmental Protection Agency (EPA) (as with all herbicides sold in the United States). All those who use such chemicals are required by law to follow the label directions on the manufacturer's herbicide container— "the label is the law." Bonneville's herbicide treatments comply with the EPA-reviewed and -approved manufacturers' instructions printed on the label.

Bonneville is considering 24 different active herbicide ingredients—including 4 growth regulators—to be available for use in those Program Alternatives that use herbicides.

- Fifteen of these herbicides could be used for rights-of-way (Program R).
- Seven herbicides could be used in electric yards (Program E).
- Twelve herbicides could be used for non-electric facilities (Program NE).

Some of the herbicides have multiple uses and can be used in more than one program. The active herbicide ingredients are used in various formulations developed by chemical companies. Table II-4 (page 37) lists the active ingredients, registered uses and facilities where they might appropriately be used.

EPA uses a human-health toxicity rating system for herbicides, from "Category I" (highly toxic) to "Category IV" (practically non-toxic). Most of the herbicides' active ingredients proposed for use in this EIS fall into Category III or IV. However, depending on the formulation of the technical product, some of the herbicides fall into higher categories because they hold greater risk for Injury.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires all herbicides to be classified for their potential hazards based on the circumstances to which they are used. The two classifications are GENERAL USE and RESTRICTED USE. *General Use* herbicides generally have lower toxicities with corresponding lower hazards to humans and the environment. *Restricted Use* herbicides generally have higher toxicity ratings and are often hazardous to humans and/or the environment. Some pesticide formulations containing the same active ingredient may be registered in both classifications, depending on the ingredient concentration, application method, and intended use. In addition, individual states may reclassify a General Use pesticide to a Restricted Use pesticide (Federal law allows qualifying states to regulate FIFRA in a more, but not less, strict sense).

With exception, General Use herbicides can be purchased and applied by the general public without training or licensing. Exceptions include, but are not limited to, applying General Use herbicides with motorized equipment and the application of aquatic use herbicides. These exceptions and all Restricted Use herbicides can only be purchased and used by trained and licensed applicators or others under the direct supervision of a trained and licensed applicator. With either classification, the applicator is required by law to follow all label instructions and restrictions.

Bonneville employees are trained and certified through the Government Agency Plan (GAP); see **Appendix C**. GAP-certified licenses are valid for Idaho, Montana, Oregon and Washington. Due to the small acreage involved, Bonneville employees applying herbicides in California and Wyoming obtain their certification from the individual states.

Table II-4: Bonneville Proposed List of Approved Herbicides for Use

Herbicide	Registered Label Uses	Facilities Where Use is Appropriate		
		Rights-of-way	Electric Yards (bare-ground)	Non-Electric (landscaping)
Benefin	Annual grasses & small-seeded broadleaf weeds.			X
Bromacil	Broad-spectrum; controls perennial grasses & broadleaf weeds.	X	X	
Chlorsulfuron	Broadleaf & grassy weeds.	X		
Clopyralid	Annual & perennial broadleaf weeds.	X		X
2, 4-D	Broadleaf & aquatic weeds, brush, & trees.	X		X
Dicamba	Perennial & annual broadleaf weeds, brush & trees.	X		X
Dichlobenil	Broadleaf weeds & grasses, annual & perennial in seedling stages; selective for pre- & post-emergence.			X
Diuron	Wide variety of annual & perennial broadleaf & grassy weeds on both crop & non-crop sites.	X	X	
Glyphosate	Deep-rooted perennial & annual/biennial species of grasses, sedges, broadleaf weeds, brush & trees.	X	X	
Halosulfuron-methyl	Sedges & horsetail in turf & landscape.			X
Hexazinone	Annual & perennial broadleaf & grass, weeds, brush.	X		
Imazpyr	Brush, trees, annual & perennial weeds; frees up conifers for growth, maintains wildlife openings.	X		
Isoxaben	Pre-emergence control of broad spectrum of autumn- & spring-germinating broadleaf weeds.	X	X	X
Mefluidide	Growth regulatorinhibits growth & suppresses seed head production of turfgrasses & woody species.			X
Metsulfuron-methyl	Use in ROWs for control of broadleaf weeds, trees & brush.	X		
Oryzalin	Selective soil-incorporated herbicide for pre-emergent control of annual broadleaf weeds & grasses.			X
Paclobutrazol	Growth regulator controls the growth of trees.	X		
Pendimethaline	Grass weeds, some broadleaf weeds. Fertilizer to some crops.			X
Picloram	Certain annual broadleaf weeds & many annual & perennial broadleaf weeds, vines, & woody plants.	X		
Sulfometuron-methyl	Broad-spectrum pre- or post-emergence for grasses & broadleaf plants.		X	
Tebuthiuron	Relatively non-selective soil-activated herbicide. Pre- & post-emergence control of perennial & annual broadleaf weeds & brush, & grasses.	X	X	
Triclopyr	Growth regulator, woody plants & broadleaf weeds.	X		X
Trifluralin	Selective pre-emergence, annual grasses & broadleaf weeds.		X	
Trinexapac-ethyl	Grass growth regulator.			X

Herbicide Control Methods: Application

Description

Herbicides can be applied in different ways, depending on the plants that are targeted, the density of the vegetation, and site circumstances. We have divided herbicide applications into the following four categories:

- Spot
- Localized
- Broadcast
- Aerial.

These categories are based on the area that is being treated and the amount of herbicide being used. Each category uses various methods to apply the herbicide.

Spot Herbicide Application

A spot application treats individual plant(s) with the least amount of chemicals possible. The methods include, but are not limited, to the following:

- **Stump treatments.** Herbicide is applied by hand (squirt bottle) or backpack to freshly cut stumps of broadleaf trees and shrubs to prevent resprouting.
- **Injection and notch treatments.** Herbicide is injected into the tree around the base using tubular injectors (lances); or herbicide is squirted or sprayed into frills, notches, or cups chopped around the base of individual trees or shrubs. These very selective treatments are only used for specific trees or shrubs and within sensitive areas such as near water.

Injection treatment in live tree

Localized Herbicide Application

"Localized" herbicide application is the treatment of individual or small groupings of plants. This application method is normally used only in areas of low-to-medium target-plant density.

The application methods for this application group include, but are not limited to, the following:

- **Basal treatment.** The herbicides are applied by hand (squirt bottle) or by backpack. Herbicides are applied at the base of the plant (the bark or stem) from the ground up to knee height. The herbicide is usually mixed with an oil carrier to enhance penetration through the bark, and applied to the point short of run-off. These treatments can be done during the dormant season or active growing season.
- **Low-volume foliar treatment.** Herbicides are applied with the use of a backpack sprayer, all terrain vehicle (ATV), or tractor with a handgun. Herbicide is applied to the foliage of individual or clumps of plants during the growing season, just enough to wet them lightly. A relatively high percentage of herbicide is used mixed with water. Thickening agents are added where necessary to control drift. Dyes may also be added to see easily what areas have been treated.

Spot and localized applications can be applied using a backpack sprayer.

- **Localized granular application.** Granular or pellet forms of herbicide are hand-applied to the soil surface beneath the driplines of an individual plant, or as close to a tree trunk or stem bases as possible. Herbicide is applied when there is enough moisture to dissolve and carry the herbicide to the root zone—but not so much water that it washes the granules off-site.

- **Bare-ground treatments.** These applications (made via backpack sprayer, ATV or tractor with a handgun) treat the *ground or soil* to keep any vegetation from growing, rather than treating the vegetation itself. The herbicide used can be in liquid or granular formulations. This technique is used in places like substations and around wood poles.

Broadcast Herbicide Application

Broadcast herbicide applications treat an area, rather than individual plants. Broadcast applications are used to treat rights-of-way that are thickly vegetated (heavy stem density), access roads, noxious weeds, and electric yards. The application methods for this group include, but are not limited to, the following:

- **High-volume foliar treatments.** Herbicides are applied by truck, ATV, or tractor with handgun, broadcast nozzle, or boom. A hydraulic sprayer mounted on a rubber-tired tractor or truck or tracked-type tractor is used to spray foliage and stems of target vegetation with a mixture of water and a low percentage of herbicide. The herbicide mixture is pumped through hoses to a hand-held nozzle. A worker activates the nozzle and directs the spray to the target vegetation. Boom application methods involve a fixed nozzle or set of nozzles that spray a set width as the tractor passes over an area.
- **Cut-stubble treatment.** Herbicide is sprayed from a truck with a mounted boom over large swaths of freshly mechanically cut areas. This treatment is the broadcast style of cut-stump treatments. It is intended to keep plants from resprouting.
- **Broadcast granular treatment.** Granular forms of herbicide are spread by hand, belly grinder, truck or tractor. The herbicide is spread over a relatively large area, such as in an electric yard, or around tower legs.
- **Broadcast bare-ground treatments.** Herbicides are spread by ATV or tractor with a handgun, or by trucks with mounted booms. This application treats the ground or soil to keep vegetation from growing, but over a wider area. The broadcast bare-ground application is used in electric yards, sectionalizing switch platforms, and non-electric facilities.

Aerial Herbicide Application

Aerial herbicide applications are used to treat large areas that usually have heavy, dense vegetation needing control (including noxious weeds); steep slopes that make other methods unsafe; or poor road access. The application methods for this group include the following:

- **Fixed-wing aircraft.** A boom system attached to the undercarriage near trailing edge of airplane wings is used to dispense herbicides. Planes fly above the transmission-line conductors.
- **Helicopter.** Booms attached to a helicopter deliver herbicide to the target area. The helicopter may fly above or below transmission-line conductors.

Aerial applications are conducted during the growing season, and Bonneville would only use water carriers (compared to oil-based herbicide carriers). Herbicide drift is controlled by immediate shut-off devices, close monitoring of weather conditions, and the use of adjuvants to enlarge the herbicide droplet size (that makes them fall straight down). For example, if wind speeds are greater than what is recommended by the label instructions and restrictions, no spraying would be allowed. (See **Site-specific Planning Steps, Chapter III**, for aerial spraying.)

> ***New developments in helicopter aerial spraying use on-board Global Positioning Systems with predetermined computerized buffer zones. The system automatically adjusts the flow of herbicide mixture to the speed of the helicopter, and automatically shuts off at designated buffer distances. Portable weather stations are brought to the site for constant immediate read-outs of changing weather (wind speeds, humidity, temperature). The new thru-valve and microfoil booms provide accurate herbicide applications with minimal herbicide drift.***

Advantages and Disadvantages

Herbicide treatments are effective in controlling vegetation in various circumstances. Herbicides can be **selective** (affecting only the target vegetation) or **non-selective** (affecting all the vegetation in its path), depending on the type of herbicide and the application technique.

Spot and localized herbicide treatments work well in treating deciduous stumps to keep them from resprouting or in small areas needing vegetation control along a right-of-way or around a non-electric facility. Because of the selective nature of spot applications, vegetation in environmentally sensitive areas can be treated with less impact than other application methods.

Broadcast herbicide treatment is more appropriate for densely vegetated areas that are accessible by truck (such as along the access road). Broadcast methods are also appropriate in electric yards where total vegetation management is desirable.

Aerial spraying is appropriate in remote areas that are difficult to access by hiking (although there needs to be an accessible landing site for both the helicopter and the water-herbicide mix truck). Aerial herbicide treatment is also well-suited for areas of dense tall vegetation, where it is difficult to walk through, and the foliage is high and not accessible by broadcast or backpack spray.

Because herbicides tend to kill the roots of the vegetation, there is less chance for resprouting to occur; therefore, the treatment is effective for a longer term. Short-term effectiveness is not always apparent (as with mechanical or manual methods). Often an area must be reviewed months later to see whether the target vegetation was treated and affected (sometimes dyes are used to help determine whether a plant was treated). In other cases, the effects are visible in days.

After most herbicide treatments, the dead vegetation is left standing, so there is no debris disposal. Standing dead vegetation can provide both an eyesore and some wildlife cover.

Environmental concerns of herbicide treatments include the potential of herbicide drift, leaching affecting non-targeted vegetation or water sources, and potentially affecting fish and wildlife. Along the right-of-way there is usually little potential for herbicides to affect these resources because the amount of herbicide active ingredient actually used is small and because there is a long time span between treatments (3 to 10 years). In electric yards, herbicides are used more often (once a year), so there is more potential for spills, leaching, or surface runoff. No-spray buffer zones are necessary to ensure that herbicides will not reach water bodies. Care must be taken not to apply granular herbicide in areas where surface runoff is likely to occur. Herbicides should not be used adjacent to organic[3] farming.

Health and safety issues include the toxicity and potential long-term affects of the inert and active ingredients, carriers, and adjuvants. Workers—who are most likely to be exposed to large quantities and exposed repeatedly—need to take precautions when handling

[3] Certified organic farms do not use synthetic pesticides, herbicides, fertilizers or fumigants. A farm must comply with rigid standards that includes buffers between organic farms and nearby conventional farms.

herbicides (as specified on labels: that is, they should wear gloves, change clothes after use and before eating, and so on). Public health and safety issues include the potential effects of exposure, particularly one-time exposure. Although there is some public use of the right-of-way, only rarely might someone be accidentally sprayed or water sources be contaminated.

Please see Tables II–1 (page 27), and II-2 (page 30) for a list of methods and their appropriate use for various facilities and vegetation types. Table II-3 (page 33) shows specific impacts.

Costs

The costs of **spot and localized** herbicide treatments are the lowest of all the methods ($35 - $140/per acre). It is manual labor—with little equipment involved—and it is much less labor-intense to spray vegetation than it is to cut it down. Also there is no debris disposal involved.

The relatively high cost of **broadcast** herbicide treatments ($150 - $250/per acre) reflects the use of truck equipment, and the difficulty of reaching sites by access road. The costs are *less* than mechanical costs because it is quicker to drive through and spray an acre of vegetation than it is to drive through and cut and chop the vegetation.

The costs of **aerial** herbicide treatment ($20 - $160/per acre) are low because, although the equipment costs are expensive, aerial spraying can be done in much more quickly than any other method.

Table II-5, following page, compares the costs of the methods.

Table II-5: Cost Comparison of Methods

Vegetation Control Method	*Costs per acre
Manual	**$70 - $700**
Mechanical	**$100 - $600**
Biological	**Ground: $80 - $150** **Aerial: $150 - $275**
Herbicide	
Spot	**$35 - $140**
Localized	**$35 - $140**
Broadcast	**$150 - $250**
Aerial	**$20 - $160**

*In general, cost variations within the same method reflect the vegetation density of the right-of-way: low costs for low-density areas; higher costs for more densely vegetated areas. Other contributing factors include remote work locations and short work performance periods.

Debris Disposal

Description

Managing vegetation includes clean-up—the treatment of slash and debris disposal. There are four basic methods of disposing of the vegetative debris generated when vegetation is cut: chipping, lopping and scattering, burning, and mulching.

Chipping

With chipping, a mechanical brush disposal unit cuts brush into chips 10 centimeter (cm) (4 inches [in.)] or less in diameter. The chips are spread over the right-of-way, piled on the right-of-way, or trucked off site. Trunks too large to be handled by the chipper are limbed and the limbs chipped. Trunks are placed in rows along the edge of the right-of-way or scattered, as the situation requires. The chips and trunks left on the right-of-way decompose naturally.

Lopping and Scattering

With lopping and scattering, some of the branches of a fallen tree are cut off (lopped) by ax or chainsaw, so the tree trunk lies flat on the ground. The trunks are usually cut in 1-to-2-m (4-to-8-ft.) lengths.

The cut branches and trunks are then scattered on the ground, laid flat, and left to decompose.

Mulching

Mulching is a debris treatment that falls between chipping and lop-and-scatter. The debris is cut into 30-to-60-cm (1-to-2-ft.) lengths, scattered on the right-of-way and left to decompose. This method is used when terrain and conditions do not allow the use of mechanical chipping equipment.

Pile Burning

With pile burning, vegetative debris is piled off the right-of-way and burned in small piles. On occasion, Bonneville may clear brush off land right next to a substation, pile it in small piles, and burn it. Burning is a hazard *in* the right-of-way and near our electric facilities because the smoke can induce flashovers from electrified facilities. This method is rarely used because of this safety issue. Burning also contributes to air pollution and can escape to other areas if not properly managed.

Table II-6: Cost Comparison of Debris Disposal

Debris Disposal Methods	*Costs per acre
Chipping	**$175 - $250**
Lop and Scatter	**$75 - $125**
Mulching	**$175 - $275**
Pile Burning	**$90 - $125**

*In general, cost variations within the same method reflect the vegetation density of the right-of-way: low costs for low-density areas; higher costs for more densely vegetated areas. Other factors that contribute to higher costs per-acre include remote work locations and short work performance periods.

Reseeding and Replanting

Description

Reseeding and replanting are done for several reasons:

1. to control soil erosion,
2. to prevent the establishment of noxious weeds,
3. to help establish low-growing vegetation,
4. to promote wildlife habitat,
5. to mitigate visual impacts.

Reseeding

Seeds of grasses, legumes, and forbs are purchased and dispersed by drilling or by broadcasting the seeds. A tractor-drawn machine drills holes in the ground and deposits seeds in the holes. Broadcasting can be done by hand (throwing seed onto the ground), by belly-grinder (a front-held container that disperses seeds by turning a hand crank), from a truck or from tractor-mounted seeders, and from a seeder suspended from a helicopter. Seeding is appropriate on access roads, around tower legs, potentially on other portions of a right-of-way, and at non-electric facilities in landscaping.

Replanting

Seedling trees, nursery stock trees, shrubs, or other perennial vegetation that will not grow to heights that could threaten the operation of electric facilities are bought and planted. Seedling trees are appropriate for large areas of planting next to a right-of-way. Nursery stock trees or shrubs are more appropriately used as replacement trees for landowners who may need to have a landscaping danger tree removed, or for landscaping around substations or maintenance facilities.

Reseeding and replanting must be done with adapted seed and plants, at proper planting times, using good quality seed (with no noxious weed seeds present), proper seedbed preparation (soil amendments and fertilizers if necessary), and the use of effective seeding rates and drill spacing. (See **Chapter III, Site-specific Planning Steps,** for more details.)

Approving New Techniques for Use

As part of an integrated vegetation management strategy, Bonneville would adopt new techniques for vegetation control that are more effective, safer or more environmentally benign, as appropriate. The discussion below covers the process for approving and adding new techniques or new active herbicide ingredients to our selected vegetation management program.

Adding New Techniques

In order to approve a new technique for use in our program, we would review the effectiveness of the technique, the cost to use it, and the potential environmental impacts it might cause. This information would be gathered in a Supplement Analysis. The Supplement Analysis would be tiered to this program-wide EIS by comparing the impacts of the technique with those disclosed in the EIS. If the impacts were equivalent to, and safer or more environmentally benign than the ones discussed in this EIS, then the new technique would be added as a tool for use in our program. (see also the discussion under **Reasons for this EIS** in **Chapter I**.)

If the impacts of using the new technique were substantially different from those discussed in this EIS, we would either not approve its use or conduct further environmental review in order to make an informed decision as to whether we should approve and add the tool to our program.

Public notification and comments on the new technique would be solicited through the use of the *Bonneville Journal*, a publication used to announce projects, as appropriate.

For example, a new "laser-chainsaw" for manually controlling vegetation could be developed. We would review its effectiveness, costs, and environmental impacts. If the environmental impacts were equivalent to those discussed in this statement, Bonneville would add this tool to our program without further analysis.

Adding New Herbicides

Approving new herbicides or growth regulators would require the same approval process of review and tiering. (This process only applies if the vegetation management program selected includes the use of herbicides.)

For example, if a new active herbicide ingredient in which Bonneville was interested were to be approved by EPA, we would review the effectiveness, costs, and environmental impacts of the herbicide for use around our facilities. The potential environmental impacts would be analyzed by applying health and environmental risk information—through the use of EPA-developed "risk assessments"—to the use of the product around our facilities. This analysis would be compared to the herbicide analysis done in this statement. If the environmental impacts were equivalent—or if the impacts showed that the herbicide was safer or more environmentally friendly than those impacts discussed in this statement—Bonneville would add this herbicide to our program.

Likewise, if new information about an herbicide we are using is discovered (for instance, that it was found to be much more toxic than originally studied), then we would review that information in light of the analysis in this EIS to determine whether the impacts have been considered. If the new information about the herbicide were substantially different than originally reviewed, we would use the new information about the herbicide to decide whether it was appropriate for us to continue using the product.

Methods Eliminated from Consideration

Two vegetation control methods were eliminated from further consideration for Bonneville's vegetation management program: grazing and prescribed fire.

Grazing

Grazing uses domestic livestock (sheep or goats) to eat the vegetation that needs controlling. Past studies on this method determined that it was only "somewhat" effective, and that logistics (supplemental feed, water, containment, and predators) limited the usefulness of this method.

In 1977, Bonneville conducted a simulation study on the use of domestic sheep grazing to control and convert vegetation on the right-of-way. However, sheep did not readily eat conifers and red alder, the tree species of most concern for right-of-way maintenance. The study did predict that sheep grazing in forests dominated by grand-fir would cause some gradual changes in vegetation composition, leading to an increase in the abundance of grasses. The grasses would then compete with and reduce the establishment of conifer seedlings.

Goats have also been used to control brush regrowth on chaparral fuel breaks in southern California. The goats are nonselective and consume a wide variety of plant species. Effective fuel-break clearing requires enough goats to eat all leaves from all brush species (bringing in more goats two or three times per year). The goats were not expected to control tall, mature brush because it is hard to get to and, when accessible, was avoided by the animals. No one has studied whether goats could be used to control brush on rights-of-way in the Pacific Northwest.

There are problems with managing grazing animals: these include road access during wet weather, fencing, herding, water and supplemental feeding, protection from predators, disease, poison plants, erosion, water quality, and conflicts with big game management.

However, the idea of grazing is being reexamined by a New Hampshire utility that recently borrowed sheep from Montana for a right-of-way clearing pilot project.

At this point, Bonneville will continue to rely on the concluded studies. If new approaches are found more effective and feasible, Bonneville can then decide whether to prepare the appropriate NEPA analysis for inclusion of the grazing method in the vegetation management program.

Prescribed Fire

"Prescribed fire" uses closely managed burning at periodic intervals to maintain low-growing vegetation. Woody vegetation is consumed, while the regrowth of grasses and forbs is promoted.

Bonneville currently prohibits burning on the right-of-way for vegetation management, mainly for safety and reliability reasons. Prescribed burning under transmission lines is dangerous because smoke and hot gases from a large fire can create a conductive path for electricity. When a fire is burning under a transmission line, an electric current could arc from the conductor to the ground, endangering people and objects near the arc.

There are other problems with prescribed fire: it is difficult to manage burning in narrow rights-of-way, and the potential for fire to escape is great.

Information, Education, and Prevention

A vegetation management program also includes steps to educate and inform people that live along the line or near an electric facility about the need to keep vegetation a safe distance away from those facilities. Information and education are a part of all the Program Alternatives that will be discussed. The extent of information and education can vary from actively pursuing forums (such as at neighborhood community meetings or schools) to discuss Bonneville needs, to letting local people know why we are cutting vegetation if they happen to be in the area during the maintenance activities. We presently send pamphlets to people living along our transmission lines; these pamphlets describe the dangers of vegetation near electric facilities. Please see **Appendix D** for a sample of the type of information we provide.

Prevention—managing vegetation in and around our facilities so that it doesn't become a problem—is another important aspect of managing vegetation. In this EIS, the idea of prevention is discussed as part of other components of the program. Prevention is a key in IVM strategy, in the management approach of Promoting Low-growing Plant Communities, and when reseeding or replanting disturbed areas to prevent the spread of noxious weeds.

Chapter III Site-specific Planning Steps

In this chapter:

- **Site-specific Planning Steps**
- **Mitigation Measures**

Planning Steps Overview

This chapter describes the seven Planning Steps that we are proposing to use for site-specific vegetation management projects. The Planning Steps will be a tool for ensuring that environmental aspects are considered as part of an integrated vegetation management strategy and under NEPA.

The **Planning Steps** are as follows:

1. **Identify facility and the vegetation management need.**
2. **Identify surrounding land use and landowners/managers.**
3. **Identify natural resources.**
4. **Determine vegetation control methods.**
5. **Determine debris disposal and revegetation methods, if necessary.**
6. **Determine monitoring needs.**
7. **Prepare appropriate environmental documentation.**

Note: These steps apply to *planned* maintenance, not to *emergency* maintenance.

Each Planning Step has a set of **mitigation measures** used to avoid or reduce potential environmental impacts. Not all measures would be appropriate for all program alternatives. For example, a right-of-way alternative that does not use herbicides would (appropriately) not need any herbicide mitigation measures.

The Planning Steps and mitigation measures will provide a consistent and efficient process for ensuring that NEPA compliance and environmental and landowner concerns are considered when making decisions about vegetation control. A checklist will be developed based on these steps to facilitate the process.

The Project Manager—the person responsible for the vegetation management at a particular facility—would ensure that these steps are carried out.

Currently, Bonneville prepares for site-specific vegetation management on an individual basis, without program-wide direction. We plan to adopt the program-wide Planning Steps to help foster consistency across projects, jurisdictions, and over time.

This chapter also has the Federal laws that may pertain to vegetation management. Other laws that were considered, but do not pertain to this action, are listed at the end of the chapter.

Federal laws are stated in shaded boxes within the text.

1. Identify facility and the vegetation management need.

In this step, Project Managers would do the following:

- Identify the facility needing vegetation control (i.e., right-of-way, access road, electric yard) and the safety and electrical clearance requirements that need to be met.
- Identify the types of vegetation needing control (i.e., tall-growing vegetation, noxious weeds) and the density of the growth.

Rights-of-Way

For rights-of-way, Project Managers would apply the following mitigation measures, as appropriate.

As defined here, rights-of-way include access roads and microwave beam paths.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation on rights-of-way include manual, mechanical, herbicide (spot, localized, broadcast, and aerial), and biological controls (for noxious weeds).
- *Around transmission structures*, control all tree and brush species within about 9 m (30 ft.) of structures. Cut stumps are not to be

taller than 5 – 10 cm (2 – 4 in.). These species include blackberries, poison oak, scotch broom, and other vegetation that, by size or density, might hinder routine inspection and maintenance work or make it more hazardous.

- Pull all debris and slash out of the 9-m (30-ft.) area around transmission structures.
- *On the right-of-way*, control all tall-growing species that are now or would be a hazard to the line. Cut stumps are not to be taller than 10 - 15 cm (4 - 6 in.).
- *On access roads*, control all vegetation except grasses, to enable safe driving.
  - ✶ The access road is 4 to 8 m wide (14 to 25 ft. wide) and requires a 5-m- (15-ft.-) high clearance. Limbs should not hang down into the access road.
  - ✶ Cut stumps are not to be taller than 5 – 10 cm (2 – 4 in.) in the roadbed.
  - ✶ Stumps will be cut horizontal to the ground to prevent personal injuries and tire puncture.
  - ✶ Limbs are to be trimmed back as flush to the trunk as possible when trees are rooted outside of the access road.
  - ✶ All debris is to be pulled back from the access road as prescribed.
- *For danger trees*, remove all off-right-of-way trees that are potentially unstable and would fall within a minimum distance or the safety zone of the power line, as well as trees that could blow into that zone or enter into the zone when the conductor swings. Tree growth within the treatment cycle should be taken into consideration when selecting trees. (See **Appendix E** for danger tree clearance criteria.)
- *For microwave beam paths,* cut trees when they have grown into the beam path, creating signal disruption.

Promoting Low-growing Plant Communities

Consider the following steps or mitigation measures to promote a semi-stable low-growing plant community:

1. Remove existing tall-growing vegetation. If using manual methods to eliminate deciduous (resprouting-type) species, do follow-up herbicide treatments to ensure that the roots are killed.

2. Replant or reseed with ground cover if none exists or if there is a low potential for natural revegetation by low-growing species (and a high potential of natural revegetation by tall-growing species).
3. Maintain, by selectively eliminating tall-growing vegetation before it reaches a height or density to begin competition with low-growing species.
4. As much as practical, be careful not to disturb low-growing plants. When possible, use only selective vegetation control methods (such as spot herbicide applications) that have little potential to harm non-target vegetation.

Electric Yards

For electric yards, Project Managers would apply the following mitigation measures, as appropriate.

Electric yards are defined as substations, switching stations, and electric yards (including a 3-m or 10-ft. bare-ground buffer zone outside the fenced area).

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation in and around electric yards are herbicide (spot, localized, and broadcast applications) with very selective use of weed burners, steamers, selective hand-pulling.
- Use only herbicides that (1) will not corrode ground mats, underground facilities, or other metals on site; (2) are non-combustible; and (3) are non-conductive.
- Select and rotate the use of herbicide products to prevent weeds from developing resistance to herbicides.
- Avoid spray drift during application.
- *For electric yards within 100 m (328 ft.) of wells, streams, rivers, or wetlands,* determine whether the water body should be monitored for potential herbicide contamination.
- Observe all riparian buffer and pesticide-free zones established in Tables III-1 and III-2 (page 62).

Non-electric Facilities

For non-electric facilities, Project Managers would apply the following mitigation measures, as appropriate.

Non-electric facilities are defined as microwaves, maintenance yards, and the grounds surrounding electric yards or maintenance facilities.

***Guidance for Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds** (1995; 60 FR 40837) directs Federal agencies to incorporate, to the extent practicable, guidance for*

environmentally and economically beneficial practices into their landscaping programs and practices.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation at non-electric facilities include manual, mechanical, and herbicide (spot, localized, and broadcast).
- *Where cost-effective and to the extent practicable,* use regionally native plants for landscaping.
- *Where cost-effective and to the extent practicable,* seek to prevent pollution by, among other things, reducing fertilizer and pesticide use, using integrated pest management techniques, recycling green waste, and minimizing runoff.
- *Where cost-effective and to the extent practicable,* implement water-efficient practices, such as the use of mulches, efficient irrigation systems, audits to determine exact landscaping water-use needs, recycled or reclaimed water, and the selecting and siting of plants in a manner that conserves water and controls soil erosion.

Noxious Weeds

For noxious weeds, Project Managers will take the following mitigation measures, as appropriate.

The Federal Noxious Weed Act (amended 1990) directs Federal agencies to develop and implement Integrated Pest Management Noxious Weed Programs.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling noxious weeds include the use of biological controls and herbicides (spot, localized, broadcast, and aerial applications).
- Take full responsibility for controlling noxious weeds on fee-owned property.
- Enter into active noxious weed control programs with land owners/managers or county weed control districts where Bonneville activities may have caused or aggravated an infestation.
- *Where appropriate,* provide herbicides or biological control agents to landowners.
- *Consider, when practical,* washing vehicles that have been in weed-infested areas (removing as much weed seed as possible) before entering areas of no known infestations.

- *Consider, when practical,* re-seeding soil disturbed areas with approved weed-free seed.

2. Identify surrounding land use and landowners/ managers.

In this step, Project Mangers would do the following:

- Evaluate, generally, existing land uses (e.g., agriculture, residential) along a right-of-way or surrounding a facility needing vegetation control to determine any constraints on vegetation control.
- *To the extent practicable,* identify casual informal use of the right-of-way by non-owner publics to determine any constraints on vegetation control.
- Determine, generally, landowners or land managers (i.e., private residential, timber company, Federal, state) in or around the facility needing vegetation control.
- Determine whether there are any existing landowner agreements with provisions that need to be followed regarding the vegetation maintenance of a specific portion of line.
- Determine appropriate level of public involvement, notification or coordination that may be necessary. (Public contact may take place in a number of ways: notice in a local newspaper, phone calls, meetings, letters, door-hangers.)
- *If needed,* use public contact to help find out about any special uses of the land, or other issues or concerns that might need consideration when determining or scheduling vegetation control.

Agriculture

For agricultural areas, Project Managers would apply the following mitigation measures, as appropriate.

The Farmland Protection Policy Act (7 USC 4201 et seq.) directs Federal agencies to identify and quantify adverse impacts of Federal programs on farmlands. Vegetation management activities will not contribute to irreversible conversion of agricultural land to non-agricultural uses.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation in agricultural areas include manual, mechanical, biological (for noxious weeds), and herbicide (spot, localized applications, and [potentially] broadcast and aerial applications).

- Prevent the spread of noxious weeds by cleaning seeds from equipment before entering cropland.
- *If on grazing lands and there is potential for pine needle poisoning,* do not lop and scatter pine tree vegetative debris—machine-chip or haul debris off-site.
- *If using herbicides on grazing lands,* comply with grazing restrictions as required per herbicide label.
- *If using herbicides near crops for consumption,* comply with pesticide-free buffer zones, if any, as per label instructions.
- *For rights-of-way adjacent to agricultural fields,* observe appropriate buffer zones necessary to ensure that no drift will affect crops.
- *For rights-of-way near organic farms,* determine appropriate no-herbicide or spot-herbicide-only buffer zones, or provide for the owner to maintain the right-of-way, by way of a vegetation management agreement.
- *If reseeding,* determine whether any of the adjacent properties are being, or will in the immediate future be, used for growing grass seed, especially high-purity strains.
- *If reseeding near grass-seed fields,* consult with the area seed certification and registration authority to determine whether buffer zones are necessary, appropriate grass mixtures allowed, and appropriate modes of seeding used.

Residential/ Commercial

For residential or commercial areas, Project Managers would apply the following measures, as appropriate.

The Federal Noise Control Act of 1972 (42 U.S.C. 4903) requires that Federal entities such as Bonneville comply with state and local noise requirements.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation in residential/ commercial areas include manual, mechanical, biological (for noxious weeds), and herbicide (spot, localized applications and [potentially] broadcast applications).
- *Where appropriate,* assign responsibility for tall-growing species on the rights-of-way to underlying property owner (i.e., to owners of orchards or Christmas tree farms).

- *If appropriate*, offer to replace trees (with a low-growing species), or use tree growth regulators instead of removing a tree.

USFS-managed Lands

For USFS-managed lands, Project Managers would apply the following mitigation measures, as appropriate.

***The Federal Land Policy and Management Act** (1976) provides guidance for the uniform, periodic, and systematic inventories of Federal public lands and their resources.*

- Use, update, or develop site-specific vegetation management plans for rights-of-way that cross USFS-managed lands.
- Review existing site-specific vegetation management plans for consistency with USFS specific mitigation measures identified in **Appendix F**. This EIS does not supercede or revoke any existing agreements or site-specific vegetation management plans. However, if appropriate, work with local Forest Officer in revising existing plans to achieve consistency.
- Develop site-specific vegetation management plans (where they do not already exist) using the Planning Steps and mitigation measures in this EIS, including the USFS -specific measures in **Appendix F**. Conduct appropriate NEPA analysis and documentation (see Planning Step #7).
- Contact the local Forest Supervisor's or District Ranger's office, before implementing vegetation management activities on national Forest System lands (or follow direction in site-specific vegetation management plans for notification procedures). Notification should be made as far in advance of the planned date of on-the-ground implementation as is reasonably possible.
- *If expecting the USFS to conduct environmental data collection for evaluation,* allow more than one year for completion, and be prepared to reimburse the USFS for the costs in conducting such activities.
- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation on USFS-managed lands include manual, mechanical, biological (for noxious weeds), and herbicide (spot, localized applications, and [potentially] broadcast and aerial applications).
- Comment on and be involved in Forest Plan updates to include utility corridor management areas.
- See **Appendix F** for additional mitigation measures specific to USFS-managed lands.

BLM-managed Lands

For BLM-managed lands, Project Managers would apply the following mitigation measures, as appropriate.

- Use, update, or develop site-specific vegetation management plans for rights-of-way that cross BLM-managed lands.
- Contact the local BLM office, before implementing vegetation management activities on BLM lands (or follow direction in site-specific vegetation management plans for notification procedures). Notification should be made as far in advance of the planned date of on-the-ground implementation as is reasonably possible.
- *For NEPA compliance on BLM-managed lands,* use the Planning Steps and mitigation measures in this EIS, including the BLM-specific mitigation measures (see **Appendix G**) and appropriate NEPA analysis and documentation (see Planning Step #7).
- Consult with appropriate BLM regarding presence of natural resources and features and appropriate buffers or other mitigation measures.
- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation on BLM-managed lands include manual, mechanical, biological (for noxious weeds), and herbicide (spot, localized applications, and [potentially] broadcast and aerial applications).
- See **Appendix G** for additional mitigation measures specific to BLM-managed lands.

Other Federal Lands

For facilities that are on other Federal lands, Project Managers would apply the following mitigation measures, as appropriate.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation on other Federal lands include manual, mechanical, biological (for noxious weeds), and herbicide (spot, localized, broadcast, and aerial applications).
- Notify, consult and cooperate with other Federal agencies (such as the US Army Corps of Engineers [Corps]) when scheduling right-of-way vegetation control activities on their lands.

Tribal Reservations

For facilities that are on Tribal reservations, Project Managers would apply the following mitigation measures, as appropriate.

Bonneville's Tribal Policy (April 1996) follows the Department of Energy's American Indian Policy (DOE Order No. 1230.2) for Bonneville's Trust responsibility as a Federal agency; it provides a framework for a government-to-government relationship with the thirteen Federally recognized Columbia Basin Tribes. Notify, consult, and cooperate with Tribal representative when scheduling right-of-way vegetation control activities.

- If possible and practical, develop a cooperatively written right-of-way management plan with the Tribe. The plan should address specific land-use or environmental resources along the corridor that need consideration, including appropriate mitigation measures identified in this EIS.
- If possible, consider working with Tribes for replanting of traditional use plants. Low-growing traditional-use plants may include blue camas, bitter root, wild celery, biscuit root, Canby's desert parsley, Indian carrot/false caraway, field mint, blue huckleberries.
- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation on Tribal reservations include manual, mechanical, biological (for noxious weeds), and herbicide (spot, localized applications and potentially broadcast and aerial applications).

3. Identify natural resources.

In this step, Project Managers would do the following:

- Identify natural resources, or the potential for the presence of natural resources, that could be affected by vegetation management activities. These resources might include wetlands, springs, and threatened or endangered species, etc. Any consultations or contacts made through Step 2, above, could be used to help identify the natural resources along a given right-of-way or site.
- Determine whether mitigation measures should be applied or specific control methods should be used, based on the presence or potential presence of those resources.

Water Resources

For water resources (streams, rivers, lakes, wetlands, wells), Project Managers would apply the following mitigation measures, as appropriate.

Discharge Permits under the ***Clean Water Act*** *regulate discharges into waters of the United States, including wetlands.*

Section 401 *of the Clean Water Act regulates discharges into navigable waters.*

Section 402 *of the Clean Water Act regulates storm water discharges associated with industrial activities under the National Pollutant Discharge Elimination System (NPDES). The regulation includes a general permit authorizing Federal facilities to discharge storm water from construction activities (that can include tree clearing) disturbing land of 2 or more ha (5 or more ac.) into waters of the U.S. The conditions for the permit include preparation of a Storm Water Pollution Prevention (SWPP) plan.*

Section 404 *of the Clean Water Act requires permits from the U.S. Army Corps of Engineers to discharge dredged or fill material into waters of the U.S. (Vegetation debris left in a stream or wetland could be considered fill material.)*

The Department of Energy (Bonneville's parent agency) has regulations for environmental review to be in compliance with ***Floodplains/Wetlands*** *requirements (10 CFR 1022.12, and Executive Orders 11988 and 11990).*

The ***Safe Drinking Water Act*** *(42 U.S.C. sec 300f et. Seq.) is designed to protect the quality of public drinking water and its sources. State and local public drinking water regulations including sole-source aquifers.*

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation near water resources include manual, biological (for noxious weeds), some mechanical methods, and potentially some herbicides (see Tables III-1 and -2 for Riparian Buffer and Pesticide Free Zones).
- Use selective control methods and take care not to affect non-target vegetation.
- Leave vegetation intact, where possible.
- Recognize that any discharge of material (displaced soils) within a water of the U.S. may be subject to Corps regulations under the Clean Water Act.
- Notify inspector and the State of any amount of herbicide spill in or near water.

- Consider climate, geology and soil types in selecting the herbicide with lowest relative risk of migrating to water resources.
- *If using herbicides,* it may be necessary to leave untreated zones (filter strips) to preclude the possibility of herbicide movement from the application site to adjoining water bodies. See Tables III-1 and III-2.

Table III-1: Riparian Buffer Zones

Method	Buffer Width From Habitat Source, i.e., Stream or Wetland
Ground-disturbing Mechanical Methods	
Slopes under 20%	10.7 m (35 ft.) [1]
Slopes over 20%	No disturbance.
Herbicide Application Methods	
Spot	3 m (10 ft.) [2] (Standard may be relaxed for capsule injection of glyphosate up to the water's edge.)
Localized	10.7 m (35 ft.) [1]
Broadcast	15.2 m (50 ft.)[3]
Aerial	30.5 m (100 ft.)[2]
Mixing, Loading, Cleaning	100 m (328 ft.)[3]

[1] USDA, Natural Resources Conservation Service (NRCS), Conservation Practice Standard, Riparian Forest Buffer, Code 391A, 1997
[2] USDOI-BLM Standard
[3] USDOE-BPA Best Management Practice

Table III-2: Herbicide-free Zones

Zone	Buffer Width
Agricultural Irrigation Source (Wet or Dry)	30.5 m (100 ft.) [1]
Domestic Water Well	30.5 m (100 ft.) [1]
Public Water Intakes/Spring Developments	100 m (328 ft.) Upslope[1]
Secondary Containment Liners, Vaults, and Lagoons	Up to Edge of Containment Feature[1]
Storm Drains that Discharge Offsite	2 m (6 ft.) Radius[1]

[1] USDOE-BPA Best Management Practice

These are generalized standards. Other Federal agencies, as well as State and local authorities, may have stricter or more relaxed buffer zone requirements for the protection of these and other resources such as sole-source aquifers, fisheries, recreation areas, etc.

Threatened or Endangered Species and Critical Habitat

For threatened or endangered (T&E) plant or animal species, Project Managers would apply the following mitigation measures, as appropriate.

The Endangered Species Act (ESA) (16 USC 1536) provides for conserving endangered and threatened species of fish, wildlife and plants. Federal agencies must determine whether proposed actions would adversely affect any endangered or threatened species.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation in places that potentially have sensitive or threatened and endangered (T&E) species include manual, biological (for noxious weeds), mechanical (except in areas of T&E plants), and herbicide (spot applications).
- Determine whether any T&E species or designated T&E critical habitats are potentially present in the project area (through the use of T&E maps, specialist's determination, or T&E list from the U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS)).
- *If T&E species or designated critical habitats are potentially present in the project area,* determine whether they are likely to be affected. If project is likely to affect but not *adversely* affect T&E species, obtain concurrence from the USFWS and/or NMFS.
- *If it is determined that the project is likely to adversely affect T&E species or their designated critical habitats (other than marbled murrelet and spotted owl, already formally consulted),* initiate formal consultation with the USFWS and/or NMFS and prepare a Biological Assessment according to 40CFR Part 402.
- Apply mitigation measures (such as timing restrictions, or specific method use) resulting from determinations or consultations.

Marbled Murrelet

The specifications below are based on Bonneville consultation with USFWS (1995) on our maintenance program, which includes vegetation management. These specifications apply in areas determined to be suitable marbled murrelet habitat (Peterson, 1995).

- *If a tree needing removal is greater than 80 cm (32 in.) diameter at breast height and has suitable nest tree characteristics,* initiate formal consultation with the USFWS.
- *During core breeding season, from April 1- August 5,* do not carry out maintenance activities (e.g., chainsaw work) that produce noise above ambient noise levels, within 0.4 km (0.25 mi.) of known marbled murrelet habitat or occupancy (based on marbled murrelet maps).
- *During the late breeding season, from August 6 - September 15,* do not carry out maintenance activities using motorized equipment within 0.4 km (0.25 mi.) of marbled murrelet habitat or occupancy within two hours after sunrise or within two hours before sunset.

Spotted Owl

The suitable spotted owl habitat specifications below are based on Bonneville consultation with USFWS (1992) on Bonneville's maintenance program, which includes vegetation management. (USFWS, 1992).

- *Where opportunity exists,* suspend vegetation management activities within 0.4 km (0.25 mi.) of spotted owl critical habitat between March 1 and June 30, unless the owls are shown not to be nesting.
- Examine any large trees (greater than 20.3 cm [8 in.] diameter at breast height east of the Cascades, or 28 cm [11 in.] diameter at breast height west of the Cascades) that need to be removed in spotted-owl habitat for evidence of owls. If a tree has evidence of owl nesting activity, conduct formal consultation with the USFWS.
- *In case of an emergency danger tree removal—a tree suddenly becoming an imminent threat to the line, posing a danger to life and property*—immediately examine the felled tree for evidence of owl nesting. If such evidence is found, start emergency consultation with the USFWS, or, if the situation occurs during off-duty hours, conduct after-the-fact emergency consultation the next business day.

The ***Fish and Wildlife Conservation Act of 1980*** *(16 USC 2901 et seq.) encourages Federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats. In addition, the Fish and Wildlife Coordination Act (16 USC 661 et seq.) requires Federal agencies*

undertaking projects affecting water resources to consult with the USFWS and the state agency responsible for fish and wildlife resources.

Visual Resources

In visually sensitive areas, Project Managers would apply the following mitigation measures, as appropriate.

- With the use of applicable mitigation measures, methods that may be appropriate for controlling vegetation in visually sensitive areas include manual, mechanical, biological (for noxious weeds), and herbicide (spot and localized applications).
- Limit use of broadcast foliar application of herbicide to reduce the creation of large areas of browned vegetation.
- *At road crossings, highways/visual overlooks,* leave sufficient vegetation, where possible, to screen view of right-of-way.
- *If the area is a very sensitive visual resource,* consider (1) planting low-growing tree seedlings adjacent to the right-of-way (or providing low-growing seedlings to landowner for planting); (2) softening the straight line of corridor edge by cutting some additional trees outside the right-of-way; or (3) if possible, leaving some low-growing trees within the right-of-way.

Cultural Resources

For cultural resources, Project Managers would apply the following mitigation measures, as appropriate.

***National Historic Preservation Act (1966, 16 U.S.C. 470)** requires Federal agencies to take into account the potential effects of their undertakings on properties on or eligible for the National Register of Historic Places.*

***Archeological Resources Protection Act** prohibits excavation, removal, damage, or other alteration or defacement of archeological resources on Federal or Indian lands without a properly issued permit.*

***American Indian Religious Freedom Act** requires Federal land managers to include consultation with traditional Native American religious leaders in their management plans and guarantees First Amendment rights for traditional religions.*

***The Historic Sites Act of 1935**, the basis for the National Historic Landmarks Program, provides for the preservation of historic American sites, buildings, objects and antiquities of national significance.*

***Native American Graves Protection and Repatriation Act of 1990 (PL101-601)** recognizes the property rights of Native Americans in certain cultural items, including Native American human remains, funerary objects, sacred objects, and items of cultural patrimony. In cases involving the inadvertent discovery of Native American human remains or defined cultural items*

during activities occurring on Federal or Tribal lands, the activity must be halted temporarily, the items protected, and the appropriate Federal agency and Tribal authority notified of the discovery.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation in areas with potential cultural resources include manual, biological (for noxious weeds), non-soil-disturbing mechanical, and (potentially) herbicide (spot, localized, broadcast and aerial applications).
- *When using mechanical ground-disturbing vegetation control methods,* review the right-of-way for potential existence of historic and cultural resources. The State Historic Preservation Officer (SHPO) is to be consulted, as appropriate.
- *On Tribal reservation lands and public lands,* consult (visit) with the appropriate Tribe regarding potential impacts on traditional use plants and other cultural resources. Restrictions such as seasonal constraints for vegetation control, avoidance of certain areas, or using methods that do not affect non-target plants may be required. (Also see **Tribal Reservations**.)

Steep Slopes/Unstable Slopes

For steep or unstable slopes, Project Managers would apply the following mitigation measures, as appropriate.

- *With the use of applicable mitigation measures,* methods that may be appropriate for controlling vegetation in areas of steep slopes or unstable soils include manual, biological (for noxious weeds), non-soil-disturbing mechanical, and herbicide (spot, localized, broadcast and aerial applications).
- Do not using ground-disturbing mechanical equipment to clear on slopes over 20%.
- Avoid using granular or total vegetation management (non-selective) herbicides on slopes over 10%.
- Do not use herbicides with a high potential for surface runoff.
- Perform mechanical clearing when the ground is dry enough to sustain heavy equipment.
- Consider reseeding or replanting seedlings on slopes with potential erosion problems.

Spanned Canyons

For spanned canyons, Project Managers would apply the following mitigation measures, as appropriate

- Avoid removing vegetation where it will not grow up into the safety zones for the transmission line.

4. Determine vegetation control methods.

In this step, Project Managers would do the following:

- Determine the appropriate control method or combination of methods to be used for a specific facility or right-way, based on three steps above: 1) facility and vegetation control needs, 2) type of land-uses and contacts with land owners/managers, and 3) natural resources present.
- *For all methods using machinery or vehicles (i.e. chainsaws, trucks, graders),* keep the equipment in good operating condition to eliminate oil or fuel spills or excess exhaust.
- Do not wash equipment or vehicles at a stream.

Manual

For the use of manual methods, Project Managers would apply the following mitigation measures, as appropriate.

Manual control methods include the following: pulling weeds; cutting with shears, clippers, chainsaws, brush saws or axes; steaming with a hand-held hot steam device (electric yards); burning plants with propane burners (electric yards); and girdling by cutting a ring around the trunk of the tree.

- *When crews are working during the fire season*[1], each crew shall have the proper fire-suppression tools and materials, as required by the responsible fire control agency.
- Equip power-cutting tools with approved spark arresters.
- Cut conifers below the lowest live limb to eliminate the continued growth of lateral branches.
- *If planning follow-up herbicide stump treatment,* cut stumps flat for application of the chemical.
- *If planning follow-up herbicide stump treatment in rights-of-way,* cut deciduous brush about 15.2 cm to 20.3 cm (6 to 8 in.) above the ground line.
- *If planning follow-up herbicide stump treatment in access roads,* cut deciduous stumps 5 to 10 cm (2 to 4 in.) above the ground line.
- *If planning follow-up herbicide stump treatment,* apply herbicides as soon as possible after cutting. (If herbicide is not

[1] Fire season is defined by the fire protection district that has jurisdiction in that area.

applied soon after the vegetation has been cut, it may be best to wait until resprouting has occurred and then spray by foliar technique.)

- *For safety,* cut all brush stumps flat where possible. (Angular cuts leave a sharp point that could cause injuries if fallen upon.)
- *For cutting trees close to "live" power lines,* use only qualified personnel.

Mechanical

For the use of mechanical methods, Project Managers would apply the following mitigation measures, as appropriate.

Mechanical methods include the use of chopper/shredders, walking brush controllers, mowers, feller-buncher machines, roller-choppers, and blading.

- Do not use ground-disturbing mechanical equipment to clear on slopes over 20%.
- Perform soil-disturbing or heavy mechanical clearing when the ground is sufficiently dry to sustain heavy equipment.
- Use measures to control the spread of noxious weeds.
- Do not use ground-disturbing mechanical methods in areas with T&E plant species unless determined appropriate through consultations.
- Do not use ground-disturbing mechanical methods in areas with cultural resources unless determined appropriate through consultations.

Biological Controls

For the use of biological controls, Project Managers would apply the following mitigation measures, as appropriate.

- Use only those biological control agents (insects) that have been tested to ensure they are host-specific.

Herbicides

For the use of herbicide methods, Project Managers would apply the following mitigation measures, as appropriate.

***The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)** regulates all herbicides and herbicides labels; classifies herbicides as "general" or "restricted" use; describes written records certified applicators must keep, and may give fines of up to $25,000 and jail sentences of up to one year for misapplication of herbicides and violation of FIFRA standards.*

***Resource Conservation and Recovery Act (RCRA)** regulates the disposal of toxic wastes (including the disposal of unused herbicides).*

***Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)** regulates how to clean up spills of hazardous materials and when to notify agencies of spills.*

***Superfund Amendments and Reauthorizations Act (SARA)**, also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), sets up emergency response committees, requires industrial facilities to provide written plans in the event of a "chemical emergency," and requires annual inventory of all chemicals.*

***Toxic Substance Control Act (TSCA)** provides authority for EPA to secure information on all new and existing chemical substances.*

***Federal Occupational, Safety and Health Administration (OSHA)** protects worker health and safety, including requiring that workers be provided with a Material Safety Data Sheet (MSDS) for hazardous materials including herbicides.*

***Food, Agriculture, Conservation, and Trade (FACT) Act of 1990**, and amended in 1995, addresses restricted-use pesticide record keeping.*

- Follow product label directions, as required by FIFRA, including "mandatory" statements (such as registered uses, maximum use rates, application restrictions, worker safety standards, restricted entry intervals, environmental hazards, weather restrictions, equipment cleaning).
- Consider all product label "advisory" statements (such as techniques for mixing, applying and cleaning within the mandatory requirements, recommendations for protection clothing, guidelines for differing soil types, etc).
- Always have a copy of the herbicide label and Material Safety Data Sheets (MSDS) at work sites during all mixing and applications.

- Ensure that all herbicide applications are conducted in the presence of a licensed applicator valid for the state where the work is located.
- Keep records of each application, including the active ingredient, formulation, application rate, date, time, location, etc. Records must be available to state and Federal inspectors.
- Ensure the use of EPA-approved herbicides that have been reviewed by Bonneville for effectiveness and environmental considerations.

  Bonneville is proposing to use the following 24 herbicide active ingredients:

Benefin	Glyphosate	Pendimenthalin
Bromacil	Halosulfuron-methyl	Picloram
Chlorsulfuron	Hexazinone	Sulfometuron-methyl
Clopyralid-methyl	Imazapyr	Tebuthiuron
2,4-D	Isoxaben	Triclopyr
Dicamba	Mefluidide	Trifluralin
Dichlobenil	Metsulfuron-methyl	Trinexapac-ethyl
Diuron	Oryzalin	Paclobutrazol (growth regulator)

- See **Water Resources** for herbicide mitigation measures near wetlands, streams, rivers, ponds, and wells.
- *Before application*, thoroughly review the right-of-way to identify and mark, if necessary, the buffer requirements.
- Observe restricted entry intervals specified by the herbicide label and post public warning signs where required.

Each herbicide has information on the label that must be followed. The information given below is not intended to replace reading the labels.

Drift and Leach Reduction

- Use thickening agents, as appropriate, to reduce the drift hazard when applying herbicides as broadcast, aerial, or localized foliar treatments.
- *When trying to reach the upper foliage of tall brush*, take care to prevent drift or spraying of non-target species.

- Ensure that there is no danger of granular herbicides being washed from the areas of application. (If the herbicide is not assimilated into the soil, heavy surface runoff can cause problems elsewhere, both on and off the right-of-way.)
- Avoid application to ground that is to be planted later (with herbicides that could damage subsequent crops).
- Pay close attention to present weather and changing weather:
  * **wind** (may blow dry or wet spray applications away from treatment site),
  * **humidity** (if humidity is too low, herbicide effectiveness may be reduced due to volatilization and closed pores on surface of vegetation),
  * **temperature inversions** (may cause movement of evaporated "clouds" of herbicide formula to non-target vegetation or evaporation of carrier, reducing drop size and increasing drift potential), and/or
  * **heavy rainfall** (may wash herbicide off plants or soil and move away from treated area).

Table III-3, below, identifies Bonneville's minimum weather restrictions. (These restrictions are to be used in the absence of more stringent label instructions and restrictions.)

Table III-3: General Climate Restrictions for Herbicide Applications (restrictions may very according to label instructions and state or local requirements)

Control Method	Max. Temp*	Min. Humidity	Precipi-tation	Wind	Season
Stump	___	___	Minimal	___	frost-free (wood must not be frozen for penetration)
Foliar	75°	30%	None	0-5 mph	spring/summer (or as specified on herbicide label)
Basal	75°	30%	Minimal	0-10 mph	frost-free (wood must not be frozen for penetration)
Pellet	___	___	Moderate required	___	frost-free
Aerial	70°	50%	None	0-5mph	growing season

* Evaporation (volatilization) of some herbicides occurs with higher temperatures, causing drift and potential damage to non-target plants. Volatilization is more likely a problem with ester formulations than amine formulations.

Spot Stump Application

A spot application is treatment of individual plant(s) with the least amount of chemicals possible. Stump treatments are done by hand (squirt bottle or canister) or by backpack.

- *For spot treatment,* cut stumps cut flat, 15.2 – 20.3 cm (6 - 8 in.) above ground (except for access roads and around structures sites which should be 5 – 10 cm (2 – 4 in.) above ground) to facilitate treatment and reduce trip and fall hazards. Treatment should occur within 8 hours to prevent resprouting.
- Directly spray the root collar area, sides of the stump, and/or the outer portion of the cut surface, including the cambium, until thoroughly wet, but not to the point of runoff. This would avoid, or minimize, deposition to surrounding surfaces.

Localized Basal Application

Localized herbicide application is the treatment of individual or small groupings of plants. Basal is the treatment of the base—bark or stem—of a plant.

- Apply basal treatments at any time during the year except when snow or water prevent application to the groundline. However, in general, treatments are more effective during the spring (when plants are leafing out) and less effective in the fall (when they are dropping their leaves).
- Use basal bark treatments to control woody plants with stems less than 15.2 cm (6 in.) in diameter.

Localized Foliar Application

Foliar treatment is the treatment of the leaves of the plant.

- Do not apply when rain is imminent (better plant penetration is obtained when herbicide dries and is absorbed; rain may wash herbicide off).
- Apply foliar treatments during active growing and after leaves have developed.

Localized and Broadcast Pellet Application

This is the application of granular or pellet herbicides, treating either small groupings of plants by hand or large areas with dispersing machines.

- Observe buffer zones and maintain recommended buffer widths.
- Do not broadcast pellets where there is danger of contaminating water supplies.

- Apply pellets or granular herbicides when it is anticipated that the treatment area will receive about 5 cm (2 in.) of rain or sprinkler irrigation, generally within two weeks after application, so that pellets dissolve and the chemical can be carried into the root system.
  - ✶ *For areas east of the Cascade Mountains with less than 15 inches of precipitation,* apply in the fall.
  - ✶ *For areas west of the Cascade Mountains or in high moisture areas,* apply in the spring.
- Do not apply pellet herbicides within three times (3X) the crown width (or dripline) of an off-right-of-way tree.
  - ✶ *When soils are rocky or shallow, the slope is away from the right-of-way, or the size and age of the off-right-of-way vegetation may indicate that part of the root system may be within the right-of-way,* consider observing greater pellet edge distances.

Broadcast Application (Liquid Herbicide)

This is the application of herbicides by use of tractors or trucks that treat a large area.

- Observe buffer zones and maintain recommended buffer widths.
- Do not use broadcast application where there is danger of contaminating water supplies.
- Do not use broadcast method where there are adjoining susceptible crops and ornamental bushes.

Aerial

This is the application of herbicides with a helicopter or airplane.

- Consider surrounding land use before assigning aerial spraying as method. Aerial spraying may be limited by incompatible adjacent land use, such as domestic water sources, some agricultural areas, and densely populated areas. Observe buffer zones and maintain recommended buffer widths.
- Do not use aerial application where areas of browned vegetation are not acceptable.
- Use thickening agents, if applicable, to avoid drift. The use of a microfoil boom may preclude need of thickening agents.
- Do not make aerial application when the wind velocity exceeds 5 mph. (See weather requirements.)

- Fly no higher than necessary to achieve appropriate application, reduce drift potential, and maintain flight safety.

Mixing

- Prepare spray mixture in accordance with the label(s) instructions (do not exceed the amount of herbicide per acre specified on the label).
- Perform mixing on rights-of-way, within electric yards, or other suitable locations and with respect to buffer zones and recommended buffer widths.
- Mix aerial applications only at a heliport (permanent or temporary).
- Always use siphon prevention devices/methods when filling herbicide tanks from domestic water supplies.

Spills and Misapplications

Most herbicide accidents and spills occur during mixing, loading and washing of equipment. The key to prevention is to ensure all equipment and vehicles are well-maintained and that personnel are well-trained and equipped.

- Refer to MSDSs for emergency response information.
- Report spills and misapplications to EPA in accordance with the Government Agency Plan (GAP). In addition, report spills and misapplications and clean-up according to various state and Federal laws and regulations. At a minimum:
  - Contain spill or leak, or halt misapplication;
  - Isolate area;
  - Request help and make appropriate notifications to Bonneville and state officials;
  - As soon as possible, notify the owner of the land, whether the spill occurs on or off right-of-way.
  - Clean up the spill;
  - Cleanup equipment and vehicles;
  - Dispose of cleanup materials, and;
  - Follow up with appropriate cleanup documentation.

Handling

- *During transportation*, secure herbicide containers to prevent movement within the vehicle or loss from the vehicle during the operation of the vehicle.

- Do not store herbicides in passenger compartment of vehicles.
- *When spray equipment is not being used,* all valves and tank covers shall be closed during any movement of the vehicle.
- Firmly secure to the frame of the vehicle any portable tanks used for herbicide application.

Safety

- *On jobs where herbicide splash may occur,* always use suitable goggles or face shield as required.
- Always use personal protective gear listed on the herbicide label.
- Do not permit workers with a known allergy to herbicides to participate in herbicide applications.
- Provide applicators with an on-site hand washing facility.
- Wash hands before eating, drinking, or smoking after applying herbicides and to take a hot shower at the conclusion of work.
- Do not smoke or consume food or drinks during the application of herbicides.
- Promptly change any clothing substantially contaminated by a herbicide if the material contacts the skin and the herbicide cannot be adequately removed. Each worker is to have one complete change of work clothes on the site.
- Use self-contained[2] herbicide handling equipment when appropriate and available to reduce worker exposure during herbicide mixing and handling.

Storage of Herbicides, Containers, and Equipment

- Follow label requirements for storage.
- Permanent storage facilities will meet the following requirements:
    - ✶ dry;
    - ✶ protected from freezing or excessive heat;
    - ✶ well-ventilated;

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[2] Self-contained herbicide handling equipment is equipment designed to limit worker exposure to herbicides. Examples: premixed herbicide containers that can be attached to a backpack sprayer (to limit the pouring and addition of water or other carriers to common container); canisters that are injected into the base of a tree and open to release herbicide once injected.

  * locked and, where possible, secured by gates and/or climb-proof fence;
  * impervious flooring;
  * all doors on storage areas properly posted to identify the use of the building for herbicide storage;
  * spill containment measures or devices;
  * a fully developed and maintained Spill Prevention and Countermeasure Plan;
  * maintained ABC-type fire extinguisher, and
  * meeting any additional standards set by State or local law.

- Store containers with labels plainly visible. Group together all containers of the same product.
- Inform local fire department, in writing, of the amounts, kinds, and locations of stored herbicides.
- Stack herbicide containers on stable pallets and out of the way, to prevent container damage by other traffic.
- Store containers upright. Seal all containers appropriately. If containers are not in good condition, repackage and label with a copy of the label and the relabeling date.
- Do not store herbicides in empty food or drink containers.
- *Where practicable,* maintain a complete inventory indicating number and identity of containers in storage unit.
- Label "contaminated with herbicides" any of those items used for handling herbicides at the storage site that might be used for other purposes. Do not remove item from site without thorough decontamination.
- Do not transfer herbicides to unmarked containers except for immediate use. Do not return unmarked containers back to a storage area.
- Store herbicide containers in such a way that the oldest batch is used first and that partially used containers are used first.
- Clean spilled areas immediately. Inspect storage areas frequently for leakage.
- Store only minimum amounts of chemicals at field and temporary locations; order out no more chemicals than necessary.
- Dispose of unwanted or unusable products promptly and correctly.

- *In temporary locations, such as the field,* store all chemicals in buildings or vehicles that can be locked up.
- *During transportation,* do not leave vehicles transporting chemicals unattended unless the chemical is being carried in a closed van.

Disposals

- Do not burn paper and carton-type containers unless so stated on the label.
- Dispose of containers or cartons in one of three ways:
  - ✶ **Triple rinse** containers of liquid herbicides before disposal. The rinse solution will be poured into the mix-tank and *used for treatment.* Each rinse solution shall be equal to at least 10 percent of the container volume. Dispose of the empty containers as noncontaminated waste, at any legal landfill dump.
  - ✶ Use a **rinsing nozzle** (instead of triple rinsing). A rinsing nozzle has a sharp point that can puncture a plastic or metal empty herbicide container and flush the container's contents into the mix tank.
  - ✶ Return **returnable** "mini-bulk" type containers to the distributor for refill.
- Dispose of unwanted or unusable herbicide products as contaminated waste at an approved waste facility.
- Dispose of contaminated materials (including contaminated soil) resulting from cleanup procedures according to agency directives.
- Place any contaminated materials to be transported in watertight containers.

5. Determine debris disposal and revegetation methods, if necessary.

In this step, Project Managers would do the following:

- Determine the appropriate debris disposal methods to be used, based on four steps above: 1) facility and vegetation control needs, 2) type of land-uses and contacts with land owners/ managers, 3) natural resources present, and 4) control methods used.
- Determine whether reseeding or replanting is necessary for erosion control, preventing noxious weed infestation, establishing and promoting low-growing plants, or promoting wildlife habitat.

Vegetative Debris Disposal

For vegetative debris disposal, Project Managers would apply the following mitigation measures, as appropriate.

***The Federal Clean Air Act**, as revised in 1990 (PL 101-542, 42 USC 7401), requires the EPA and states to carry out programs intended to assure attainment of the National Ambient Air Quality Standards.*

*Section 404 of the **Clean Water Act** requires permits from the U.S. Army Corps of Engineers to discharge dredged or fill material into waters of the U.S. (Vegetation debris left in a stream or wetland could be considered fill material.)*

- Do not permit debris from tree falling, cutting, or disposal to fall into or be placed in any watercourse, spring, pond, lake, or reservoir, *unless* there is approval from the appropriate authorities for stream habitat projects.
- *Where the scattering method of disposal is used,* perform in accordance with specific requirements or agreement with the responsible fire control agency.
- *If on grazing lands and there is potential for pine needle poisoning,* do not lop and scatter pine tree vegetative debris—machine-chip or haul debris off-site.
- *If using heavy equipment for piling debris,* perform when the ground is able to support equipment, and excessive rutting will not occur.

- Reduce vegetation debris accumulation that can produce a fire hazard along the right-of-way.
- *If debris is removed from site*, take debris to an approved dumpsite.
- *If burning vegetation debris piles*, burn off the right-of-way. Do not burn debris close enough to the right-of-way or facility where smoke could provide a conductive path from the transmission lines or electric equipment to the ground.
- *Before pile burning is attempted off the right-of-way*, secure from the applicable fire control agency any required permits for burning.
- *If burning vegetative debris piles*, keep piles relatively small to keep intense and prolonged heat from damaging the soil horizons.
- *If burning*, do not pile burn in or next to watercourses.
- *If burning*, do not use oil, diesel, or rubber to start pile burn fires.

Reseeding/ replanting

If reseeding or replanting is determined to be necessary, Project Managers would apply the following mitigation measures, as appropriate.

- Select for establishment those seeds, seedlings, or plants that are consistent with management objectives and adapted to climatic conditions, soils, landscape position, and the site itself.
- Use adapted seed and plant materials, considering appropriate species for availability of moisture, temperature and alkali or acidic soils.
- *If using native species*, use species that meet the objectives of the re-vegetation project, including erosion control, noxious weed management, competition of tall-growing trees, and wildlife management.
    - ✱ Consider using native seed/plants if the costs are reasonable, and they are readily available in the quantity and quality needed to perform the project.
    - ✱ *If native seed mixes are not reasonably priced or available in needed quantities*, consider a seed mix with some percentage of native seeds.
- Use high-purity seed; take actions to prevent purchase of seed contaminated with noxious weeds.
- Prepare seedbed properly.

- Use proper planting time and dates to ensure enough moisture for germination and growth and before frosts.
- Use effective planting methods; drill seeding is most effective, broadcast methods are appropriate when drill method is impractical.
- Consider increasing seeding rates for critical erosion areas by 150% of recommended drill seeding rates.
- *For wildlife forage*, consider adding legumes.
- *For creating shrub cover*, consider adding shrub species.
- Plant tree and shrub stock according to local standard.
- Follow recommendations for applying appropriate soil amendments and fertilizers.
- If practical, control weed growth during seed or seedling establishment.
- *If possible*, protect the site from grazing for 1-2 years until establishment.
- See mitigation measures for seeding near agricultural areas.

6. Determine monitoring needs.

In this step, Project Managers would do the following:

- Determine what steps are needed to evaluate whether treatments or mitigation measures are working properly and to ensure that other resources are not being adversely affected.
- Visit rights-of-way shortly after treatment (at least within a year of treatment) to determine effectiveness:
  - ✶ Was target vegetation controlled?
- Visit rights-of-way within a year of treatment to determine whether any other impacts occurred:
  - ✶ Were non-targeted plants affected?
  - ✶ Were there any environmental impacts (i.e., erosion, water contamination, debris in wetlands)?
  - ✶ Were desired results for environmental resources achieved (water, fish, soil, scenic, cultural).

- Monitor to determine whether follow-up treatments or mitigation measures are necessary (e.g., erosion control measures such as mulching, hydroseeding, coconut blankets).
- Use monitoring to help determine methods/issues for next treatment cycle.

7. Prepare appropriate environmental documentation.

In this step, Project Managers would do the following, as appropriate:

This Draft EIS was prepared according to the National Environmental Policy Act (NEPA, 42 USC 4321 et seq.). NEPA is a national law that protects the environment. NEPA applies to all Federal projects or projects that require Federal involvement.

- For environmental compliance, document the outcome of the Planning Steps through the use of a checklist; attach any T&E species consultations or other supplemental information as appropriate.
- Develop a Supplement Analysis (a NEPA analysis tiered to this program-wide EIS) that compares the project-specific potential impacts with those disclosed in the EIS.
- Conduct further NEPA environmental review if anticipated impacts or site-specific work are *substantially different* from those evaluated in EIS, or if significant new circumstances or information relevant to environmental concerns are found. If further NEPA review is needed, it would be in the form of an EA or an EIS depending on the extent of the substantially different impacts.

Other Requirements

The following Federal requirements are listed here for information only; they do not pertain to this project.

***Energy Conservation at Federal Facilities** - Vegetation management activities do not include the operation, maintenance, or retrofit of an existing Federal building; the construction or lease of a new Federal building, or the procurement of insulation products.*

Rivers and Harbors Act section 10 *- No work or placement of structures would be expected for during implementation of vegetation management activities.*

Radon Gas and Indoor Air Quality Act *- This act does not apply because vegetation management activities would not involve the release of radon gas into the air, groundwater, or soil in levels that exceed the ambient radon level.*

Executive Order on Environmental Justice (EO 12898) *- This Executive Order was enacted to ensure that Federal agencies do not unfairly inflict environmental harm on economically disadvantaged and minority groups within the U.S. or any or its territories. The vegetation management program would not result in disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.*

Coastal Zone Management Act*—This act requires that Federal actions be consistent, to the maximum extent practicable, with approved state Coastal Zone Management programs. Bonneville's vegetation management program is not expected to have coastal zone impacts.*

Chapter IV
Program Alternatives

In this chapter:

- **Right-of-way Program Alternatives**
- **Electric Yard Program Alternative**
- **Non-electric Program Alternatives**

Alternatives Overview

This chapter describes and compares the different **program alternatives**—the different options for action to address the need to manage vegetation. Each set of alternatives identifies one alternative as **"current practice" (No Action)**: this means that we keep doing what we are now, without any change.

The National Environmental Policy Act says that, when agencies are making a decision on an action that could affect the environment, the agency must also consider ***not*** *taking action—the "no action" alternative.*

In preparing this environmental study, we have analyzed, evaluated, and compared the alternatives. The resulting information will be used to decide which course of action to follow.

The alternatives are broken in to three different programs, beginning on page 83. "Current Practice" alternatives are identified with an asterisk (*).

Right-of-way Program

The right-of-way program includes vegetation management on transmission-line rights-of-way and access roads, and along microwave beam paths. This program has three sets of alternatives that can be combined in different ways to create an overall right-of-way program. The different combinations will address the following three questions:

1. Which **management approach** should Bonneville adopt for maintaining rights-of-way?

* **MA1 – Time-Driven** (which uses repetitive maintenance cycles for vegetation control), or

MA2 –Promotion of Low-growing Plant Communities *(Bonneville and environmentally preferred)* (a progressive approach that requires more intense work in the short term, with diminished work in the long term).

2. What **methods package** (or "tool box") should Bonneville adopt for managing right-of-way vegetation?

R1 – Manual, Mechanical, Biological, or

R2 – Manual, Mechanical, Biological + **Herbicide – *spot and localized application*** *(environmentally preferred)*, or

* **R3** – Manual, Mechanical, Biological, Herbicide – *spot, localized* + ***broadcast application***, or

R4 – Manual, Mechanical, Biological, Herbicide – *spot, localized, broadcast* + ***aerial application*** *(Bonneville preferred).*

3. If Bonneville decides to use **herbicide methods** in the right-of-way program, on what **kinds of vegetation** should they be applied?

VS1 – Noxious Weeds only, or

VS2 – Noxious Weeds & Deciduous *(environmentally preferred)*, or

* **VS3 – Any Vegetation** *(Bonneville preferred).*

Electric Yard Program

The Electric Yard Program includes substations, electric yards, and sectionalizing switches. The program has one alternative, and one alternative eliminated from further consideration.

* **E1 – Herbicide Treatment.**

Non-electric Program

The Non-electric Program includes facilities that have landscaping and gravel work yards or parking lots. The two alternatives will address the following question:

What methods should Bonneville use for managing non-electric facility vegetation?

* **NE1 – Mixed Methods with Herbicides** *(Bonneville preferred)*, or

NE2 – Non-herbicide Methods *(Environmentally preferred).*

Differences between the Alternatives

Because herbicide use was a major topic of the comments received on Bonneville's vegetation management program, we have designed many of the alternatives to reflect the issue of **whether or not to use herbicides and, if so, to what degree.**

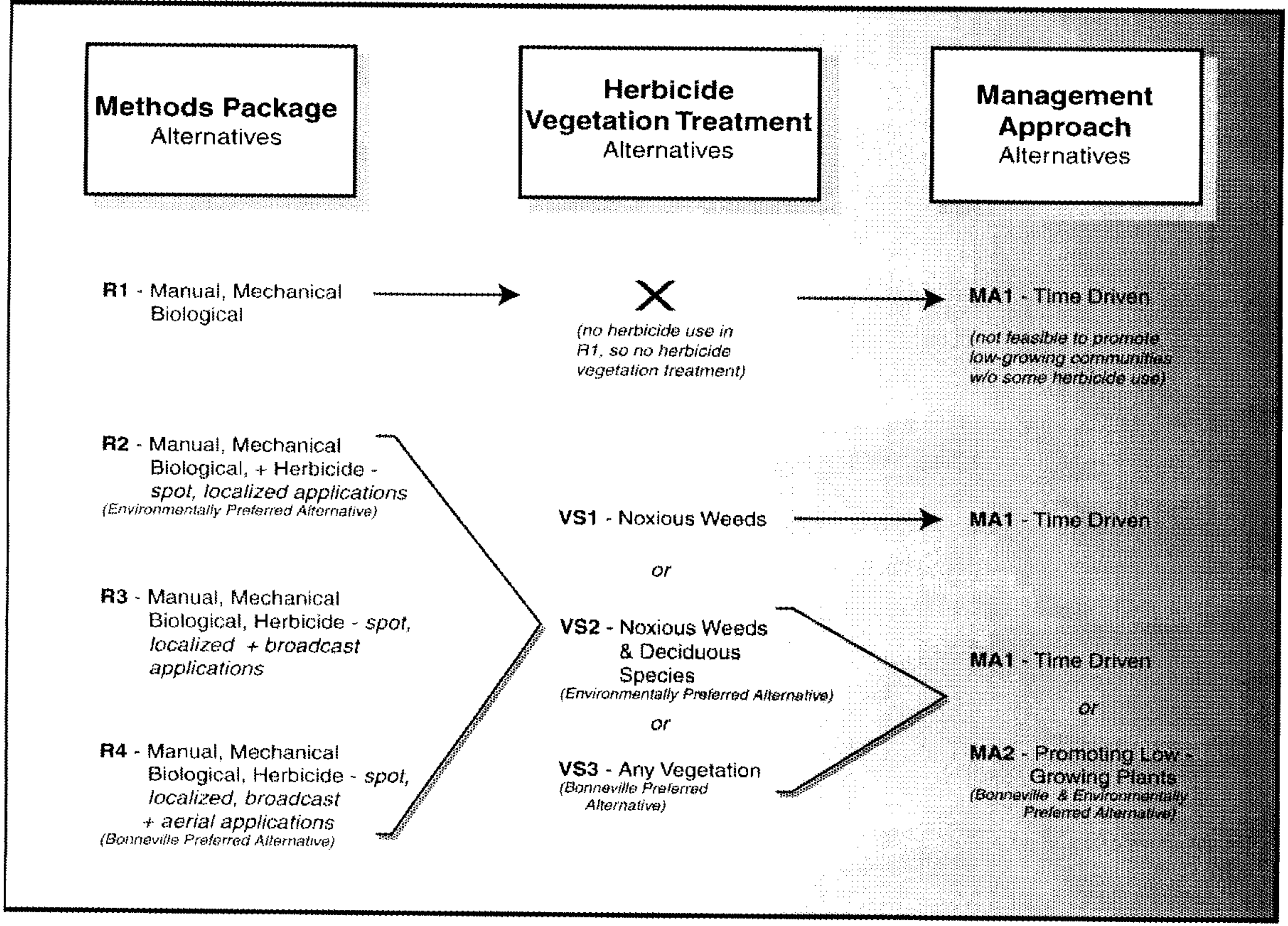
The **right-of-way program** addresses the herbicide issue in three ways:

1. The management approach, including whether there is an end goal that would reduce herbicide use in the long term;
2. Whether herbicides are included in our "tool box," and (if so) what kind of application methods would be allowed (a range from spot treatments to aerial spraying); and
3. If we do use herbicides, whether we limit the type of plants that can be treated with herbicides.

The **non-electric program** addresses the herbicide issue by offering an alternative with herbicide use and an alternative without herbicide use.

The next sections contain detailed information on each set of alternatives.

Figure IV–1: How The Right-of-way Alternatives Can Be Combined



Right-of-way Management Approach Alternatives

The right-of-way program has two alternatives for how to approach vegetation management:

*MA1 - Time-driven (*current practice*), and

MA2 - Promotion of Low-growing Communities *(Bonneville Preferred & Environmentally Preferred Alternative).*

Alternative MA1: Time-driven (*current practice*)

Description

Bonneville would follow a management approach in which cycles of maintenance are repeated in a continuing (and basically unvarying) loop to achieve the desired result.

We would determine appropriate scheduling (cycle times) for managing vegetation for a right-of-way. For instance, now we cut vegetation every 2 - 8 years on the West side of the Cascades (where ample water supply means that vegetation growth is faster) and every 10 - 15 years on the East side of the Cascades (where vegetation growth is slower).

At each designated cycle management point, we would clear or treat the right-of-way to try to ensure that no vegetation would threaten the transmission line or block access until the next cycle of treatment. As with MA2, we would also undertake any emergency work (trees that threaten the line and need to be removed immediately, rather than waiting for planned maintenance).

This approach might use herbicides, or not. It is based on clearing or treating vegetation as it needs to be done, rather than trying to clear preventively to lessen future vegetation management. This approach could be implemented with any of the right-of-way program alternatives (e.g., any of the Methods Package alternatives and the Vegetation Selection alternatives).

This approach most closely resembles our current practice. We mostly manage our rights-of-way based on a time-driven approach, although we are attempting to promote low-growing plant communities in a few areas. More information on our current practice related to the Time-driven approach is found in Chapter I, under **Managing Vegetation at Bonneville Facilities.**

Impacts

Under this management approach, impacts would continue very much as at present. Sapling-filled corridors would develop, requiring the same or increasingly intensive maintenance with each maintenance cycle. With each cycle, there would be repeated disturbance of the right-of-way, including habitat disturbance, noise disturbance, and soil and non-target plant disturbance.[1]

Health and safety impacts associated with this alternative would be regular maintenance impacts; however, the chances of such impacts occurring would be greater with this alternative than with Alternative MA2 because the maintenance cycles would involve more intense work. If herbicides were not used, then there would not be any potential health impacts associated with exposure to herbicides (as there could be with Alternative MA2).

Because this approach could use any of the maintenance methods, the method-specific impacts would depend on the methods used. This alternative does not *require* the use of herbicides, and therefore could eliminate potential impacts associated with herbicide use.

Cost

This alternative would cost less than MA2 initially, but more in the long term. The costs of maintaining the right-of-way with a Time-driven management approach would remain constant or go up with each maintenance cycle because the right-of way would either keep reverting back to forest stage, or would increase with tree density as deciduous species resprouted.

Alternative MA2: Promotion of Low-growing Plant Communities

(Bonneville Preferred & Environmentally Preferred Alternative)

Description

With this alternative, Bonneville would promote the establishment of low-growing plant communities on the right-of-way, in a progressive (evolving) approach that requires somewhat more intense work in the short term, but diminished work in the long term.

The goal of this alternative is to change the vegetation structure to predominately low-growing vegetation, so that the right-of-way would require less intensive maintenance over time. In the long term, the *schedule* for vegetation management along the right-of-way might be the same as that for the Time-driven alternative; however, established low-growing plant communities would lessen the *amount* of vegetation that would need to be managed. In the short

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[1] Details on impacts are described in **Chapter VI.**

term, the vegetation maintenance schedule would need to be adjusted to allow for more frequent visits: perhaps every year or two to treat new tree seedlings before they get tall enough to compete with the low-growing species.

As with MA1, we would also immediately undertake any emergency work to remove trees that are an imminent threat to the line.

Because maintenance would likely be scheduled often at first, we would be unable to do all rights-of-way at the same time and would have to "phase" the program in.

This management approach of promoting low-growing plant communities is based on protecting low-growing plants from disturbance during maintenance and from competing tall-growing vegetation so that low-growers can establish and propagate. We could not carry out a wholesale planting of species, which would be infeasible and expensive for some 24,140 km (15,000 mi.) of corridor.

This alternative could be implemented *only* with the right-of-way methods package alternatives that include the use of herbicides (R2, R3, or R4), and the vegetation selection alternatives that include treatment of deciduous species (VS2 and VS3). This alternative requires the use of at least spot-herbicide treatment to treat deciduous species. See Figure IV-1 for these combinations.

How Low-growing Plant Communities Function

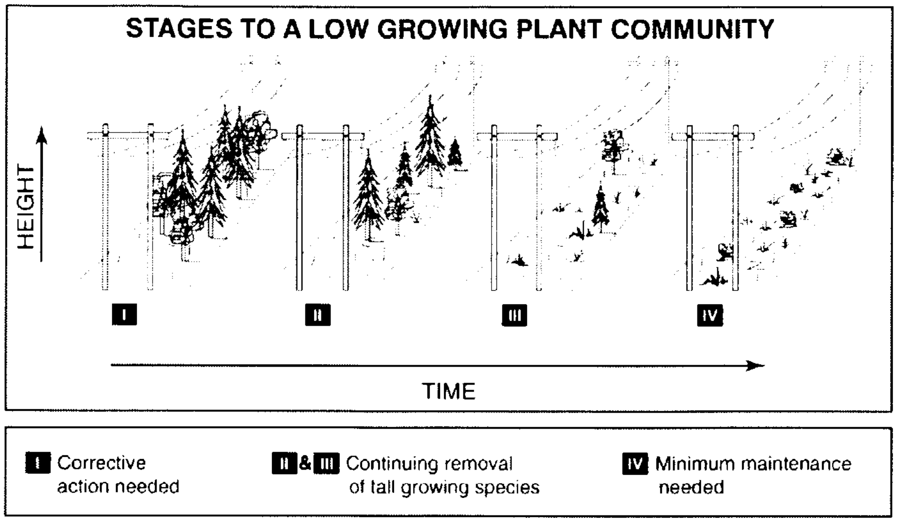
Research has shown that the establishment of a dense low-growing plant community may reduce the presence of trees (Bramble and Burns, 1983). Low-growing plants (grasses, shrubs, forbs, and herbs) can often "out-compete" trees and tall-growing brush for sunlight and nutrients. Where the low-growing plants shade the ground and absorb available moisture, it is harder for the trees to germinate underneath the shrubs or to grow up through the low-growing plant cover. This is essentially vegetation "self-management," and lessens the need for human intervention.

The low-growing plant community consists of shrubs, ferns and grass species (e.g., salmonberry, ceanothus, blackberry, bracken fern, and pinegrass).

In addition to competing for nutrients and sunlight, some plants produce chemicals to keep competing plants away. Such "allelopathic" interactions between plants may help establish and maintain low-growing communities in the rights-of-way.

There will always be some trees that are able to "get through" the low-growing vegetation and brush layer. We would have to eliminate those tall plants before they, in turn, begin shading and competing for moisture and space with the low-growing species.

Figure IV-2: Stages to a Low-growing Plant Community



There are a number of ways to achieve the goal of a semi-stable low-growing plant community that competes with and slows the growth of tall-growing trees. Here are steps to illustrate one way to achieve a low-growing plant community:

1. Remove existing tall-growing vegetation.

   If the tree density is thick (as in Stage #I in Figure IV-2), it is considered **corrective** action. Methods used for corrective actions can include non-selective methods such as mechanical clearing, broadcast, or aerial herbicide applications. However, if the tree density is not great (as in Stages II & III), it is not considered corrective. At this stage, more selective methods of vegetation removal may be more appropriate so as not to disturb any existing low-growing or desirable plants.

2. Use herbicides to treat deciduous trees to ensure that the trees do not resprout. (Studies to date indicate that early herbicide treatments are instrumental in keeping taller-growing vegetation from developing, just long enough to allow low-growing plants to be competitive (Bramble and Burns, 1983)).

3. Consider replanting or reseeding with ground cover if none exists or if there is a low potential for natural revegetation by low-growing species (and a high potential for natural revegetation by tall-growing species).
4. Maintain by selectively eliminating tall-growing vegetation before it is tall enough to shade or compete with other desirable species. Maintenance should be done with great care, so as not to disturb low-growing plants. The first few years may require continuing removal (Stages II & III in Figure IV-1) of tree saplings before the low-growing plant community can successfully maintain itself.

Bonneville, in conjunction with Oregon State University, is undertaking a long-term research project to test and demonstrate vegetation management strategies on electric utility rights-of-way. The primary goal of the research project is to design, test, and document vegetation management strategies and methods that will promote the establishment and growth of successionally stable low-growing plant communities within rights-of-way. We hope to gain valuable information regarding Pacific Northwest rights-of-way plant community dynamics with respect to various applied vegetation control strategies.

Impacts

The right-of-way clearing for Alternative MA2 would be less drastic than that of Alternative MA1. Over time, low-growing plant communities would lead to fewer tall-growing plants and less need to clear. Impacts associated with removing vegetation (sedimentation, disturbance) would decrease over time.

Health and safety impacts of this alternative also decrease over time as low-growing plants become established and maintenance activities lessen.

Because this alternative requires the use of at least some herbicides to help control the resprouting of deciduous species, impacts include potential herbicide impacts.

Cost

This alternative would probably cost more than Alternative MA1, Time-driven, in the short term, because for the first few years vegetation would most likely need to be treated more often until low-growing plant communities were established. In the long term, however, this alternative would be less expensive to maintain the right-of-way under this alternative because less clearing would be needed.

Table IV-1, below, compares the costs, impacts, and effectiveness of the two management approaches.

Table IV-1: Comparison of the ROW Management Approach Alternatives

Decision Factors	MA 1 Time-Driven *(current practice)*	MA2 Promotion of Low-growing Plant Communities *(Bonneville Preferred & Environmentally Preferred Alternative)*
	Managed on a designated cycle time	*Managed to achieve low-growing vegetation on ROW in the long term*
Minimizes adverse environ-mental impacts	Increased frequency of habitat, noise, soil, and non-target plant disturbance and intrusions upon landowners. More frequent maintenance cycles in long-term increase health and safety risks. Reduced contamination risks if avoid herbicide use.	Reduced soil, non-target vegetation, and habitat disturbance because less clearing needed as low-growing plant communities successfully establish on ROW. Reduced safety risks as maintenance cycles become less frequent. Slightly increased contamination risk due to herbicide use.
Achieves cost and administra-tive efficiency	Long-term maintenance costs increase as deciduous species resprout and require more frequent treatment.	Long-term costs reduced as low-growing plant communities are successfully established and maintenance cycles become less frequent.
Complies with laws and regulations	Complies with all laws and regulations.	Complies with all laws and regulations.
Ensures a safe and reliable power system.	Electric stability and reliability could be compromised if maintenance cycles are not adequately implemented.	Electric stability and reliability improves as low-growing plant communities successfully inhibit growth of species that could interfere with power flow.

Right-of-way Methods Package Alternatives

The right-of-way program manages vegetation on transmission-line rights-of-way and access roads. (Rights-of-way cannot have tall trees or brush close to transmission-line conductors, nor can brush block access roads or towers; noxious weeds need to be controlled as appropriate.) The program also includes microwave beam paths (trees must not block paths). The right-of-way program has four Methods Package alternatives:

R1 – Manual, Mechanical, Biological

R2 – Manual, Mechanical, Biological + **Herbicide – *spot and localized application*** *(Environmentally Preferred Alternative)*

* **R3** – Manual, Mechanical, Biological, Herbicide – *spot, localized* + ***broadcast application*** *(current practice)*

R4 – Manual, Mechanical, Biological, Herbicide – *spot, localized, broadcast* + ***aerial application*** *(Bonneville Preferred Alternative).*

These alternatives are the various packages or combinations of methods that could be available for use in our management program—the "tools" in our "tool box."

> ***Please note:*** *For each alternative, a pie chart shows a general percentage of each method that would be used to control right-of-way vegetation throughout our service territory, given the methods available with the alternative. These general percentages were developed by people who conduct vegetation management for Bonneville, who know the system, and who have the training to apply the various methods, given the terrain, vegetation types and natural resources present.*
>
> ***Also:*** *The amount of biological control used does not change from alternative to alternative. Bonneville plans to pursue the use of insects, where possible in conjunction with other agencies, to help control the spread of noxious weeds, regardless of the management program chosen.*

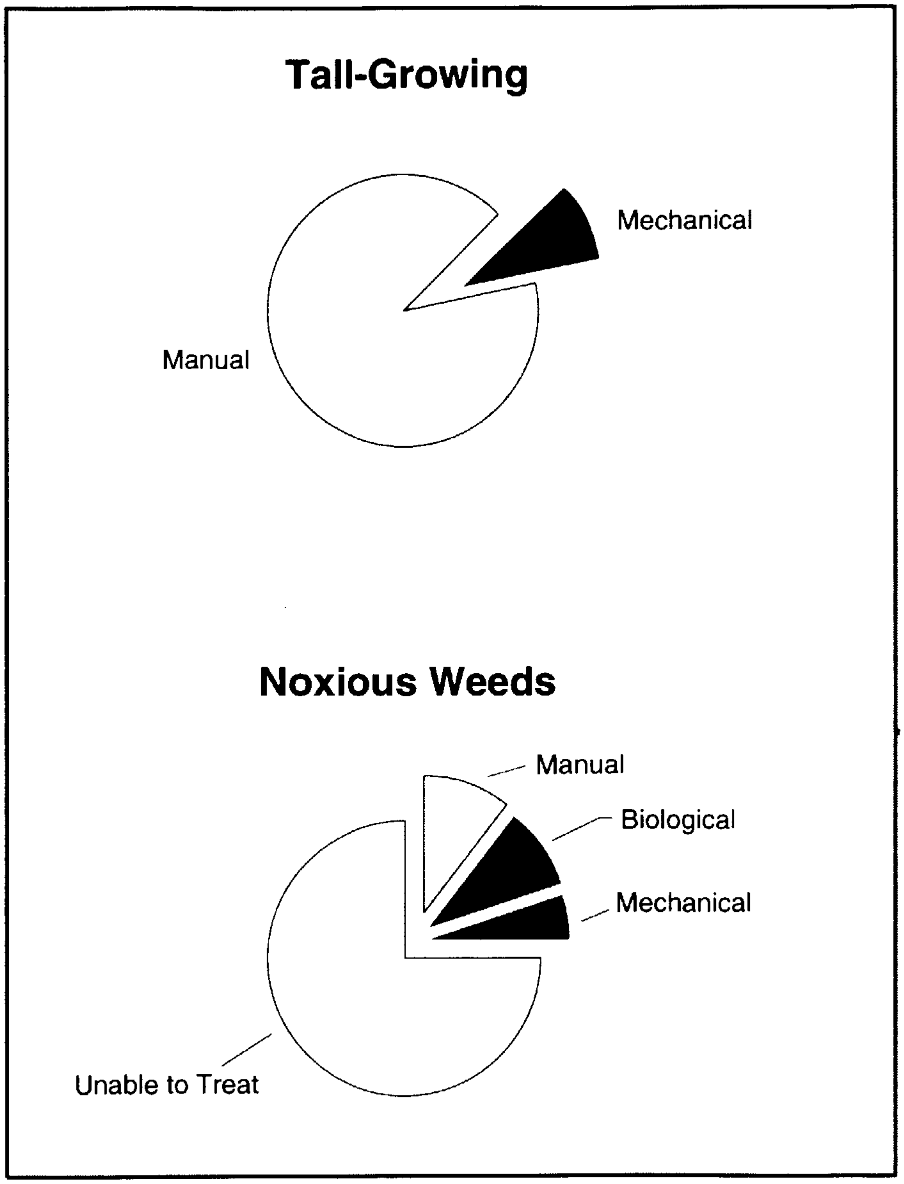
Alternative R1: Manual, Mechanical, Biological

Description

Alternative R1 would use a mix of manual, mechanical, and biological methods to control vegetation on the rights-of-way, access roads, and around towers. No herbicides or growth regulators would be used.

This chart shows generally how much each of the methods would be used to maintain our rights-of-way using methods available under Alternative R1.

Figure IV-3: Mix of Methods under Alternative R1



Some people think that herbicides should not be used in a variety of land management practices—forestry, agricultural, or home use. This sentiment (as well as the opposing sentiment that herbicides should be so used) was reflected in our EIS scoping, as well as in some comments to other Federal land-managing agencies in their practices. Alternative R1 was developed to see how it would work not to use herbicides to manage the vegetation along our rights-of-way.

With this mix of methods, most of the right-of-way would be managed manually, through chainsaw cutting of tall-growing vegetation. Mechanical control would be used in areas where vegetation was extremely dense, possibly on access roads where low brush can be a hindrance, and around tower structures. A large percentage of areas with noxious weeds could not be treated with this alternative. In those areas where noxious weeds could be treated, biological, manual, and a small amount of mechanical means would be used.

This alternative would be compatible with the Time-driven approach (MA1); it would not be compatible with the Low-growing Plant Communities approach (MA2).

Impacts

This alternative relies heavily on manually keeping the right-of way cleared. The environmental impacts, therefore, are mostly associated with manual impacts. Generally, environmental impacts from this alternative would be relatively benign in the short term: there would be some noise from chainsaws that would disturb wildlife and residents, and there is potential for chainsaw oil to get into water bodies. Overall, however, the direct environmental impacts (other than the cutting of the vegetation) from using chainsaws would be minimal.

The indirect or long-term impacts of this alternative would occur as vegetation resprouted. Deciduous vegetation resprouts with an increased number of stems when cut, creating more thickly vegetated rights-of-way that need to be managed even more intensively. The right-of-way then needs more extensive clearing (more vegetation per acre needs to be cut) with each successive maintenance cycle.

When densely vegetated areas are cleared, environmental impacts are more drastic compared to the selective removal of trees or brush. More habitat is affected, more soil is disturbed, non-target plants that have grown in shade-tolerant situations are suddenly exposed, human presence on the right-of-way is increased, and visual impacts are more sudden and more dramatic.

Noxious weed control is a concern with this alternative. Biological control agents (insects) are available for some, but not all, noxious weeds. Biological controls can also be limited due to weather and site-conditions. Mechanical or manual methods are also not very effective, because noxious weeds are very resilient and capable of resprouting through roots, as well as from seed.

Worker health and safety impacts with this alternative would be related to chainsaw accidents, felling of trees, and relatively minor physical impacts of hiking—often on very rough terrain. It is also potentially dangerous to cut trees on steep terrain, compared to spraying a tree with herbicide and leaving it standing. Impacts related to mechanical methods would be due to heavy equipment accidents; impacts of biological methods include injury from hiking rights-of-way and potential helicopter or plane accidents if aerially applying biological controls.

Cost

This alternative would cost more to implement than alternatives that include the use of herbicide methods, for the following reasons:

1. No herbicide treatments of deciduous vegetation means that maintenance cycles would repeat more often in areas of deciduous species.
2. In deciduous areas, maintenance would be more intensive (resprouts are denser than initial saplings).
3. The more labor-intensive manual methods generally cost more than herbicide methods. (See Table II-5 in **Chapter II**.)
4. Labor-intensive manual methods are more time-consuming, requiring higher administrative costs than herbicide methods.

Alternative R2:

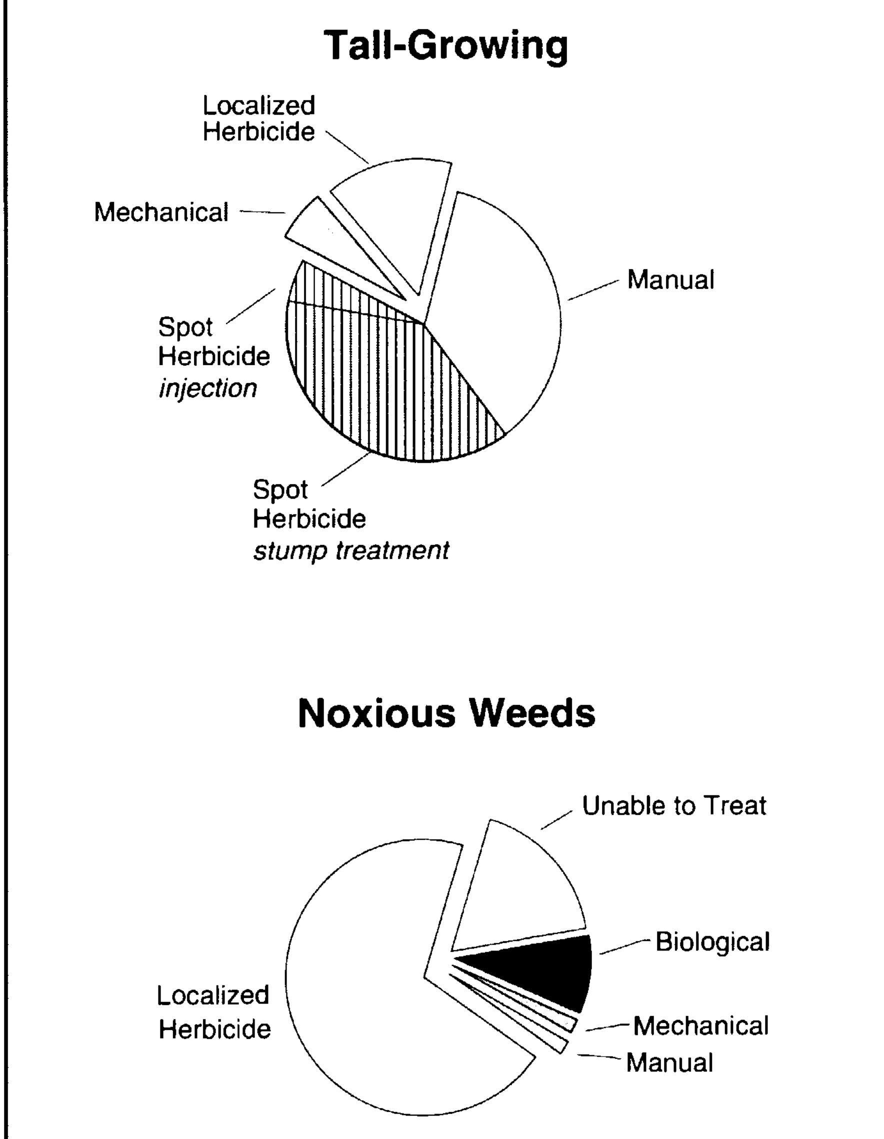
Manual, Mechanical, Biological + **Herbicide – *spot and localized application***

(Environmentally Preferred Alternative)

Description

Alternative R2 would use a mix of all the methods—manual, mechanical, biological, and herbicide. However, only spot herbicide and localized herbicide applications would be used (no broadcast or aerial herbicide applications would be used). Herbicide applications include the use of growth regulators.

Figure IV-4: Mix of Methods under Alternative R2



This pie chart shows generally the percentage of the methods we would use to maintain our rights-of-way under Alt. R2.

Herbicide use for tall-growing vegetation is dependent on the selection of Alternatives VS2 (noxious weeds and deciduous), or VS3 (any vegetation).

As with all the alternatives, most of the right-of-way would still be managed manually: we would use chainsaws to cut tall-growing vegetation.

However, nearly half those areas manually cut would receive follow-up spot herbicide treatments (on deciduous vegetation). *Herbicide use for tall-growing vegetation is dependent on the selection of Alternatives VS2 (noxious weeds and deciduous), or VS3 (any vegetation).*

The next most used method would be localized herbicide treatments. A relatively small amount of spot treatment (not used in conjunction with cutting) and mechanical methods would also be used. By adding herbicide methods, manual methods would be used somewhat less than with R1.

Noxious weeds would be treated mainly via localized herbicide applications (backpack or ATV-mounted sprayers). Some biological methods would be also used. Manual and mechanical would rarely be used. There would still be some areas or weeds that could not be treated.

This alternative would be compatible with both the Time-driven approach (MA1) and the Low-growing Plant Communities approach (MA2).

Impacts

This alternative would have short-term environmental impacts from manual methods (chainsaw noise, exhaust, potential fuel/oil leaks), although those impacts would be less than those of R1. Spot and localized herbicide use could involve potential spills that could contaminate water bodies and affect other non-target vegetation. However, because this alternative uses more selective herbicide application techniques that can target only the plants needing treatment and have less potential for drift, there is less potential to affect non-target plants or water bodies than under R3 or R4.

In the long term, this alternative could be able to control resprouting of deciduous plants, reducing the amount of regrowth along rights-of-way.

Worker health and safety issues associated with this alternative would include those for manual (chainsaw accidents, felling of trees), mechanical (heavy equipment accidents), and biological (hiking right-of-way). This alternative would have fewer manual safety issues for workers than R1, because workers would be able to use herbicides to treat vegetation on steep slopes or sites that are awkward or potentially dangerous for felling trees.

Worker safety issues would also include those associated with handling herbicides—toxicity and potential chronic effects of repeated exposures to herbicides. Herbicides must be handled appropriately and with caution. (See discussions of herbicides in **Chapters II and III.**)

Public health and safety impacts with this alternative would include those associated with manual (little/no impact), mechanical (flying debris) and slight potential public exposure to herbicides (potential toxic reactions if there were a spill or misapplication).

This alternative could control noxious weeds more easily than R1, because noxious weeds are difficult to manage solely with mechanical and manual methods. However, noxious weed control would not be as easy as under R3 and R4, which allow the use of broadcast and/or aerial applications of herbicides.

Cost

This alternative would cost less to implement than Alternative R1 in the short term: herbicide methods of controlling vegetation are less expensive than manual methods. However, the cost difference is not dramatic because herbicide methods of treatment replace only some of the manual treatments that would occur in R1.

This alternative would cost quite a bit less to implement than R1 in the long term; the use of spot and localized herbicide treatments on deciduous trees should reduce the overall need for maintenance, which in turn should reduce overall program costs.

This alternative would cost slightly more than R3, and quite a bit more than R4.

Alternative R3:
Manual, Mechanical, Biological, Herbicide – *spot, localized* + ***broadcast application*** *(current practice)*

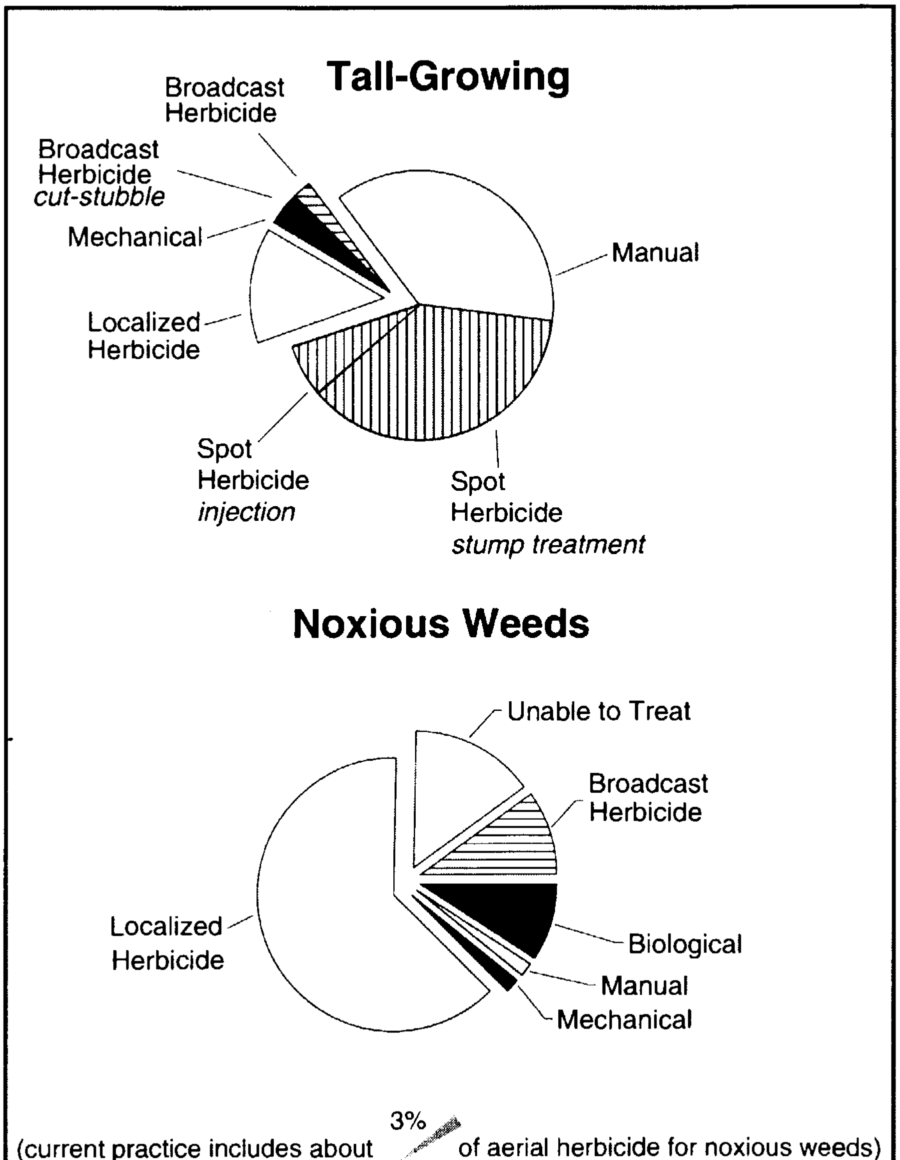
Description

Alternative R3 would use a mix of all the methods—manual, mechanical, biological, and herbicide. Spot, localized, and broadcast herbicide applications would be used. No herbicides would be aerially sprayed. See Figure IV-5, below.

Figure IV-5: Mix of Methods under Alternative R3

This pie chart shows generally the percentage of the methods we would use to maintain our rights-of-way under Alt. R3.

Herbicide use for tall-growing vegetation is dependent on the selection of Alternatives VS2 (noxious weeds and deciduous), or VS3 (any vegetation).



This alternative varies only slightly from R2: most of the right-of-way would still be managed manually. Nearly half of those areas manually cut could receive follow-up spot herbicide treatments (deciduous vegetation).

Herbicide use for tall-growing vegetation is dependent on the selection of Alternatives VS2 (noxious weeds and deciduous), or VS3 (any vegetation).

The next most-used method could be localized herbicide treatments. A relatively small amount of broadcast herbicide, spot herbicide treatment (not used in conjunction with cutting), and mechanical methods would also be used.

Half of the mechanical treatments could also receive a subsequent broadcast herbicide treatment ("cut-stubble" treatment of deciduous species). Using broadcast herbicide means that the amount of right-of-way that would be treated manually is slightly reduced, compared to R2. The ability to use one more "tool" offers a little more flexibility in determining the best way to manage a right-of-way, given all the site conditions.

Noxious weeds would still mostly be treated with localized herbicide applications, with some broadcast application being used instead of localized or spot treatments. There would still be untreatable areas.

This alternative would be compatible with both the Time-driven management approach (MA1) and the Low-growing Plant Communities management approach (MA2).

This method most closely represents Current Practice for right-of-way vegetation management. However, our current practice includes participation with other agencies for a small amount of aerial herbicide applications on noxious weeds.

Impacts

Environmental impacts would be very similar to those for R2, with slightly less impact from manual methods and somewhat more potential for herbicide contamination impacts. The latter would be greater because somewhat more herbicide would be used and because the application technique is non-selective. Non-selective broadcast spraying can potentially affect non-targeted plants and has greater potential for drift.

As with R2, this alternative could in the long term be able to control resprouting of deciduous plants and reduce the amount of regrowth along rights-of-way. If promoting low-growing plant communities, broadcast herbicide applications would be most appropriate for rights-of-way requiring corrective action (see Figure IV-1). Broadcast herbicide applications are non-selective; they would not be appropriate for maintaining rights-of-way with low-growing plant communities.

As with R2, the worker health and safety issues associated with this alternative would include those for manual, mechanical, and biological. This alternative would have somewhat fewer manual safety issues for workers than R2, because manual controls would be used less, but slightly more potential herbicide safety issues because more herbicide would be used. However, because the application is done via a truck, there is actually less potential for worker exposure with the chemical.

Public health and safety impacts with this alternative would include those associated with manual, mechanical, and potential public exposure to herbicides. The slight potential public exposure to herbicide would be somewhat greater with this alternative than with R2, because there is more potential for drift and accidentally spraying persons on the right-of-way with broadcast methods (compared to spot or localized herbicide applications).

Noxious weeds could be controlled more easily with this alternative than with R1, which is limited to mechanical and manual methods, and somewhat more easily than with R2. Alternative R3 allows the flexibility to choose broadcast applications to treat a noxious weed infestation if the site and weed species would best be treated in this manner.

Cost

The costs of this alternative would slightly less than R2. There would be some slight efficiencies in the use of broadcast applications (quicker right-of-way treatment of large areas), with higher costs for the use of the necessary equipment. As with R2, the long-term costs of this alternative would be less than those for R1 because deciduous plants could be treated so that they don't resprout.

Alternative R4:

Manual, Mechanical, Biological, Herbicide – *spot, localized*, *broadcast* + ***aerial application***
(Bonneville Preferred Alternative)

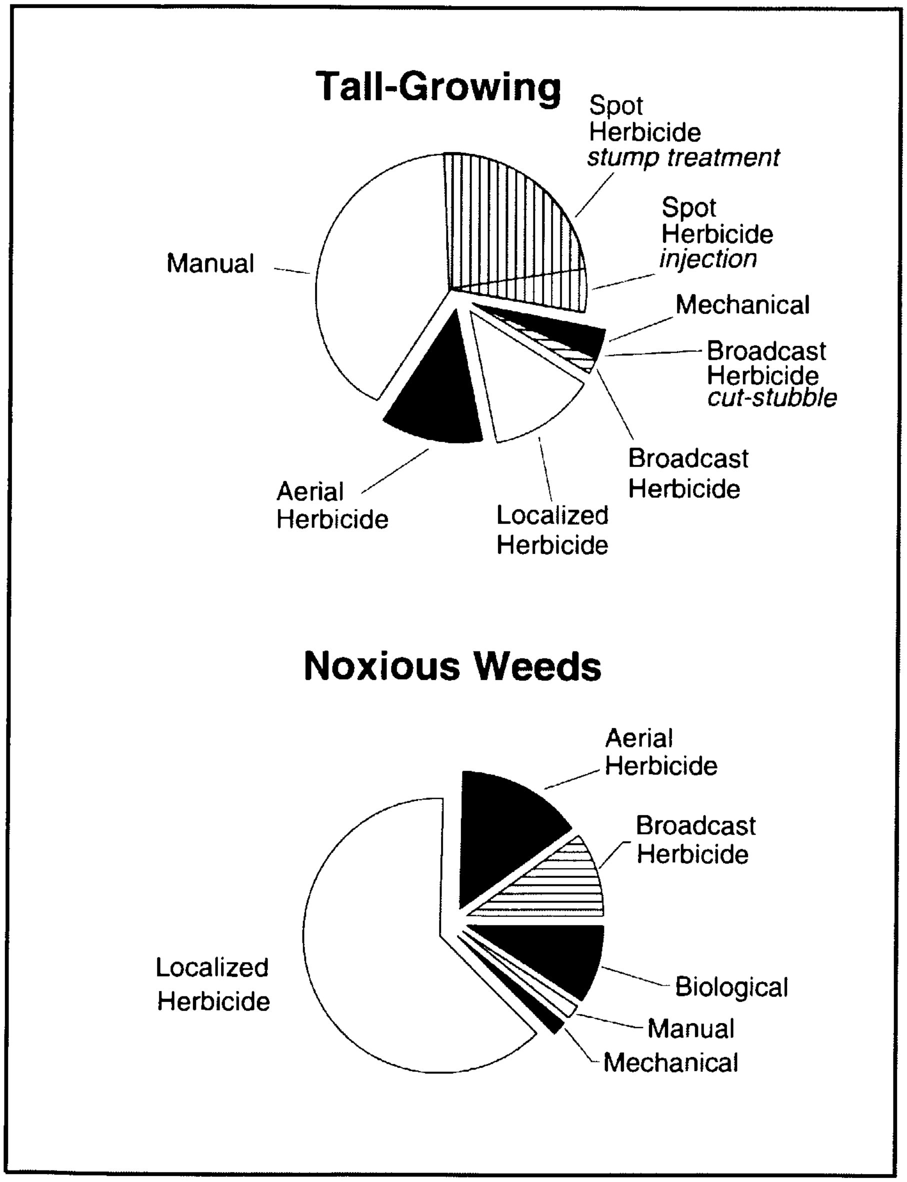
Description

Alternative R4 would use all the methods available, including selective use of aerial herbicide application.

This alternative is similar to R2 and R3: most of the right-of-way would still be managed manually. Nearly half of manually cut areas could receive follow-up spot herbicide treatments (deciduous).

Herbicide use for tall-growing vegetation depends on selection of Alts. VS2 (noxious weeds/ deciduous), or VS3 (any vegetation).

Figure IV-6: Mix of Methods under Alternative R4



This pie chart shows generally the percentage of the methods we would use to maintain our rights-of-way under Alt. R4.

Herbicide use for tall-growing vegetation is dependent on the selection of Alternatives VS2 (noxious weeds or deciduous), and VS3 (any vegetation).

The next most-used methods would be localized herbicide and aerial herbicide treatments. Some spot herbicide treatment (not used in conjunction with cutting), broadcast herbicide applications, and mechanical methods would also be used. Half of the mechanical treatments would also receive a subsequent broadcast herbicide treatment ("cut-stubble" treatment of deciduous species).

Adding aerial spraying would reduce reliance on manual methods, manual-with-spot-herbicide treatments, and localized treatments.

This alternative offers the widest range of methods to be used—the greatest number of "tools" in the tool box—when determining the appropriate way to manage the vegetation along a right-of-way.

This alternative would be compatible with both the Time-driven management approach (MA1) and the Low-growing Plant Communities management approach (MA2).

Impacts

The environmental impacts of this alternative would be very similar to those of R2 and R3, with slightly fewer impacts from manual methods and somewhat more potential for herbicide contamination impacts (more herbicide would be used, and the aerial application technique added to this alternative is non-selective).

Non-selective aerial herbicide spraying can *potentially* affect non-targeted plants and has greater potential for drift. Although aerial spraying is a non-selective application technique, the type of herbicide used can be species-selective—affecting only the plant species it is designed for.

As with R2 and R3, this alternative could in the long term control resprouting of deciduous plants and reduce the amount of regrowth along rights-of-way. If we were promoting low-growing plant communities, broadcast and aerial herbicide applications would be most appropriate for rights-of-way requiring corrective action (see Figure IV-1). Because these herbicide applications are non-selective, they would not be appropriate for maintaining rights-of-way with low-growing plant communities.

Other environmental impacts associated with this alternative include short-term helicopter or plane noise disturbance of wildlife and potentially of neighbors. This alternative would lessen some environmental impacts on those small portion of corridors that would be treated with aerial spraying, because aerial applications do not cause ground disturbance, non-target plants are not crushed, and soils are not disturbed.

Table IV-2: Comparison of the Methods Package Alternatives

Decision Factors	R1 Manual, Mechanical, Biological	R2 Manual, Mechanical, Biological, + Herbicide – *spot, localized application* *(Environmentally Preferred Alternative)*	R3 Manual, Mechanical, Biological, Herbicide – *spot, localized* *+ broadcast application* *(current practice)*	R4 Manual, Mechanical, Biological, Herbicide – *spot, localized, broadcast* *+ aerial application.* *(Bonneville Preferred Alternative)*
Minimizes Adverse Environmental Impacts	**Mostly manual impacts** ▪ Resprout of deciduous species. ▪ Chainsaw noise disturbance (people & wildlife). ▪ More worker presence on ROW. ▪ Potential worker accidents. **Some mechanical impacts** ▪ Can cause resprout. ▪ Can disturb non-target vegetation. ▪ Possibly expose/compact/erode soils & subsurface artifacts. ▪ Noise. ▪ Safety machinery accidents, flying debris. **Small amount of Biological impacts** ▪ Potential feed for fish, wildlife. ▪ Insects not aesthetically pleasing. ▪ Difficult to treat noxious weeds.	**Manual impacts** same as R1, with the following difference: ▪ If herbicides are used on deciduous vegetation, no resprout impacts. **Mechanical impacts** same as R1. **Biological impacts** same as R1. **Herbicide impacts** ▪ If used on deciduous, lessens resprout, ROW not treated as intensively, less worker presence. ▪ Potential spill, drift, or leaching could affect water, fish, vegetation, slight potential to affect wildlife, public. ▪ Slight potential of soil microbes being affected. ▪ Standing dead vegetation may reduce aesthetics. ▪ Worker impacts if careless repeat exposure. ▪ Greater ability to treat noxious weeds.	**Manual impacts** same as R2. **Mechanical impacts** same as R1, with the following difference: ▪ If follow-up broadcast herbicide is used, no resprout impacts. **Biological impacts** same as R1. **Herbicide impacts** same as R2, with the following differences: ▪ Additional *potential* for herbicide drift (broadcast applications). ▪ Greater ability to treat large areas of noxious weeds.	**Manual impacts** same as R2, with the following difference: ▪ Somewhat less impact—manual used less. **Mechanical impacts** same as R3. **Biological impacts** same as R1. **Herbicide impacts** same as R3 with the following differences: ▪ Slight potential of aerially spraying unseen resources—wetlands, etc ▪ Less worker presence on ROW in aerially treated areas. ▪ Less soil disturbance in aerially treated areas. ▪ Slight potential for public exposure in aerially treated areas if unable to ensure no public on remote ROWs. ▪ Greater ability than R3 to treat large areas of noxious weeds.
Achieves Cost and Administrative Efficiency	**Higher costs than other alternatives** due to the following: ▪ Manual labor takes more time to carry out. ▪ Deciduous resprouts create more clearing required in future. ▪ Some administrative efficiencies in environmental reviews (compared to determining buffers and mitigation for herbicide use).	**Less cost than R1 due to following** ▪ Spot stump treatment of manual cuts more expensive short-term, but lessens resprout & thus long-term cutting costs. ▪ Localized & spot herbicide applications used instead of manual reduces costs (less labor-intensive, requires little debris disposal). ▪ Increased administrative costs (compared to R1) due to environmental reviews for herbicide use.	**Relatively similar to R2 with the following differences:** ▪ In small areas where broadcast used instead of manual, costs and administrative efficiencies. ▪ Use of broadcast on portion of mechanical cuts would lessen those resprouts.	**Relatively similar to R3 with the following differences:** ▪ Where aerial is used instead of manual, labor costs more, but also administrative efficiencies (fewer people to coordinate – large area done quickly). ▪ Increased environmental review costs for use of aerial compared to manual.
Complies with Laws and Regulations	Complies with all laws and regulations (may be difficult to comply with control of noxious weeds).	Complies with all laws and regulations.	Complies with all laws and regulations.	Complies with all laws and regulations.
Ensures a Safe and Reliable Power System	Electric reliability and safety could be compromised with difficulty in keeping up with fast deciduous tree growth.	Electric reliability and safety possible.	Electric reliability and safety possible.	Electric reliability and safety possible.

ROW = Right-of-way

As with R2 and R3, the worker health and safety issues associated with this alternative would include those for manual, mechanical, biological, and herbicide methods. However, because manual methods would be used slightly less, this alternative would have somewhat fewer manual safety issues for workers than R2 and R3.

The additional use of herbicides would entail more potential herbicide safety issues. However, because aerial herbicide application is done via a helicopter or plane (rather than by backpack or hand application), there is actually less potential for worker contact or exposure with the chemical with this application technique. There is some risk of aircraft accidents when flying over or under transmission lines.

As with R2 and R3, public health and safety impacts with this alternative would include those associated with manual, mechanical, and potential public exposure to herbicides. The potential for public exposure to herbicides with this alternative would be slightly more than with R2 and R3, because there is more potential for drift with aerial herbicide use and a slightly greater potential for accidentally spraying persons who could be on the right-of-way.

Alternative R4 allows the additional flexibility to choose aerial herbicide applications to treat noxious weed infestations (if the site and weed species would best be treated in this manner).

Cost

The costs of this alternative would be quite a bit less than those for R2 and R3—there would be some administrative efficiencies in the use of aerial applications (quicker right-of-way treatment of large areas), with relatively low costs for aerial methods. As with R2 and R3, the long-term costs of this alternative would be less than those of R1 because deciduous plants can be treated so that they don't resprout.

Table IV-2, page 105, compares the methods packages alternatives.

Vegetation Selection Alternatives

Methods package alternatives R2, R3, and R4 use herbicides. For these three alternatives, another decision needs to be made—**which vegetation** can be treated with herbicides. We have three Vegetation Selection Alternatives, based on the three groupings of vegetation types that are being considered for herbicide treatment:

VS1 - Noxious Weeds,

VS2 - Noxious Weeds and Deciduous,

* **VS3 - Any Vegetation.**

Alternative VS1: Noxious Weeds

With **VS1** (noxious weeds only), we would treat only noxious weeds with herbicides. With this alternative, we would be able to keep in compliance with controlling noxious weeds.[2] However, deciduous species would not be treated. It would not be possible to implement the Promotion of Low-growing Plant Communities management approach (MA2) with VS1.

With this alternative, the environmental impacts from herbicide use would be limited to *only* those areas treated for noxious weed invasion. Because herbicides would not be used on deciduous species, there would be environmental impacts associated with the increased maintenance needed to clear densely vegetated areas.

Alternative VS2: Noxious Weeds & Deciduous *(Environmentally Preferred Alternative)*

With **VS2** (noxious weeds and deciduous), only noxious weeds and deciduous resprouting/suckering-type plant species could be treated with herbicides. With this alternative, noxious weeds could be adequately addressed, as could the major issue of treating deciduous resprouting vegetation. With the ability to treat those deciduous species, we can promote low-growing plant communities along the right-of-way.

The environmental impacts of this alternative would include those associated with the use of herbicides in areas with deciduous species. However, there would be less impact (compared to Alternative VS1), because less maintenance would be needed on the right-of-way. Both the Time-driven management approach (MA1) and the Low-growing Plant Communities management approach (MA2) could be implemented with this VS alternative.

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[2] It is difficult to manage noxious weeds without herbicides, especially when a biological agent is not available for a particular weed species.

Alternative VS3: Any Vegetation

(current practice - Bonneville Preferred Alternative)

With **VS3** (any vegetation), we would be able to choose to treat any targeted vegetation with herbicides. Noxious weed issues could be addressed, deciduous species could be controlled, and there would be added flexibility in how a right-of-way would be managed. Being able to treat any vegetation allows for the option to injection-treat a stand of conifers in the right-of-way and leave the dead trees standing for habitat, while also eliminating the costs and the impacts on non-target plants from felling trees, chopping them up, and disposing of them. **This alternative represents Current Practice for Vegetation Selection for Herbicide treatment.**

There would be more potential environmental impacts associated with herbicide use. The extent of maintenance needed and the associated environmental impacts would be the same as those under Alternative VS2 (because deciduous species could be treated) and less than those under Alternative VS1. Both the Time-driven management approach (MA1) and the Low-growing Plant Communities management approach (MA2) could be implemented with this VS3 alternative.

Table IV-3, following page, compares the impacts of selecting different groups of vegetation for herbicide treatment.

Table IV-3: Vegetation Selection for Herbicide Treatment Alternatives

Decision Factors	VS1 Noxious Weeds	VS2 Noxious Weeds and Deciduous *(Environmentally Preferred Alternative)*	VS3 Any Vegetation *(current practice-Bonneville Preferred Alternative)*
	Use herbicides to treat only noxious weeds	*Use herbicides to treat only noxious weeds & resprouting/ deciduous species*	*Use herbicides to treat any vegetation*
Minimizes Adverse Environmental Impacts	▪ Able to treat noxious weeds. ▪ Most impacts due to manual & mechanical. ▪ Resprout of deciduous vegetation; more human presence & maintenance-related impacts. ▪ Herbicide impacts limited to areas treated for noxious weeds.	▪ Able to treat noxious weeds. ▪ Most impacts due to manual & mechanical, some herbicide impacts. ▪ Deciduous treatments lessen resprout, ROW not treated as intensively, less human presence & maintenance-related impacts. ▪ Potential herbicide impacts greater than VS1, less than VS3.	▪ Able to treat noxious weeds. ▪ Impacts due to manual, mechanical, & herbicide. ▪ As with VS2, deciduous treatments lessen resprout, ROW not treated as intensively, less human presence & maintenance-related impacts. ▪ Potential herbicide impacts greater than VS1 & VS2.
Achieves Costs & Administrative Efficiency	**Higher costs than VS2, VS3** ▪ Manual labor takes more time to carry out. ▪ Deciduous resprouts create more future clearing. ▪ Some administrative efficiencies in environmental reviews w/ no herbicides for tall-growing.	**Less cost than VS1 due to the following:** ▪ Herbicide treatment of deciduous less expensive than manual (VS1), also lessens resprout & thus long-term cutting costs. ▪ Some increased administrative costs (compared to VS1) due to environmental reviews for herbicide use.	**Somewhat less cost than VS2** ▪ Herbicide treatment of tall-growing less expensive than other methods, also lessens resprout & thus long-term cutting costs. ▪ Some increased administrative costs (compared to VS1) due to environmental reviews for herbicide use. ▪ Additional potential savings compared to VS2 due to less debris disposal. ▪ Some administrative efficiencies due to increased flexibility to treat areas difficult to treat with manual methods.
Complies with Laws & Regulations	Complies with all laws & regulations.	Complies with all laws & regulations.	Complies with all laws & regulations.
Ensures a Safe & Reliable Power System	Electric reliability & safety could be compromised with difficulty keeping up with fast deciduous tree growth.	Electric reliability & safety possible.	Electric reliability & safety possible.

Electric Yard Program Alternative

The electric yard program includes vegetation management in substations, electric yards and sectionalizing switches. All these areas need to be kept bare, with no vegetation at all.

There is one alternative for managing vegetation in our electric yards.

* **E1 Herbicide Treatment** *(current practice)*

One alternative was also eliminated from consideration for safety reasons.

Alternative E1: Herbicide Treatment

Description

To control vegetation in electric yards we would mostly use pre-emergent herbicides—herbicides that are applied to the ground to keep vegetation from germinating. Herbicides would be applied about once a year. For the few cases where vegetation *has* been able to grow within the electric yard, we would use a follow-up post-emergent herbicide, weed burners, steamers, or selective hand-pulling. These post-emergent methods have potential safety issues, but are necessary in cases of sprouted vegetation. **This alternative represents current practice for electric yards.**

Impacts

Any potential environmental impacts associated with keeping an electric yard free of weeds would be those resulting if any herbicides were to migrate off-site. Any migration would be due to either leaching or run-off. Pre-emergent herbicides tend to be persistent—they stay active for a long time—and are therefore more likely still to be active after moving.

Pre-emergent herbicides, however, do not have any greater chance of causing health impacts compared to post-emergent herbicides (there is no relationship between persistence and toxicity).

Worker health and safety impacts could occur from potential exposure to herbicides during application and when a worker is present in the yard. Application exposure would be about once a year.

Potential public health and safety impacts from electric yard vegetation control could occur if there was herbicide movement off-site, such that it exposed a person to herbicides.

Eliminated from Consideration

For safety reasons, we **eliminated from consideration** the alternative of not relying on pre-emergent herbicides in electric yards. If we did not use pre-emergent herbicides, people would have to treat all vegetation after it has sprouted. A plant in an electric yard has to grow up through a metal ground mat and could provide another grounding path for electricity. If a person were to come in contact with a plant in the yard during a fault in or near the substation, he or she could be electrocuted.

Non-electric Program Alternatives

The non-electric program includes vegetation management in or around facilities that have landscaping, gravel work yards or parking lots. It also includes the control of noxious weeds on property that we own (fee-owned land) such as acreage around a substation.

There are two alternatives for how to mange vegetation in and around our non-electric facilities.

* **NE1 Mixed Methods with Herbicides** *(current practice - Bonneville Preferred Alternative)*

NE2 Mixed Methods with No Herbicides *(Environmentally Preferred Alternative)*.

Alternative NE1: Mixed Methods with Herbicides
(current practice - Bonneville Preferred Alternative)

Description

Alternative NE1 would continue to contract landscaping services, maintain landscaping manually, use herbicides to suppress weeds, and apply fertilizers. **This alternative represents Current Practice for Non-electric Facilities.** The vegetation at most of our non-electric facilities is presently maintained by licensed, contract landscaping services.

Impacts

The potential environmental impacts associated with this alternative would be due to possible herbicide movement off lawns, gravel yards, and general landscaping; and noise and pollution from lawn movers, weed whackers, and leaf blowers. There is no potential environmental impact from hand hoeing, clipping, or weed pulling.

Health and safety impacts for workers, and to a much lesser extent for the public, would include exposure to herbicides, exhaust, and noise. Workers also have the potential to be hurt with sharp objects such as clippers, or to experience back injuries from hoeing or weed pulling.

Cost

This alternative would cost less to maintain vegetation around our non-electric facilities, because herbicide use is less labor-intensive and maintenance would not have to be conducted as often.

Alternative NE2: Non-herbicide Methods

(Environmentally Preferred Alternative)

Description

Alternative NE2 would manage vegetation landscaping and vegetation at other non-electric facilities without using any herbicides. We would use manual methods (hoes, saws, clippers), mechanical methods (lawn mowers), and fertilizer.

Impacts

Environmental impacts would include the potential spread of noxious weeds: it is difficult to treat noxious weeds without herbicides. Visual impacts could occur, if facilities were not kept up very regularly (as they would have to be when using all manual methods); weeds growing in landscaped areas or in parking lots would not be visually appealing. Noise and pollution could occur from lawn movers, weed whackers, and leaf blowers

Health and safety impacts would be limited to manual and mechanical methods (potential exposure to exhaust and noise). Because this alternative would rely more heavily on manual and mechanical labor than Alternative NE1, workers would have some increased potential to be hurt with sharp objects such as clippers, and to experience back injuries from hoeing or weed pulling. There would be no potential herbicide exposure impacts with this alternative.

Cost

This alternative would cost more to maintain vegetation around our non-electric facilities, because it would require more labor-intensive maintenance more often.

Table IV-4: Comparison of Non-electric Program Alternatives

Decision Factors	NE1 Mixed Methods with Herbicides *(current practice - Bonneville Preferred Alternative)*	NE2 Non-Herbicide Methods *(Environmentally Preferred Alternative)*
	Use manual, mechanical, and herbicide methods, and fertilizer.	*Use manual and mechanical methods, and fertilizer*
Minimizes Adverse Environmental Impacts	▪ Potential herbicide movement off-site; noise and pollution from mechanical equipment use. No anticipated impacts from manual methods. ▪ Workers/Public: Potential exposure to herbicides, exhaust, noise. Workers could be hurt by equipment.	▪ No impacts associated with potential herbicide movement off-site. Without herbicide use, noxious weeds could spread in the area. If maintenance were not carried out frequently, visual appearance could degenerate. Noise and pollution impacts would be the same, but would be likely to occur more often. ▪ Worker/public: Same as under NE1, except that exposure to herbicides would not occur and there would be increased potential for injury because more mechanical and manual methods would be used.
Achieves Cost and Administrative Efficiency	Less costly alternative because it is less labor-intensive.	This alternative would cost more because it would require more labor-intensive maintenance, more often.
Complies with Laws and Regulations	Complies with all laws and regulations	Complies with all laws and regulations
Ensures a Safe and Reliable Power System	Would not affect electric reliability or safety.	Would not affect electric reliability or safety.

Chapter V
Affected Environment

In this chapter:

- **Setting**
- **Existing Environmental Resources**
- **Existing Land Use, Ownership & Management**
- **Existing Human Environment**

This chapter describes the existing environment that might be affected by Bonneville's use of various vegetation management methods.

Setting

Bonneville's service territory, the area crossed by our transmission-line system, covers 777,000 square km (300,000 square mi.) of the Pacific Northwest. This area includes the states of Oregon, Washington, Idaho, and Western Montana, as well as small portions of Northwest Wyoming, Northern California and Utah. (See Figure I-1, Bonneville's Service Territory, page 2.)

The landscape of the Pacific Northwest varies tremendously. Dominant features include mountain ranges; fertile valleys; broad flat plains; the vast Columbia River basin and numerous rivers, streams and wetlands; vast rangelands; many thousands of acres of farmlands; large cities; sprawling suburbs; national forest; and Tribal lands.

Figure V-1, following, illustrates the Pacific Northwest geography.

The electric facilities that compose our electric transmission system fall into three basic categories:

1) rights-of-way (including access roads),
2) electric yards (including substations), and
3) non-electric facilities (maintenance yards, parking lots, landscaping).

(See **Chapter I** for more detailed description of these facilities.) Our facilities are found in many different landscapes, but have this in common: the environment immediately in and around them has been managed through the years either to keep the vegetation cut close to the ground or to eliminate it, so that it does not interfere with operation or maintenance of the transmission system.

Because this EIS addresses vegetation management around facilities throughout the entire Bonneville service area (*not* at specific sites), the affected environment is discussed in general terms.

Vegetation

Vegetation within the Bonneville service territory is a diverse mix of varying species found in varying topography, climate, and soils. Most of the vegetation around Bonneville's facilities and on rights-of-way was cleared for construction and is managed to protect electric reliability or to maintain landscaping. The result is a highly complex pattern of natural and introduced vegetation in Bonneville's rights-of-way.

The vegetation within our service area can be broadly classified as grassland, shrubland, and forest. (See Figure V-2, Vegetative Cover.) (Please note that where rights-of-way cross residential areas, much of the landscape-type vegetation is usually taken care of by the people who own or manage the land. This practice is similar to that in farming areas, where the farmers manage the agricultural vegetation. See **Land Uses** for further discussion.)

Within each of these major vegetation zones (grasslands, shrubland, and forest) are riparian areas, which have vegetation specially adapted to growing next to streams and rivers. Specific plants designated by Federal, state or local agencies as threatened, endangered, or sensitive (TES) are also found in the service territory, as are noxious weeds (undesirable plants).

Grasslands

Grasslands are naturally growing grasses found in the prairie communities of the southern Puget Lowlands and the Oregon Willamette Valley, as well as within the extensive rangelands of eastern Washington, Oregon, Southern Idaho and intermountain valleys of Montana. These grasses include orchard grass, ryegrass, Idaho fescue and wheatgrass, as well as forbs that are flowering plants such as yarrow, plantain, Arrowleaf balsamroot and lupine.

Pacific Northwest Geography

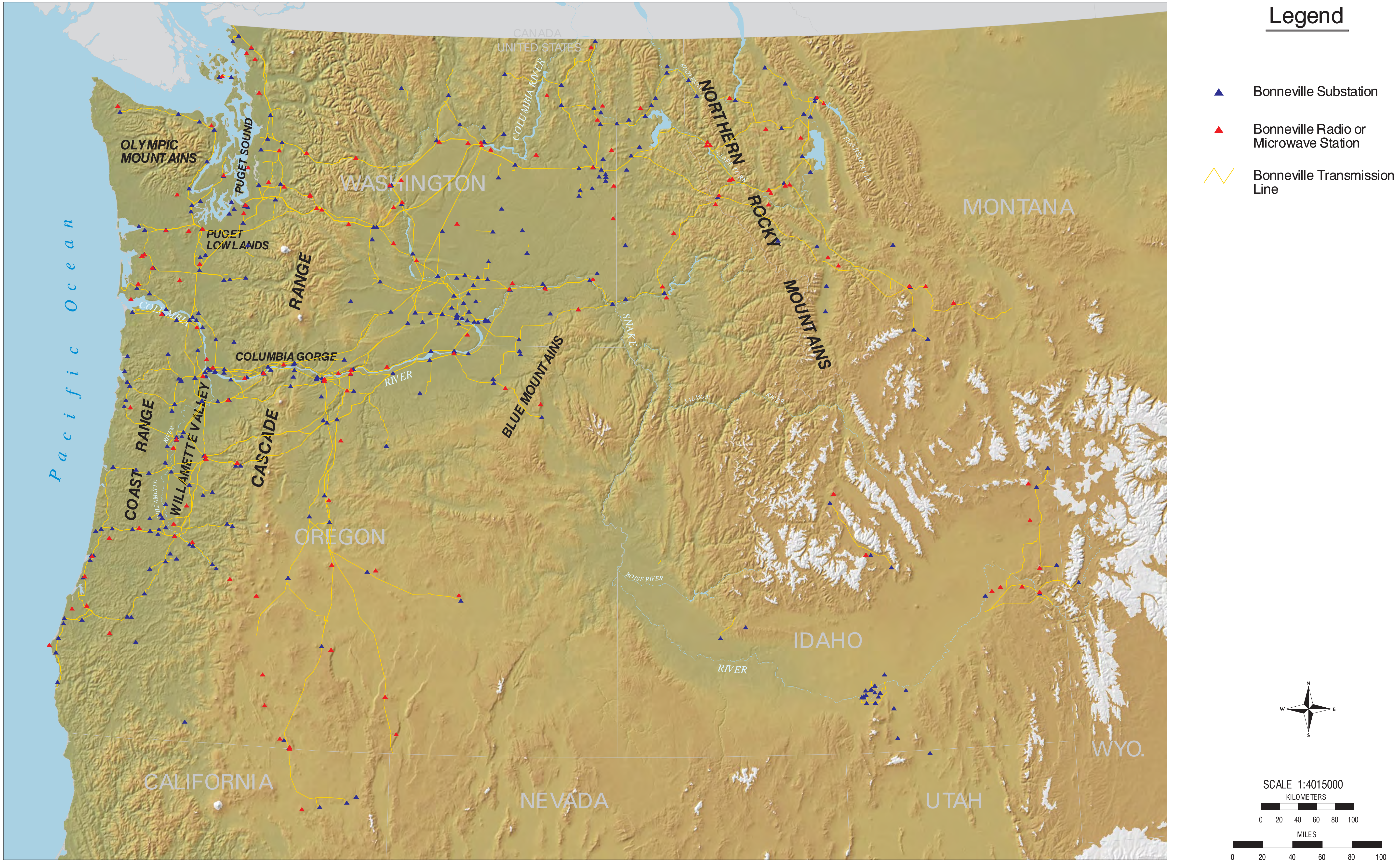


Figure V-1 PNW Geography

Vegetation Type

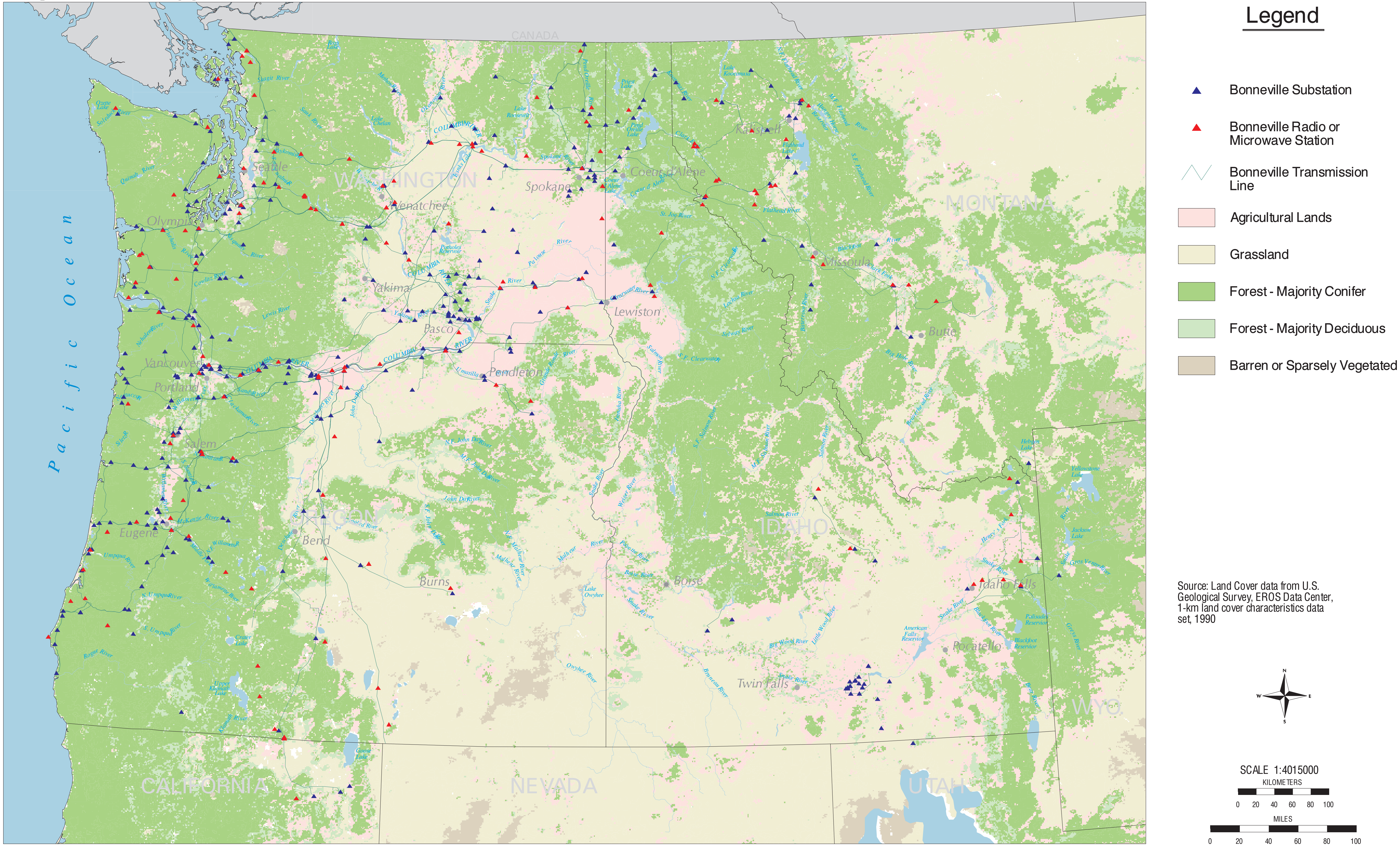


Figure V-2 Vegetation Type

Shrublands

Shrublands are interspersed throughout the region. These include shrubby areas located on mountains and in low-lying areas, rangeland, and shrub-steppe vegetation. Typically, these areas have no trees. Herbaceous plants (i.e., grasses, grass-like plants, and forbs) range from densely abundant to none. Some of these shrubs could include sagebrush, snowberry, bitterbrush, and willows.

Forests

Forested areas occur primarily where precipitation is highest: in the Coast Range; within the Willamette and Puget Sound valleys, along the Cascade Mountains; in the Blue Mountains of northeastern Oregon; and in the Rocky Mountains of Idaho, western Montana, and western Wyoming. These extensive forests include coniferous, deciduous, and mixed tree species.

Forested areas are a key concern for Bonneville's Vegetation Management Program because trees can resprout/reseed within the right-of-way or grow tall and fall into the line. Within most of our rights-of-way, trees that could interfere with the operation and reliability of the line have been removed. Remaining forested areas on the right-of-way are found within draws or along rivers and streams that the transmission lines span. Forested areas also remain along the edges of about 13,680 km (8500 mi.) of transmission-line corridors. It is in these areas that the greatest changes in vegetation structure and composition have occurred as a result of building and maintaining Bonneville's facilities. See Table V-1 for Forest Types by Regional Distribution and Typical Dominants.

Riparian Areas

Within these major vegetation zones are **riparian areas** where the vegetation may be taller and more lush than the surrounding vegetation because more water is available. Riparian areas refer to the areas around streams, rivers, or other bodies of water. In dry locales, riparian areas and floodplains may support tree belts, where cottonwood and other deciduous trees grow within the area where water is available. Typical plants include willow, cattails, rushes, sedges, grasses and other grass-like plants.

Table V-1: Forest Types by Regional Distribution and Typical Dominants

Regional Distribution	Typical Dominants Without Disturbance	Typical Dominants After Disturbance	Typical on Wet Sites
Coastal Oregon & Washington	Sitka spruce*, western hemlock*	red alder*, salmonberry, elderberry, Douglas-fir*	red alder*, western redcedar*, huckleberry, salal
Coast ranges, western Cascade range, western Columbia Gorge	Douglas-fir*, western hemlock*, incense-cedar* (southern Oregon), western white pine* (Puget Sound area), shore pine* (Puget Sound area)	red alder*, bigleaf maple*, snowbrush ceanothus, Douglas-fir*, vine maple, salmon-berry, huckleberry	red alder*, western redcedar*, bigleaf maple*, Oregon ash*, willows
Subalpine areas of Cascade & Olympic ranges	silver fir*, mountain hemlock*, western white pine*, noble fir*	subalpine fir*, lodgepole pine*, huckleberry, salmonberry, elderberry	black cottonwood*, Sitka alder, quaking aspen*, thimbleberry
Eastside Cascade Range, mid-elevations of Blue Mountains & Rocky Mountains (N. Idaho, W. Montana)	grand fir*, Douglas-fir*, western larch*, ponderosa pine*, white fir*, lodgepole pine*, western white pine*	lodgepole pine*, western larch*, mountain maple, huckleberry, ceanothus, elderberry	black cottonwood*, paper birch*, quaking aspen*, Sitka alder, mountain ash*
Lower east side of Cascade Range, lower elevation of Blue Mountains & western Rocky Mountains	ponderosa pine*, bitterbrush, snowbrush, chokecherry, Idaho fescue, Oregon white oak (eastern Cascades)	bunchgrasses, ceanothus, blackhawthorne	quaking aspen*, lodgepole pine*
Rocky Mountains of northern Idaho (mid-elevations)	Western redcedar*, western hemlock*, western white pine*	grand fir*, Douglas-fir*, birches*, western larch*, Sitka alder, thimbleberry	western redcedar*, devil's club, Sitka alder, willows, black cottonwood*
Subalpine areas of northern Rocky Mountains, Blue Mountains & Okanogan Highlands	Englemann spruce*, subalpine fir*, subalpine larch*, mountain hemlock*	lodgepole pine*, Oregon boxwood, Englemann spruce*, rusty menziesia, huckleberry	black cottonwood*, Sitka alder, elderberry, mountain ash*, quaking aspen*, paper birch*
Siskiyou Mountains of southwestern Oregon	Douglas-fir*, incense-cedar*, sugar pine*, white fir*, tanoak, madrone	ceanothus, manzanita, tanoak, Douglas-fir*	Oregon ash*, white alder*, bigleaf maple*
Willamette Valley of western Oregon	Oregon white oak*, Douglas-fir*, grand fir*	Oregon white oak*, poison-oak, blackberry	black cottonwood*, Oregon ash*, red alder*, willows

* Indicates tall-growing species.

Threatened & Endangered Plants

Threatened or endangered plants are those plants that have been Federally listed by the USFWS. Most of these plant species have declining populations due to various ecosystem pressures such as urban development, grazing, and logging. These species are protected by the Endangered Species Act (ESA), which requires Federal agencies to insure that their actions do not jeopardize these species or their critical habitats. Table V-2 lists the Federally listed plants that potentially could occur in the Bonneville service territory. Figure V-3 (after page 124) shows T&E plant observation areas.

Table V-2: Current Federally Listed Plants

Common Name	Scientific Name	Status	State
Ute ladies' tresses	*Spiranthes diluvialis*	T	MT, ID
Water howellia	*Howellia aquatilis*	T	MT, ID, OR, WA
Nelson's checker-mallow	*Sidalcea nelsoniana*	T	OR, WA
Applegate's milk-vetch	*Astragalus applegatei*	E	OR
Golden paintbrush	*Castilleja levisecta*	T	OR, WA
Western lily	*Lilium occidentale*	E	OR
Bradshaw's desert parsley	*Lomatium bradshawii*	E	OR, WA
Malheur wire-lettuce	*Stephanomeria malheurensis*	E	OR
Marsh sandwort	*Arenaria paludicola*	E	OR, WA
Macfarlane's four-o'clock	*Mirabilis macfarlanei*	T	OR

T = Threatened E = Endangered

The USFS and BLM have also designated as *sensitive* those plants that need protecting on the lands the agencies manage. These plants are protected to insure that they do not decline further in population.

Even though we routinely clear and control vegetation, TES plant species can grow within Bonneville's rights-of-ways and near electric yards.

Noxious Weeds

Noxious weeds are plant species designated by Federal or state law. These plant species have been found to harm to crops, livestock, public health, and/or property. Some noxious weeds are native to the Northwest, but most are introduced from Europe or Asia. Disturbed areas such as transmission corridors often become infested with noxious weeds. These species take advantage of disturbed soils and the lack of competing vegetation in areas recently cleared. The weeds can be introduced and transported by vehicles, livestock, and natural elements such as wind, water, and wildlife. Bonneville works with local and state weed control districts and boards to combat noxious weed infestations. Common noxious weeds at which control programs are aimed include tansy ragwort, Canadian thistle, leafy spurge, bull thistle, dalmation toadflax, diffuse knapweed, gorse, scotch broom and musk thistle.

Soils

The soil in which vegetation grows is a complex system of physical and biological elements and processes. It is essential for plant life, and has a major role in defining local ecosystems. It is vital for crop, forage, and timber production.

Soils form as weather and minute organisms act on mineral and organic materials over time, on particular landscapes. Because there is a wide variety of landforms and climates, soils are quite diverse throughout the program area. There is a total of eleven major soil categories (known as *soil orders*). Six of these are found within Bonneville's service territory (see Table V-3.)

Table V-3: Soil Types in Bonneville's Service Territory

Type	Description
Mollisols	Soils of grassland ecosystems that are important, productive agricultural soils; they occur in eastern Washington and Oregon, the Willamette Valley, and intermountain valleys of Idaho and western Montana.
Inceptisols	Soils of productive forestland that are often "young" (less developed) and found on fairly steep slopes, recent geomorphic surfaces and in material resistant to weathering. These soils occur in Puget Sound and in mountainous areas.
Ardisols	Soils of very dry regions. These soils are prevalent in central Washington and southern Idaho along the Snake River Plain.
Andisols	Formed in volcanic ash. These soils can store large volumes of water and are among the most productive forest soils in the Pacific Northwest. The soils often occur at higher elevations in the mountains of Washington, Oregon, and northern Idaho.

Type	Description
Entisols	Soils are of relatively recent origins and are characterized by great diversity. These soils predominate on the pumice-mantled forested plateaus of central Oregon and floodplains and terraces.
Alfisols	Well-developed soils formed primarily in cool wet regions, usually under forest vegetation. They are productive for both commercial timber and agriculture. These soils occur in the mountains of western Montana and western Wyoming.

Water

Water is one of the most important resources present within Bonneville's service area. Water resources provide:

- irrigation,
- recreation,
- fish and wildlife habitat,
- transportation corridors,
- drainage and flood control,
- drinking water,
- power, and
- social and Tribal values and use.

Because water is so important, many local, state, regional, and Federal groups and agencies have strongly emphasized the protection and restoration of water resources, including many watershed-based planning efforts. The Clean Water Act provides some protection of Waters of the United States. This protection includes requiring permits for discharging dredge or fill material into rivers, streams, or wetlands. Downed trees or cut brush would be considered fill material if left in a stream, river, or wetland.

Bonneville transmission lines, access roads and microwave beam paths often must cross water resources, including wetlands, rivers and streams and their associated floodplains. Substations and other electric yard facilities are sometimes found near these water resources.

Bonneville's transmission system also crosses 10 sole-source aquifers: the Cedar Valley, Central Pierce County, Cross Valley, Eastern Columbia Plateau, Lewiston Basin, Missoula Valley, Newberg Area, North Florence Dunal, and Spokane Valley Rathdrum Prairie aquifers.

Because trees and shrubs often grow faster near water, these areas often need extra attention by Bonneville maintenance crews to make sure that vegetation does not grow into our lines. In other cases, transmission lines span well above deeply cut stream channels, leaving the channel and associated vegetation unchanged.

Water resources and the actions that affect them are closely related to **soils**, and **fish**.

Rivers and Streams

The Columbia River is the predominant river within Bonneville's service area. This river flows from British Columbia south through east and central Washington, and then west between Washington and Oregon, to the Pacific Ocean. Tributaries include the Snake River, which originates in Wyoming and flows through Idaho into Oregon, as well as the Kootenay, Pend Oreille, Spokane, Okanogan, Wenatchee, Yakima, Walla Walla, John Day, Deschutes, Hood, and Willamette rivers.

Other rivers not part of the Columbia River system but within Bonneville's service area include the Skagit, Skykomish, Snoqualmie, Nisqually, Chehalis, Nestucca, Flathead, Bitterroot, and Umpqua rivers.

At one or more points, Bonneville's transmission system crosses all of these rivers, as well as many smaller perennial and intermittent drainages. Rivers and streams are important not only as habitat for fish and other aquatic organisms, but also for transporting water, nutrients, minerals, and organic materials. Rivers also can transport pollutants and sediments, allowing negative elements to have far-reaching effects.

Precipitation in the Pacific Northwest ranges from 254 cm (100 in.) per year at the Cascade crest to less than 20 cm (8 in.) per year in low-elevation basins and plains east of the Cascades. The amount of sediment in rivers and streams varies with the season. In some areas, sediment is high during snowmelts in May and June; in other areas, sediment is high during heavy winter rains.

The water quality of rivers and streams is threatened by many sources and actions, including the following:

- soil disturbance (erosion from roads, timber harvest, development, agricultural production, and grazing),
- vegetation cover loss (crop production, commercial timber harvest, and grazing), and

- chemical pollution (agricultural chemicals, industrial wastes, human and livestock waste, and petroleum associated with urban runoff and car, truck, and boat traffic).

These actions affect water quality by depositing silt in the bottoms of streams, rivers, and lakes (sedimentation); by muddying the water (turbidity); by polluting the water; and by increasing water temperatures. Waters affected by point and/or non-point source pollution and not currently in compliance with or expected to satisfy applicable water quality standards are listed with the EPA as "water quality limited." General surface water runoff from places such as parking lots and farmlands can also be called non-point pollution. (Point pollution comes from a defined place like the end of a pipe.)

Wetlands

Wetlands are important because they provide wildlife habitat and help to control flooding and protect water quality. They are also protected under Federal, state, and local laws and policies.

Wetlands are defined as follows:

> *areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3, 40 CFR 230.3).*

Wetlands are often found within transmission-line rights-of-way; along Bonneville-maintained access roads; and next to substations, electric yards, and other Bonneville facilities. In the past, wetlands were considered wastelands, and Federal agencies were encouraged to build facilities in them so as not to compete with the public for more usable profitable lands. Therefore, many older Bonneville facilities are found located near wetlands.

Floodplains

Floodplains are low-lying areas associated with streams, rivers, and/or wetlands that have at least a one-percent chance of flooding each year. Under 10 CFR 1022 and Executive Order 11988, Federal agencies are required to avoid or minimize adverse impacts that might result from changing or occupying floodplains.

Many of Bonneville's transmission-line rights-of-way and access roads cross floodplains, while some substations and maintenance facilities are located next to floodplains.

Fish and Other Aquatic Species

Water supports fish and other aquatic species. Fish are an important resource to the Pacific Northwest, both for their economic value to the sport and commercial fisheries, and for their cultural and religious value to the region's Native American Tribes and others.

Rivers and streams in this region support a large number of anadromous fish (species that migrate downriver to the ocean to mature, then return upstream to spawn), as well as varied populations of resident fish (fish that live and migrate in fresh water).

The main anadromous fish runs in the Columbia Basin are Chinook, coho, chum, and sockeye salmon; steelhead and searun cutthroat trout; and American shad, white sturgeon, and Pacific lamprey. Pacific salmon and steelhead trout are especially important due to their commercial, sport, and cultural values. Popular resident game fish in the region include western cutthroat trout, rainbow trout, Dolly Varden (bull trout), sturgeon, and Kokanee salmon.

Other aquatic species include salamanders, turtles, frogs and invertebrates (insects, crayfish, snails, etc.).

Threatened and Endangered Species

Many fish, as well as other aquatic species, are presently listed under the ESA as threatened or endangered. Many other species of fish are candidate species. Currently, fish and wildlife agencies throughout the Pacific Northwest are engaged in recovery efforts for listed and other dwindling salmon stocks. Tables V-4 and V-5 show currently listed threatened or endangered fish and snails. Figure V-3 shows watersheds with T&E species.

Sensitive Fish Species

The USFS and BLM have designated as sensitive those populations of fish that are in decline or that are considered likely to become threatened or endangered should current trends continue. Sensitive fish presently found in areas of Bonneville's facilities include white sturgeon; five species of lampreys; sockeye, chum, and coho salmon; coastal, Lohontan, and various other races of cutthroat trout; and pygmy whitefish, burbot, several species of minnows, suckers, and sculpins.

Threatened and Endangered Species

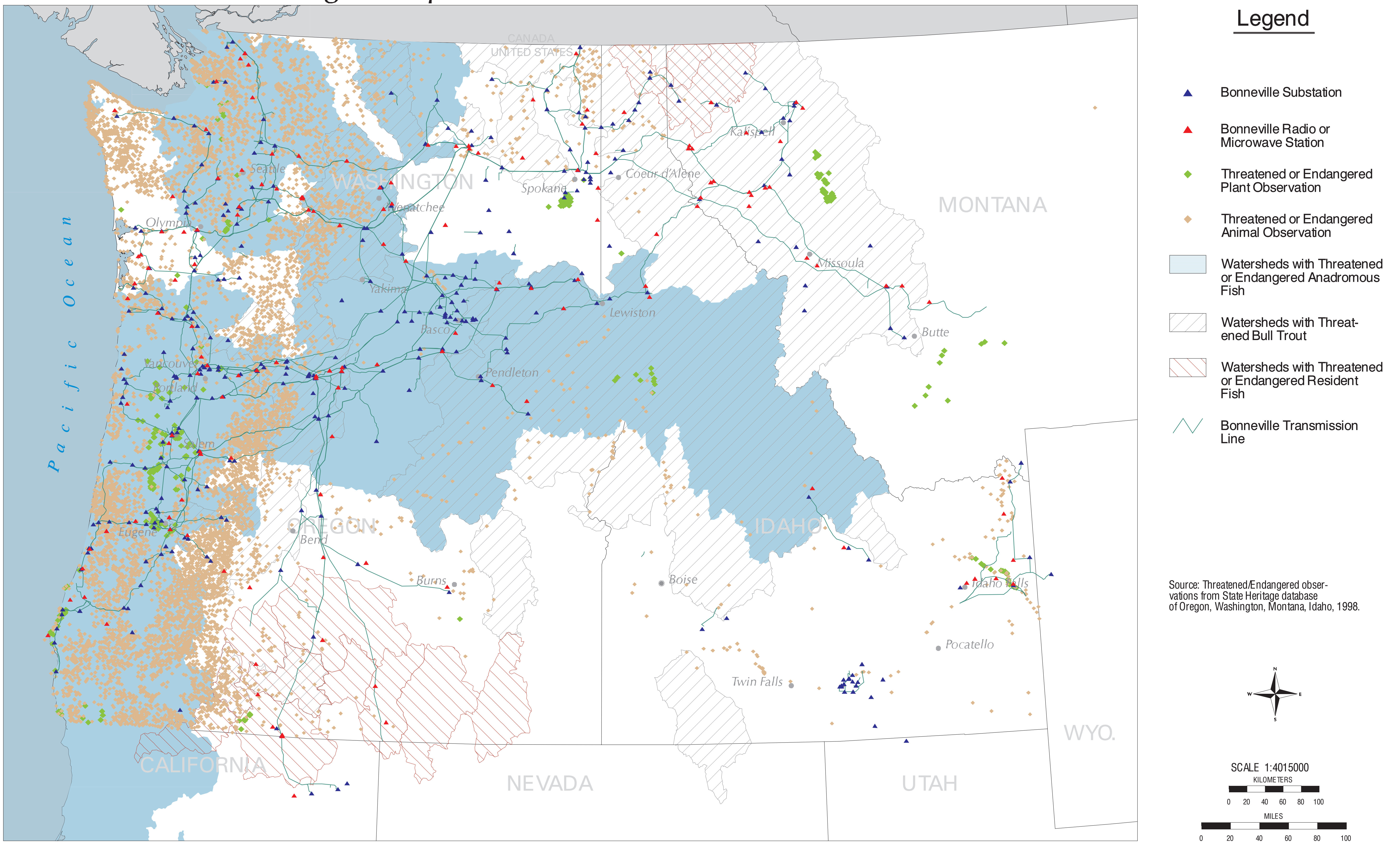


Figure V-3 T&E Species

Table V-4: Threatened and Endangered Fish Species

Fish Common Name	Scientific Name	Status	State
Pallid Sturgeon	*Scaphirhynchus albus*	E	MT
White Sturgeon (Kootenai River pop.)	*Acipenser transmontanus*	E	MT, ID
Borax Lake Chub	*Gila boraxobius*	E	OR
Hutton Tui Chub	*Gila bicolor*	T	OR
Oregon Chub	*Oreonichthys crameri*	E	OR
Foskett Speckled Dace	*Rhinichthys osculus ssp.*	T	OR
Lost River Sucker	*Deltistes luxatus*	E	OR
Warner Sucker	*Catostomus warnerensis*	T	OR
Shortnose Sucker	*Chasmistes brevirostris*	E	OR
Lahontan Cutthroat Trout	*Oncorhynchus clarki henshawi*	T	OR
Umpqua River Cutthroat Trout	*Oncorhynchus clarki clarki*	E	OR, WA
Chinook Salmon	*Oncorhynchus tschawytscha*	T, E (depending on location)	ID, OR, WA
Coho Salmon	*Oncorhynchus kisutch*	T	OR
Sockeye Salmon	*Oncorhynchus nerka*	E	ID, WA
Chum Salmon	*Oncorhynchus keta*	T	OR, WA
Steelhead	*Oncorhynchus mykiss*	T, E (depending on location)	OR, WA, ID
Bull Trout (Klamath River pop.)	*Salvelinus confluentus*	T	CA, OR
Bull Trout (Columbia River pop.)	*Salvelinus confluentus*	T	MT, ID, NV, OR, WA

Table V- 5: Threatened and Endangered Snail Species

Snails Common Name	Scientific Name	Status	State
Banbury Springs Limpet	*Lanx sp.*	E	ID
Bliss Rapids Snail	*Taylorconcha serpenticola*	T	ID
Utah Valvata Snail	*Valvata utahensis*	E	ID
Bruneau Hot Springsnail	*Pyrgulopsis bruneauensis*	E	ID
Snake River Physa Snail	*Physa natricina*	E	ID
Idaho Springsnail	*Fontelicella idahoensis*	E	ID

Wildlife

Pacific Northwest wildlife is diverse, ranging from creatures such as large mammals to birds, insects, and reptiles, all contributing to the ecological health and diversity of the region. Some gain special interest because of their economic and recreational value or because they are protected by a state or the Federal Government.

Transmission-line corridors, microwave beam paths, and access-road corridors contain a variety of wildlife habitats. Substations and other electric-yard facilities do not provide any wildlife habitat, but may be next to such habitat.

Open-land Habitat

Habitat conditions (the kind and amount of food, cover, and water) determine the wildlife species and number of individuals. Rights-of-way are dominated by habitats for open-land wildlife. These consist of cropland, pasture, meadows, and areas overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, berries, browse, and wild herbaceous plants. Winter cover crops and grain stubble fields also provide winter feeding areas for many wildlife species. Shrub and thicket habitats occur mostly when land has been recently cleared for human uses such as rights-of-way. Typical mammals include deer, coyote, fox, skunk, rabbit, and mice. Birds commonly observed in these areas include quail, pheasant, red-tailed and Swainson's hawk, owl, crows, meadowlarks, goldfinches, swallows, wrens, blackbirds, cowbirds, sparrows, and starlings.

Forest Habitat

Bonneville facilities are often located in the midst of forest wildlife habitats that consist of areas dominated by coniferous and/or deciduous tree cover, and associated forest understory vegetation. Typical mammals found in the forest habitat include elk, deer, black bear, cougar, bobcat, coyote, red fox, Douglas' squirrel, squirrel, chipmunk, and beaver. Common birds include ruffed grouse, hawks, owls, ravens, jays, woodpeckers, towhees, and finches. Forest amphibians and reptiles include newts, salamanders, western toads and Pacific treefrogs.

Riparian Habitat

Riparian wildlife habitats and wetland habitats also occur within Bonneville rights-of-way and next to other Bonneville facilities. Riparian habitats occur in the zones that make a transition between aquatic and upland zones. Mammals found in riparian habitat include black-tailed deer, coyote, fox, beaver, otter, mink, raccoon, opossum, and bushy-tailed woodrats. Common riparian birds include bald eagles, hawks, owls, kingbirds, swallows, robins, blackheaded grosbeaks, juncos, bushtits, and starlings. Riparian reptiles and amphibians include northern alligator lizards, racer snakes, garter snakes, salamanders, rough-skinned newts, western toads, and several species of frogs.

Wetland habitats are permanently or intermittently flooded, and include such areas as freshwater marshes, swamps, bogs, seeps, wet meadows, and shallow ponds and lakes. Some of the wildlife attracted to these wetland habitats are beaver, muskrat, mink, raccoon, bald eagle, osprey, marsh hawk, ducks, geese, coots, rails, herons, kingfishers, snipe, sandpipers, plovers, killdeer, swallows, common yellowthroat, painted turtle, garter snake, newts, salamanders, toads, and several species of frogs.

Other Habitats

Special and Unique Habitats [1] are non-plant features that are found throughout the region and are used by wildlife. They include the following:

- **Snags** are standing dead trees. Snags provide cavities for shelter, and abundant insect populations for food.
- **Downed Woody Debris** includes large logs and root wads. Loose bark and areas under logs are used for cover and foraging spots for amphibians, reptiles and small mammals. Rootwads are used for nesting; and the entire log provides a food source for woodpeckers.

[1] As defined by Thomas (1979).

- **Exotic trees**, such as Lombardy poplar, black locust, and Siberian elm, are found at old homestead sites or existing rural homes and farms. These trees are used for perching, breeding, and shelter by raptors.
- **Talus** is an accumulation of rock fragments at the base of cliffs and steep slopes. Talus is used by variety of reptiles, small mammals, and rare species such as the Larch Mountain Salamander.
- **Cliffs** provide secure habitat for nesting hawks and falcons as well as lizards, snakes, and upland game birds (e.g., chukar). Steep terrain limits human and predator access, thus providing wildlife refuges.

Divided Habitat

Rights-of-way often cut through habitat types, thus dividing them and creating a contrast between what is *in* the right-of-way and what is *outside* it. Some species of wildlife take advantage of this difference in habitat. Edge species (species that tend to live where two differing habitats meet) use rights-of-way frequently. Red-tailed and Swainson's hawks, for example, will often nest in forested habitats next to transmission-line corridors, but feed in the open area within the corridor. Other edge species include barn swallow, common raven, western fence lizard, dark-eyed junco, common nighthawk, black-tailed deer, and eastern cottontail rabbit.

Deer and elk are often attracted to maintained Bonneville rights-of-way next to forested habitats. The low-growing shrubs and grasses within maintained corridors provide forage that is not available within shaded forests. The rights-of-way containing nutritious vegetation for forage can contribute to increased populations. Year-round deer use of rights-of-way is directly related to the amount of browse available (Goodwin, 1975; Cavanaugh et al.,1976; Eaton and Gates, 1979).

In urban and suburban areas, transmission-line corridors can serve as greenbelts, providing habitat for a variety of wildlife, including various songbirds, small mammals, and even larger mammals, such as deer and coyote.

Threatened and Endangered Animal Species

As with plant species, T&E animal species are protected by law, requiring Federal agencies to make sure that their actions do not jeopardize these species or their critical habitat. Figure V-3 (after page 124) shows T&E habitat in the Bonneville Service Area. Tables V-6 and V-7 show currently listed threatened or endangered mammals, birds and insects.

Table V- 6: Threatened and Endangered Mammals

Mammals Common Name	Scientific Name	Status	State
Grizzly Bear	*Urus arctos*	T	MT, WA, ID,WY
Woodland Caribou	*Rangifer tarandus caribou*	E	WA, ID
Columbian White-tailed Deer	*Odocoileus virginianus leucurus*	E	OR, WA
Gray Wolf	*Canis lupus*	E	MT, WA, ID,WY

Table V- 7: Threatened and Endangered Bird and Insect Species

Birds Common Name	Scientific Name	Status	State
Piping Plover	*Charadrius melodus*	T	MT
Western Snowy Plover	*Charadrius alexandrinus nivosus*	T	OR, WA
Bald Eagle	*Haliaeetus leucocephalus*	T	MT, OR, WA, ID, NV, UT, WY
Marbled Murrelet	*Brachyramphus marmoratos marmoratos*	T	OR, WA
Whooping Crane	*Grus americana*	E	MT, ID
Brown Pelican	*Pelecanus occidentalis*	E	OR, WA
Aleutian Canada Goose	*Branta canadensis leucopareia*	T	OR, WA
Northern Spotted Owl	*Strix occidentalis caurina*	T	OR, WA
American Peregrine Falcon	*Falco peregrinus anatum*	E	MT, OR, WA, ID, NV, UT, WY
Insect			
Oregon Silverspot Butterfly	*Speyeria zerene hippolyta*	T	OR, WA

Of the presently listed threatened or endangered bird species present in Bonneville's service territory, the following four have habitat most likely to be affected by Bonneville's activities:

- northern spotted owl,
- marbled murrelet,
- peregrine falcon, and
- bald eagle.

The spotted owl and marbled murrelet nest in large old-growth trees in the forests of western Washington and Oregon. Some of these forests have nest sites; others may not have nests, but offer conditions suitable for nesting. These suitable areas are called Critical Habitat. As described under **Vegetation**, old-growth or mature trees are found next to, not in, transmission-line corridors. These potential nesting trees can become "danger" trees and threaten the transmission lines.

The peregrine falcon and bald eagle have breeding and wintering areas on the shorelines of the Washington and Oregon coasts, the Strait of Juan De Fuca, the Puget Sound area, and the larger rivers and lakes within Bonneville's service area. These birds often fly through transmission-line corridors, and sometimes perch and even nest on transmission towers.

Other presently listed threatened and endangered wildlife species that may live within Bonneville managed areas include the following:

- grizzly bear,
- gray wolf, and
- Columbian white-tailed deer.

Grizzly bears and gray wolves are wide-ranging species that may cross Bonneville rights-of-way and roads; however, they are more closely associated with wilderness and roadless areas. Grizzly bears and gray wolves are found in the Northern Cascades, Bitterroot Mountains, Lower Clark Fork, and Central Idaho Mountains. Bonneville has transmission lines that cross grizzly bear habitat.

Gray wolves also occur around transmission lines; however, there are no packs, and no denning or rendezvous sites known in the vicinity of Bonneville rights-of-way. Columbian white-tailed deer are found on islands in the lower Columbia River and on the mainland along the river, as well as in the valley floors of the Umpqua River Basin.

Sensitive Animal Species

As with sensitive plants, the USFS identifies sensitive animal species in each Forest Region. Many of these animals are closely tied to specific habitat types, especially to native habitat such as late-successional and old-growth forest, native shrub- and grasslands.

Those sensitive species that are associated with late-successional forest but that are not also threatened and endangered species include the following:

- birds such as the northern goshawk, several species of woodpecker, and other cavity-nesting birds, and
- small mammals, such as the marten and fisher.

Sensitive species associated with grasslands/shrubs of the relatively dry interior Columbia River Basin and portions of Idaho include the following:

- Colombian sharp-tailed grouse
- pygmy rabbit,
- kit fox, and
- Idaho ground squirrel.

Land Use

The two dominant land uses within or near Bonneville's transmission facilities are agriculture and commercial forest. Other land uses include recreation, residential, commercial, and industrial.

Agriculture

Agricultural lands generally include crops, orchards, and rangelands. Transmission lines and access roads cross agricultural areas. Some Bonneville land outside substation fences is used for agriculture.

Low-growing crops or grazing lands need little to no vegetation management by Bonneville (except for noxious weeds). Problems for transmission reliability can occur where orchards or Christmas tree farms along transmission corridors are left untrimmed or not harvested and trees grow too close to the lines.

Oregon

Agriculture is Oregon's second largest industry, after forestry. In the cool moist climate of the Willamette Valley, over 170 different crop and livestock items are produced, including grass and legume seeds, tree fruits and nuts, wine grapes, berries, vegetables, nursery stock, Christmas trees, and field crops such as wheat, oats, mint and hops, hay, livestock and poultry and miscellaneous field crops. On the coast, Tillamook County dairy farms are famous for their cheeses. Cranberries are harvested near Coos Bay.

East of the Cascades, haying and raising cattle on ranges and pastures is common. Crops in this area often require irrigation, but make for some of the highest crop yields in the nation for certain commodities.

Hood River County, amid the foothills of Mt Hood in north-central Oregon, produces high-quality tree fruit, particularly apples and pears; The Dalles, just to the east, produces sweet cherries. The Rogue River Valley in southern Oregon produces pears and other tree fruit.

In central Oregon around Madras, Redmond, and Prineville, rich soil irrigated by the Deschutes, Crooked, and John Day rivers produces potatoes, mint, hay, and other field crops in abundance. In south-central Oregon, on a high plateau with sandy volcanic soils, the Klamath Basin specializes in fresh market potatoes, sugar beets, and beef cattle.

Washington

Washington is divided into two regions. Farms to the west of the Cascades tend to be small. Dairy products, poultry, and berries are the primary commodities produced.

The eastern side of the state has larger farms. Small grains such as wheat and barley, potatoes, fruit and vegetables are the primary commodities produced. In 1996, Washington produced more than half of the nation's apple crop.

Idaho

Idaho has diverse agriculture. In the north part of the state, the primary crops are grain, dry pea, lentil, and hay. The southwest corner's traditional crops are mixed, with fruit orchards, vegetables, and specialized commodities such as mint, hops, and seed crops. Along the Snake River, the land is dotted with large irrigated fields of alfalfa hay, dry beans, potatoes, small grains, and sugar beets. The southeast and east are a mixture of dryland and irrigated grain, hay, and potato fields. Cattle and sheep graze on the vast rangelands throughout the state.

Montana

Crops account for over half of Montana's agriculture products. Wheat is the largest crop (including four classes: hard red spring, hard red winter, durum, and soft white). Montana also produces sugar beets, alfalfa hay, and other crops such as apples, buckwheat, canola, cherries, potatoes, dry beans, field peas, flax, grapes, garlic, lentils, safflowers, sunflowers, oats, mustard, corn, rapeseed, mint, kabocha squash, Christmas trees, and many more crops.

California, Modoc County

Modoc County, California, the only county in California with Bonneville facilities, produces alfalfa hay, pasture and rangeland with cattle, potatoes, barley, sugar beets, onions, wheat, and horseradish.

Wyoming, Teton County

Teton County, Wyoming, the only county in Wyoming with Bonneville facilities, has wheat and barley fields as well as pastures near the transmission line and substation.

Forest Lands

Bonneville's facilities also cross private, commercial, and government-managed forests. Uses of these forests vary from wood product production to recreation and rural residential.

Timber production is common throughout western Oregon and western Washington, a region where precipitation and temperature are optimal for tree growth. These coniferous forests are some of the most productive in the world, exhibiting high growth rates and large tree sizes. Because there is less precipitation east of the Cascades, timber management is limited to the more moist and colder higher elevations. Here, tree growth rates are slower due to the less optimal conditions.

Under intensive management, forestlands are planted, competing species are controlled, and timber trees are harvested on short rotations. Maintaining site productivity and high tree-growth rates is a high priority. Because trees, especially those grown for timber, can grow too close to transmission lines, timber production does not occur within the transmission-line rights-of-way. An exception is where conductors cross canyons with sufficient clearance for mature tree heights.

Recreation

Transmission-line rights-of-way and associated access roads are often used by recreationists such as hunters, anglers, and campers, especially on Federal lands. During winter, cross-country skiers and snowmobilers may also use transmission-line corridors and roads. In rural and urban areas, open cleared rights-of-way are often used as playing fields, bike trails, or hiking trails.

Residential, Commercial and Industrial

Many Bonneville electric facilities are located in cities, towns, suburbs, or in commercial or industrial areas. Substations, transmission lines, access roads, and maintenance facilities were often originally built on the outskirts of town; with growth, homes and business have built up around them. These areas include the following:

- Eugene, Salem, Portland, Redmond, Pendleton, and Bend (OR);
- Bellevue, Vancouver, Wenatchee, Yakima, Pasco, and Spokane (WA);
- Idaho Falls, Coeur d'Alene, and Lewiston (ID); and
- Kalispell, Missoula, and Butte (MT).

In these areas, businesses, homes, and other properties adjoin rights-of-way and substations, while lawns, gardens, playgrounds, bike paths, and parking lots may extend beneath the transmission lines.

Land Ownership/Management

This section describes the various ownerships crossed by Bonneville facilities. Figure V-4 shows the different categories of land ownership.

Bonneville and Private Lands

Bonneville owns most of the land under and around our substations, maintenance facilities, and microwave sites. We do not own land where these facilities are located on USFS- or BLM-managed lands.

Bonneville usually obtains easements from the landowner for transmission-line rights-of-way and access roads. Sixty-six percent of the land crossed by Bonneville's rights-of-way is owned by private individuals or companies. Easements are generally written to be perpetual: they stay in effect even if the land is subdivided and/or sold. The easements include rights for Bonneville to manage the line and right-of-way. The details of each easement vary, as do the rights Bonneville has on that land.

Land Ownership

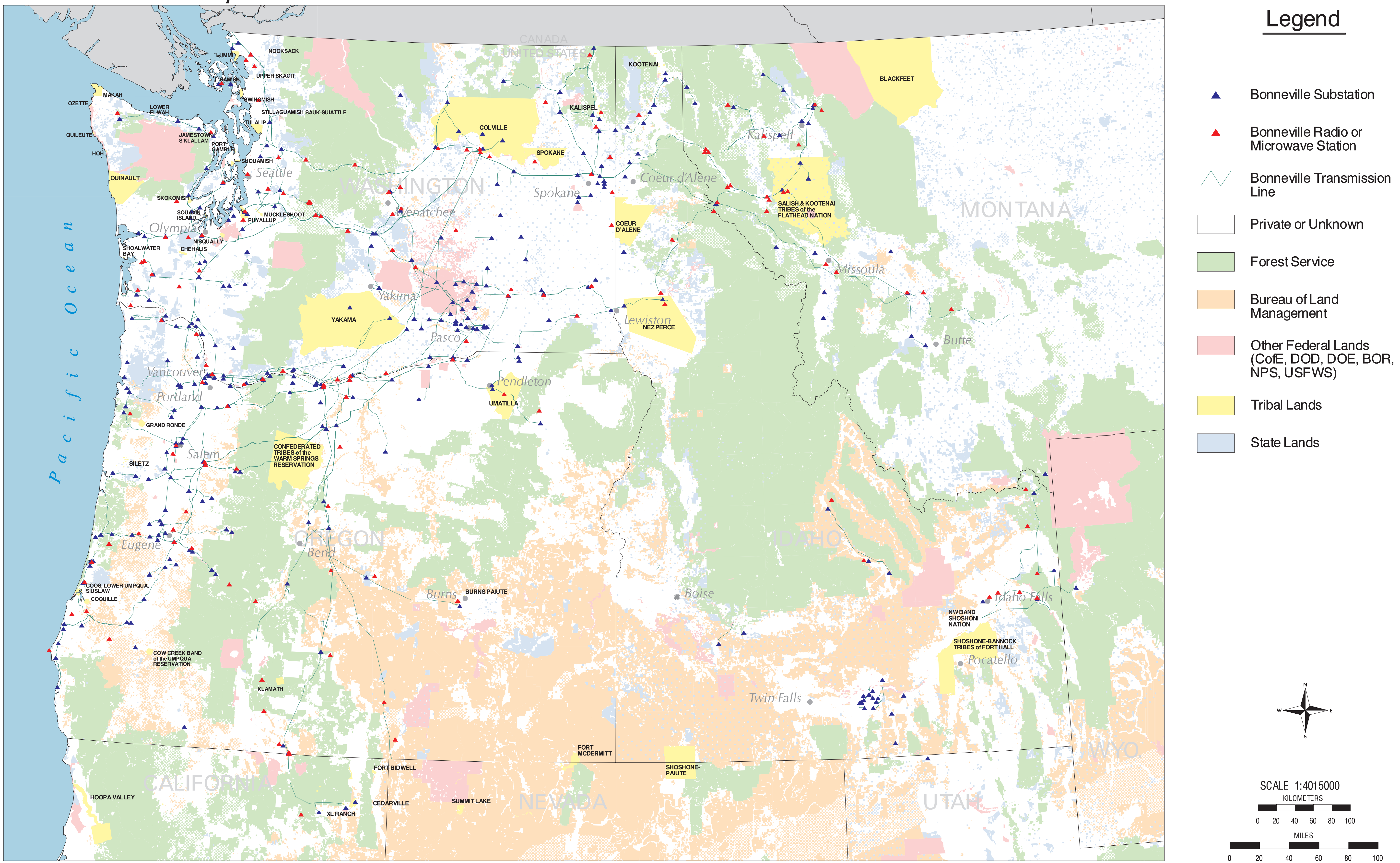
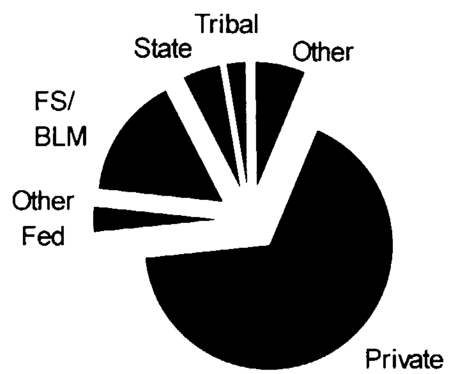


Figure V-4 Land Ownership

Figure V-5: Land Ownership by Percentage along Corridors



Bonneville establishes agreements with landowners to permit certain activities on rights-of-way (like Christmas tree farms) on condition of proper safety and vegetation control.

Because private lands are within counties or cities boundaries, some local government regulations can apply to Bonneville's vegetation management. (See below: **City, County, and State Lands**.)

USFS- and BLM-managed Lands

About 1368 km (850 mi.) or 16% of Bonneville's transmission-line corridors are located on lands managed by the USFS. About 837 km (520 mi.) or 10% of our corridors are located on lands managed by the BLM. There are 16 (or 5%) Bonneville substations and 44 Bonneville microwave/radio sites (or 33%) located on BLM *or* USFS land.

Figure V-6 shows USFS- and BLM-managed lands. Table V-8 shows the National Forests that have Bonneville facilities on them. Table V-9 lists the BLM districts that have Bonneville facilities on them.

The BLM and USFS must comply (as Bonneville must) with many Federal laws such as NEPA and the ESA. Both these agencies have additional plans governing their land. Bonneville's vegetation management can be affected by these plans. The BLM and USFS can be affected by Bonneville's vegetation management of electric facilities on their lands. The USFS and BLM are cooperating on this EIS as a step toward addressing each other's needs.

USFS and BLM plans and regulations are both programmatic (general) and site-specific for the management of individual Forests or Districts. Often, land-managing plans give no specific guidance for Bonneville to manage vegetation within powerline corridors or other electric facilities. However, Bonneville's facilities often cross different designated habitat types that are addressed in the plans, and vegetation management is addressed indirectly with three general themes:

- protecting riparian areas,
- protecting old-growth/ late-successional habitat, and
- limiting herbicide use.

The number and nature of USFS requirements vary from Forest to Forest, or District to District for the BLM. Vegetation management projects are covered by several different USFS and BLM environmental documents and decisions. The primary documents are noted in **Chapter I** and described in greater detail in **Appendices F and G**, USFS and BLM background.

Table V-8: USFS National Forests with Bonneville Transmission Facilities

USFS National Forests and Bonneville Transmission Lines	
Forest	**State and Forest**
Region 1	**Idaho** Clearwater NF Coeur d'Alene NF Kaniksu NF St. Joe NF **Montana** Deerlodge NF Flathead NF Gallatin NF Kootenai NF Lolo NF
Region 4	**Wyoming** Bridger-Teton NF **Idaho** Caribou NF Boise NF Targhee NF Challis NF (2 microwave/ radio stations)
Region 5	**California** Modoc NF **
Region 6	**Washington** Columbia River Gorge NSA** Colville NF Olympia NF ** Okanogan NF (1 radio sta.) ** Mt Baker - Snoqualmie NF ** Wenatchee NF ** **Oregon** Columbia River Gorge NSA ** Crooked River Grasslands Deschutes NF** Fremont NF Mount Hood NF ** Siuslaw NF ** Umatilla NF Wallowa-Whitman NF** Willamette NF ** Winema NF**

** included in regulations from Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA/USFS and USDOI/BLM, 1994b).

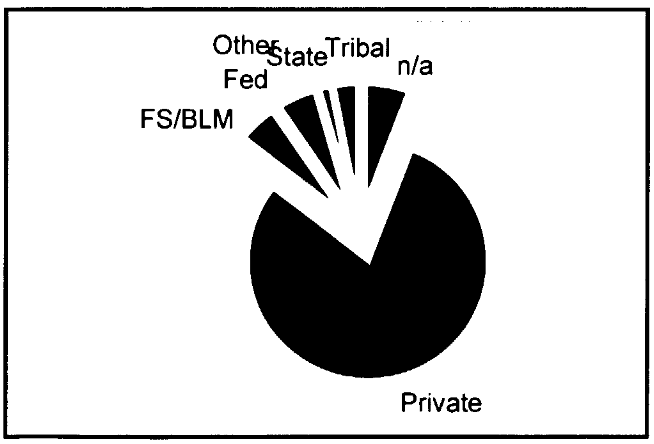
NF = National Forest NSA = National Scenic Area

Table V-9: BLM Districts with Bonneville Transmission Facilities

BLM Districts and Bonneville Transmission Lines		
State	District	
Idaho	Lower Snake River Upper Columbia-Salmon/Clearwater	Upper Snake River
Washington	Spokane	
Oregon	Coos Bay ** Medford ** Salem ** Lakeview** Prineville	Eugene ** Roseburg ** Burns Vale
California	Susanville (Substation)	
Montana	Butte	

** included in regulations from Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA/USFS and USDOI/BLM, 1994b).

Figure V-7: Land Ownership by Percentage around Substation Property



Tribal Lands

Bonneville's facilities also cross Tribal lands, including nine Indian reservations, as follows:

- Flathead Indian Reservation of the Confederated Salish and Kootenai Tribes,
- Yakama Nation,
- Nez Perce Tribe,
- Nisqually Indian Tribe,
- Kootenai Tribe of Idaho
- Confederated Tribes of the Colville Indian Reservation,

BLM - and USFS - managed Lands

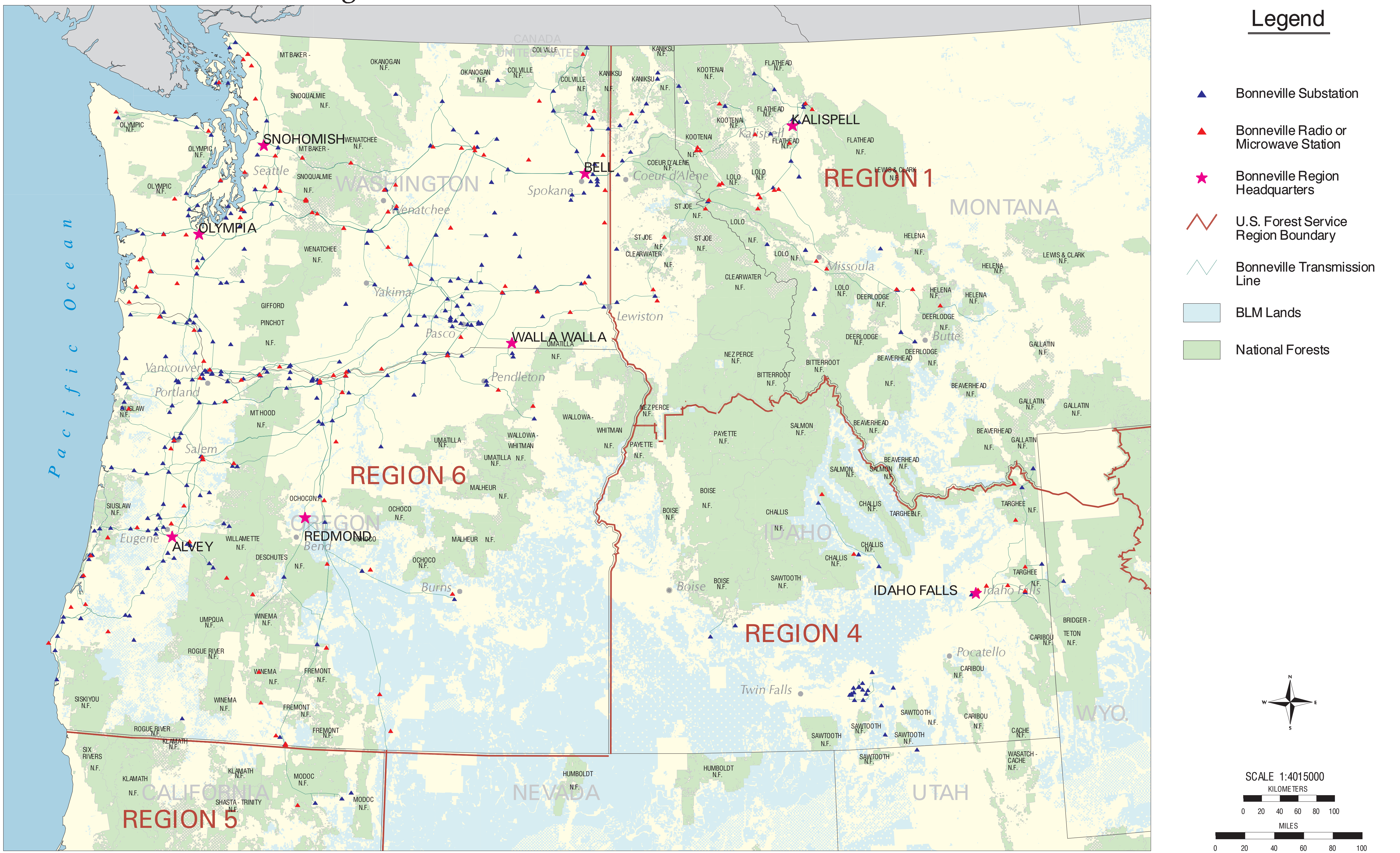


Figure V-6 BLM - & USFS - managed Lands

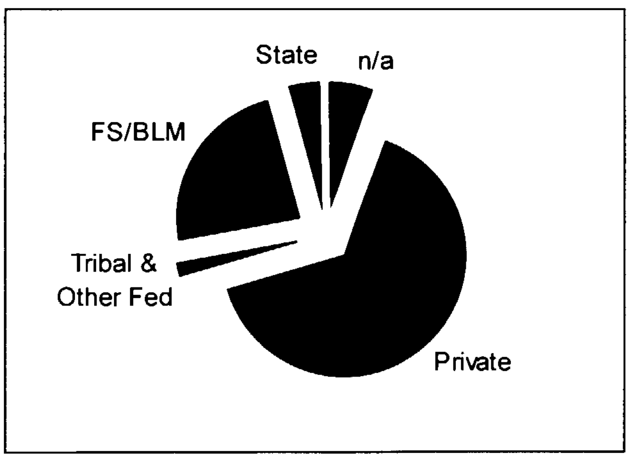
- Confederated Tribes of the Warms Springs Indian Reservation,
- Umatilla Indian Reservation, and
- Puyallup Reservation.

About 357 km (222 miles) of transmission corridor cross reservations. There are 10 Bonneville substations (3%) and 1 microwave tower (less than 1%) located on Tribal land.

Tribal reservations are shown on Figure V-4, after page 134.

Most of these Tribal Reservations have plans that include guidelines for vegetation management. Also, Native American Tribes hold and exercise legal rights to activities and resources both within and beyond Reservation boundaries. These rights notably include fishing, hunting, gathering wild plant materials, and religious practices.

Figure V-8: Land Ownership by Percentage around Radio/Microwave Stations



City, County, and State Lands

Bonneville's service area crosses many jurisdictions, including cities, counties, and states, that have ordinances and plans defining land use. As a Federal agency, Bonneville does not apply for local permits from state, county or city governments unless a local government has been designated as the regulator for a Federal law. Bonneville tries to consider consistency with state and local ordinances, plans, and policies associated with adjacent land uses.

Cultural and Historical Resources

Cultural and historic resources can be generally categorized into three groups:

1) historic sites, including historic architecture, engineering and archeological sites;
2) Native American archeological sites; and
3) traditional cultural properties.

Most identified cultural resources in the Columbia River Basin are archeological sites such as campsites, housepit villages, rockshelters, rock art (petroglyphs and pictographs), lithic (stone) quarries and workshops, burial grounds and cemeteries and isolated rock cairns, pits and alignments. Archeological sites are valued for:

- information they contribute to understanding past events and cultures,
- public recreational and educational interest, and
- their significance as part of the heritage of contemporary Native American cultures.

Sites of historic significance relate to early Euro-American exploration, the fur trade, military history, mining, navigation, agriculture, and early settlement.

Native American traditional cultural properties include a broad range of features from the natural environment and the sacred world, such as distinctive shapes in the landscape, traditional use plants and animals (including game animals, livestock, and food and medicinal plants), ceremonial sites, and places of spiritual renewal and guidance.

These cultural resources are found throughout the Pacific Northwest, along transmission-line corridors and next to other electric facilities that cross Tribal reservation, Federally managed, and private lands.

Public Health and Safety

Transmission facilities provide electricity for heating, lighting and other services essential for public health and safety. Contact with the electric equipment can injure people and cause property damage.

Managing vegetation around electric transmission facilities keeps the electricity from flashing to ground or other objects. This same vegetation management can potentially harm humans. Exposure to herbicides, use of sharp tools, machinery and heavy equipment, and burning slash piles can injure people.

National Electrical Safety Code

Bonneville's vegetation management program is based on portions of the National Electrical Safety Code 1997 Edition (NESC, 1997). In general, the NESC requires tree trimming and removal to prevent " . . . grounding of the circuit through the tree." Electric contact between a tree and an energized conductor can occur even though the two do not actually touch. In the case of high-voltage lines, electricity will arc across an air gap. The distance varies with the voltage at which the line is operated. Bonneville has established minimum distances that a tree can be to a transmission line; the NESC designates how close a worker can come to energized lines. (Please see **Appendix E** for more information on this subject.)

The NESC specifies factors that should be considered if a tree is to be removed or trimmed: tree growth, movement of the tree and conductors in wind, voltage, and sagging of the conductor at high temperatures.

Equipment Use

Workers (and potentially the public) are at risk of physical harm resulting from tree felling and topping, use of sharp tools, driving on unimproved roads, and work conducted near high-voltage lines and transformers.

Herbicides

All herbicides sold or distributed in the United States must be registered by the Environmental Protection Agency (EPA). This means that the EPA must conclude that the particular agent in question can be used without posing unreasonable risks to people or the environment, based on scientific evidence.

Current law also mandates that older registered herbicides be reregistered based on advances in scientific knowledge. EPA lists recently reregistered herbicides in a Reregistration Eligibility Decision (RED).

Pertinent facts about herbicides, including controls for proper use, safety requirements, toxicity data, and application restrictions are summarized in EPA RED fact sheets. (See **Appendix H.**) EPA also imposes these regulations by including them on container labels to direct the proper use of a herbicide. It is illegal *not* to follow label instructions and restrictions.

Smoke/Fire

Another potential issue related to public health and safety and vegetation management is smoke from burn piles. Bonneville has two burning techniques: we sometimes use a burner to kill weeds in substations and/or we burn vegetative debris piles created from right-of-way vegetation maintenance. For safety and reliability reasons, burn piles are located away the transmission line unless the line is de-energized.

Smoke can reduce local air quality and can cause health concerns for people—particularly people with respiratory problems—who live near the place where burning is occurring.

Visual Resources

Visual quality varies tremendously throughout the Pacific Northwest: from forests, mountains, ocean views, and rolling hills to picturesque and cosmopolitan cities. For the most part, Bonneville facilities and rights-of-way have been part of the visual landscape for many years and, in some cases, decades.

Bonneville 's Vegetation Management Program most affects visual quality where vegetation within maintained rights-of-way contrasts with surrounding vegetation, primarily forested areas. Areas where Bonneville transmission lines cross forested areas include the Olympics, Cascades, Northern Rockies, and Coast Range. In such areas, maintained rights-of-way can create a visibly sharp, linear edge between forest and right-of-way.

Towers are also typically visible within forested areas, although trees can often block or soften the views of most towers, leaving those exposed on hill tops or within valley gaps as the most visible. In non-forested areas, the towers exert much more visual presence than does the maintained vegetation beneath them.

Major factors that determine corridor visibility include existing soils, vegetation, the view from viewpoints, adjacent settings, and contrasts between surfaces (vegetation and exposed soils) inside and outside the corridor.

Bonneville electric yards can be very visible, with their structures, light colored gravel, fencing, and lighting. In residential neighborhoods, visual screening becomes an important management consideration. Because typical shade trees near substations can cause safety and reliability problems, Bonneville has often "visually softened" some of these facilities with fencing, low-growing vegetation, and slow-growing trees.

Air Quality

Within Bonneville's service area, many airsheds either do not currently or have not in the past met Federal air quality standards. Those that currently do not meet the standards are called "nonattainment areas." Those areas listed as nonattainment are either taking measures to reduce air pollution or are gathering better data, so that they can be reclassified as "maintenance areas." If they do not receive redesignation by the Federal government's deadline (varies with designation status), the Federal government withholds highway funds.

The status of **nonattainment** designations is constantly being reviewed by state authorities with the hope that those areas will achieve redesignation as maintenance areas—thus lifting the strict standards imposed on them. Most of the nonattainment areas in the Northwest are scheduled for redesignation in the near future. A few that will probably not be redesignated in the near future include Pocatello, ID (particulates), and Spokane and Yakima, WA (both: carbon monoxide).

Many airsheds presently listed as nonattainment are eligible for redesignation to maintenance areas because they have not exceeded the standards for at least 3 years. Bonneville will treat these airsheds as nonattainment areas, but will watch for changes in designation. These areas include the following: Montana (Butte, Columbia Falls, Kalispell/Whitefish and Flathead County, Flathead Indian Reservation (Poulson/Ronan), Libby, Missoula, and Thompson Falls); Idaho (Boise, Pinehurst and Shoshone County, and Sandpoint), and Oregon (Eugene/Springfield and Lane County, Grants Pass, Klamath Falls, La Grande, Lakeview, Medford, Oakridge, and Salem). "Maintenance areas" include Eugene and Portland (OR), Vancouver (WA), and Seattle-Tacoma-Everett (WA).

Socioeconomics

Population centers range from small rural communities to major metropolitan areas, with much of the population occurring within the urban centers of the Puget Sound and Willamette Valley regions. McGinnis and Christensen (1994, citing U.S. Bureau of Census 1990 data, 1991) report that counties in the Interior Columbia River Basin had a 1990 population of 2.9 million. As a comparison, 6.3 million people reside in western Oregon and Washington. Washington counties comprise 38% of the population; southern Idaho counties, 27%; Oregon counties, 12%; Montana counties, 11%; and northern Idaho counties, 7% (counties in the Interior Columbia River Basin in Wyoming, Utah, and Nevada comprise the remaining 5% of the study area population). Within the interior Columbia Basin, the most populated county in 1990 was Spokane, Washington (361,364); the least was Camas, Idaho (McGinnis and Christensen 1994).

Economic Conditions

Major resource-based economies include crop, forage, and timber production. Within urban centers, more industrial- and service-based economies exist, including manufacturing, production, and retail.

Over the past 13 years, the Pacific Northwest has evolved from a resource-based economy to a more diversified economy with growing trade and service sectors. The manufacturing share of the regional nonfarm employment was 15.5% in 1993. Resource based manufacturing made up 24.2% of the manufacturing employment and high technology industries' (aerospace and electronics) share was 38.6%.

The lumber and wood products industry held 2.6% of the total regional employment in 1993. Food processing was 2.0%, while transportation equipment was 3.2% (1993). Aluminum production is economically important to the region, but its employment is relatively small; it had a 0.5-percent share of total employment in 1993. Employment in wholesale and retail trade was 24.7% in 1993, while employment in the services sector was 24.9%.

Bonneville's system supplies electric power for many municipalities and industries. Industrial customers such as aluminum plants or high-tech manufacturers count on very reliable electric service. Unexpected electric interruptions can cause negative economic repercussions from down-time, re-setting equipment, and lost revenues.

The affected area, in terms of potential economic effects, can extend beyond the Pacific Northwest. Power on Bonneville's transmission system can flow north to Canada or south to California. Because transmission systems are linked together, the same power can end up being used in New Mexico, Arizona, Texas, Utah, or Nevada. Therefore, when power is interrupted in one place, a chain of interruptions can occur several states away. An example is the August 10, 1996, power outage referenced in Chapter I: it caused power outages in ten states, interrupting electric service for a period of time from several minutes to nine hours for 7-½ million customers (residents and businesses).

Chapter VI Environmental Consequences

In this chapter:

- **Impacts of the Methods**
- **Impacts of the Alternatives**
- **Cumulative Impacts**

This chapter describes the potential environmental impacts of the various methods and program alternatives, by environmental resource (vegetation, water wildlife etc.) and human resource (land uses, visual, health & safety, etc.).

Vegetation

The following section discusses general impacts of vegetation management on vegetation.

General Impacts

Target Vegetation

Bonneville is aiming to control the growth of target vegetation. Target vegetation includes the following:

- tall-growing vegetation in the right-of-way or microwave beam path;
- tall-growing vegetation that is *off* the right-of-way but that could fall or bend into the line;
- noxious weeds on our rights-of-way or other Bonneville land;
- trees or woody stemmed shrubs on access roads;
- any vegetation within substations, switchyards, or radio/microwave sites; and
- trees that are outside substations but that could fall into the substation or onto the substation fence.

While we are aiming to control target vegetation, impacts could also occur on non-target vegetation. Changes could also occur to the overall vegetation structure and diversity on the right-of-way.

Non-target Vegetation

Impacts on non-target vegetation from general vegetation management (regardless of the method used) could include the following:

- trampling, crushing, or accidental removal of plant species;
- increased exposure to direct sun and weather;
- change in plant community composition and diversity;
- changes in soil moisture, nutrient level, and soil structure due to compaction; and
- increase in noxious weed invasion.

While workers conduct vegetation maintenance along the right-of-way, they or their vehicles could trample or crush non-target vegetation. Non-target plant species also could be accidentally removed or parts of the plant cut. The vegetation would be more affected by these impacts if they were to occur during the growing season than during the winter, when plants are dormant and usually less affected by disturbances. Regardless of maintenance timing, many species would recover from the impacts by the following season. Plants that are plentiful in the area would re-establish themselves through roots or seed dispersal.

Structure and Diversity

Controlling tall-growing vegetation can also affect vegetation structure (plant community composition) and diversity. In grassland or shrub areas, these characteristics do not change much because these naturally occurring low-growing plant communities need little or no treatment.

In forested areas, the dynamics of the plant community on the right-of-way change constantly. Trees in adjacent forests send a continuous flow of tree seeds to the right-of-way, pushing the succession of plant development on the right-of-way toward a forest condition (Bramble and Byrnes, 1983). This trend toward a developing forest is found more along the edge of the right-of-way. By contrast, plants associated with open areas that have developed since initial right-of-way clearing are found more abundantly at the center of the right-of-way (Brisson et al., 1997).

Where tree seedlings on the right-of-way are allowed to develop and grow to the point that they become a threat to the line, plant diversity can be reduced. The many young developing trees will compete with striving meadow-plant species and reduce the overall diversity of plant species in the area—leaving only forest or developing forest-type plant species.

When big trees that have provided a canopy are removed, plants living below are exposed to sunlight and weather. Some plants might die from this exposure; some plants, more tolerant of varying conditions, would survive but could suffer from sunburnt foliage for a growing season or two. Still others might use the opportunity of open space to reproduce and dominate the area.

In some cases, this change in conditions and subsequent plant development might reduce the diversity of species in the plant community. This would happen under two main conditions: (1) if those plant species taking over were the same as those within the forest, or (2) if those species were aggressive invasive plants (such as blackberries or noxious weeds) that could dominate and out-compete other plant species.

Noxious weeds are non-native plants that act as pioneer species: they colonize and take over disturbed sites such as newly cleared rights-of-way. (The amount of ground disturbance and, consequently, the extent of the opportunity, depends on the method of control used.) Noxious weeds threaten the existence of most native plants and greatly reduce plant diversity.

In forested areas, maintaining rights-of-way so that only small or no trees can grow can increase the overall diversity of plant species in the area. This right-of-way open space, when surrounded by shaded woods, provides a habitat for meadow-type plants—shrubs and grasses—to flourish. These meadow plants do not grow in shaded forests and could be species that lie dormant until favorable growing conditions arise. (Bramble & Burns, 1983)

When trees (such as unstable danger trees) in a forested area are removed along the right-of-way, the remaining trees, formerly inside the forest, are exposed to weather, which can cause the foliage to sunburn or the trees to freeze. The trees that make up the new "edge" are vulnerable to being blown down by winds because their root mass is not as strongly developed for resistance. (This fact is often considered when trees are being reviewed for removal—it is important to leave an edge of trees that are more stable and resistant to blow-down.)

Threatened, Endangered, and Sensitive (TES) Plants

In the last several years, Bonneville has discovered TES plant populations on various portions of our rights-of-way. Those plants include the Federally listed *Lomatium bradshawii* (Bradshaw's desert parsley) and two species recently proposed for listing: *Erigeron decumbens var. decumbens* (Willamette Valley daisy) and *Lupinus sulphureus ssp. Kincaidi* (Kincaid's sulfur lupine). Within National Forests, the USFS gives Regional and Forest designations to plant species. Through plant surveys, Bonneville has identified several sensitive plant species that are listed as "Forest Sensitive" within National Forests in Wyoming, California, and Oregon.

BLM also has designated as "sensitive" plants that need protection on the lands that the agency manages. Bonneville develops plans to protect sensitive species in coordination with either the land manager or responsible Federal agency to prevent impacts from our vegetation management program.

TES plants can be affected by change in vegetation structure on rights-of-way. Plants that are shade-tolerant can be adversely affected when the trees are removed. Most shade plants are sensitive to sunlight, and would die.

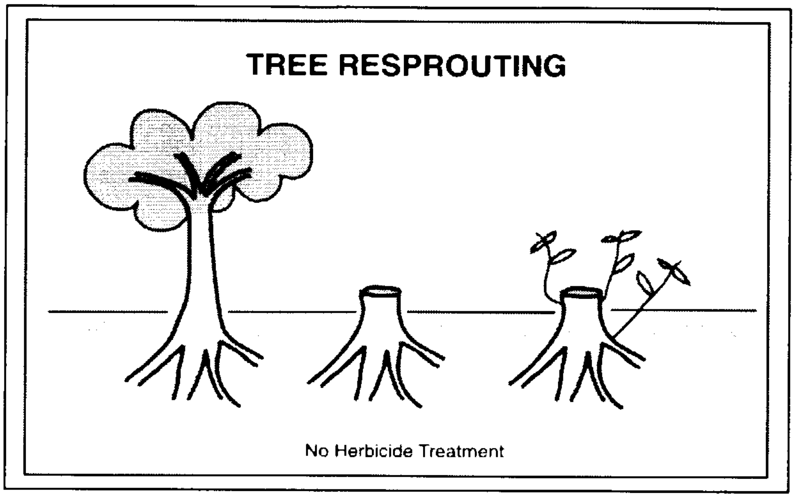
However, controlling certain vegetation types in some environments can actually encourage TES plants species to grow. This phenomenon might result from controlling other vegetation that would normally out-compete TES plants. A study conducted in Georgia, Maryland, and Virginia uncovered a significant number of rare plants on powerline easements, in comparison to those in surrounding landscapes (Sheridan et al., 1997). In central Oregon, on our own rights-of-way, *Astragalus peckii* (Peck's milk vetch) has been identified on our access roads. It appears that the site disturbance has favored the establishment of this species in some areas.

The following sections discuss method-specific impacts of vegetation management on vegetation.

Manual Impacts

Manual techniques are very selective: they generally affect only the vegetation that has been targeted for cutting. As noted above, surrounding vegetation could be crushed or damaged by workers or debris. The main (negative) impact of manual brush-cutting is that it encourages regrowth of multiple-stemmed sprouts for certain species.

Figure VI-1: Resprouting Consequences of Cutting without Herbicide Follow-up



Most deciduous trees will resprout when cut; some will also send up suckers through the roots. In Bonneville's service territory, these types of trees include alder, cottonwood, maple, and willow. To kill these trees, the roots must be killed also. Otherwise, with every cycle of tree cutting, more sprouts (or stems) grow; over time, the tree stem density increases. Resprouts grow back thick and keep low-growing shrubs from establishing themselves. Therefore, it is difficult to try to convert to a low-growing plant community using manual techniques alone (no follow-up herbicide treatments) to eliminate tall brush in plant communities that have re-sprouting species.

> ***A study by Nowak et al. (1993) compared tree densities and species composition on powerline corridors in New York State over a 16-year period and across a wide range of management schemes, environmental conditions, and plant communities. On corridors where managers used periodic selective hand-cutting with no herbicide treatments, an increase in tree density was observed. On corridors where managers used herbicides to remove trees periodically and selectively, they observed tree populations remaining at constant low density.***

Conifers (cone-bearing trees such as pines, fir, cedar, spruce, and hemlock) tend not to sprout or send up suckers when cut. However, if the conifer is cut above the lowest branch, the branch will become the "leader" and the tree will continue to grow.

For landscaped areas at non-electric facilities, such as around substation offices or maintenance headquarters, manual techniques (weed pulling, hoeing, trimming) would have no impact on non-target vegetation—unless the wrong plant were pulled or hoed.

Mechanical Impacts

Mechanical techniques (e.g., using mowers or troller-choppers) are non-selective or much less selective than manual methods: they tend to clear or cut all vegetation within the path. This could have impacts on any species that Bonneville would want to encourage to grow (such as low-growing brush, forbs, and grasses) or would need to avoid (such as TES plants).

Using some kinds of mechanical equipment (especially blading and roller-chopper types) can disturb the ground, encouraging noxious weeds to invade and grow. Others types, such as walking brush controllers, have minimal impact on soil. Noxious weeds tend to be extremely resilient and opportunistic species, with quick germination and regeneration rates. Any change in the environment that affects the composition of vegetation or exposes the soil can allow noxious weeds or other undesirable species to dominate.

Mechanical methods usually encourage deciduous species to resprout. Therefore, if the right-of-way is dominated by deciduous species, the use of mechanical clearing would most likely increase the tree-stem density of the right-of-way over time.

Grounds maintenance at non-electric facilities would consist mostly of mowers for lawns. Lawn mowing would have no impacts on non-target vegetation.

Biological Impacts

Insects and pathogens used to eat or control vegetation are highly selective for specific plants (usually noxious weeds) and therefore would not affect non-targeted vegetation. These biological controls are tested to ensure they are host-specific (Pacific Northwest Weed Control Handbook, 1997), and that they will not switch to crops, native flora, or endangered plant species in the absence of their host weed.

Herbicide Impacts

The degree to which herbicides affect non-target vegetation depends on two factors: (1) the specific herbicide used (whether it is selective or non-selective), and (2) whether the herbicide comes in contact with non-target vegetation. Such contact can occur through the application technique, drift (when herbicide drifts through the air or blows away from the area), water or soil movement, and accidental spills or accidental or careless applications. Effects of the specific herbicide on non-target vegetation depend on the "selectivity" of the herbicide. A selective herbicide kills only one type of vegetation (e.g., broadleaf plants). A non-selective herbicide might kill a number of plant types (e.g., broadleaf and grasses). The more selective a particular herbicide, the less the potential for non-targeted vegetation to be harmed.

Whether the herbicide comes in contact with non-targeted vegetation can depend on the application technique. Because **spot herbicide applications** treat individual plants (stump treatment or injection), there is little-to-no potential for the herbicide to contact non-targeted vegetation.

Localized herbicide applications, which treat individual or small patches of plants, might possibly spray non-target plants in the process of treatment or come in contact with the herbicide through direct application and/or drift. Localized treatments are not likely to cause much drift because relatively small areas are treated and the person who applies the herbicide (the applicator) has a high degree of control.

Aerial and broadcast applications treat large areas, rather than individual plants; if there were any non-target plants in the area, the herbicide would come in contact with them. These two application categories also have a greater potential to cause herbicide drift, because there is usually a relatively long distance between the spray source (e.g., a truck or helicopter) and the plants or area treated. If there is any wind or other drift-causing factor during application, the herbicide might blow off-target and potentially come in contact with non-targeted plants. Adhering to label instructions and weather restrictions and using adjuncts in the herbicide to increase droplet size would minimize or eliminate this potential drift.

Rain or erosion can sometimes move herbicides off-site through soil or water, allowing the herbicide to come in contact with vegetation outside the intended treatment area. The likelihood of this happening depends on the mobility of the particular herbicide, its persistence, the soil type, the proximity to water of the initial application, and the amount of rain (if any) present during and/or immediately after application. For a more detailed discussion of herbicide migration, please see the **Water** and **Soil Resource** sections of this chapter.

Regardless of technique, accidental spills of herbicide could cause herbicides to come in contact with non-targeted vegetation. However, legal requirements and applicator training emphasize prevention of such spill. The impacts of herbicide spills could range from low to high, depending on the persistence and mobility of the herbicide involved, as well as on how quickly and thoroughly a spill is cleaned up.

In electrical and non-electric facilities, *all* vegetation is targeted because no vegetation can be allowed (for safety reasons). Therefore, any "non-target" vegetation effects from electrical and non-electric facility vegetation management would occur only if herbicides were to move off the treatment area. The likelihood of the herbicides moving off-site and the impacts of that movement would be the same as discussed above and later in the **Water** and **Soil** sections of this chapter.

Debris Disposal Impacts

Large amounts of woody debris scattered on the surface of the ground can crush vegetation, shade the vegetation surroundings and increase soil moisture, and temporarily lower the quantity of soil nitrogen available for plant growth until decomposition of the material is nearly complete.

Burning vegetation debris can in some cases help seeds (including noxious-weed seeds) to germinate. Bare or blackened soil from burnt slash piles could expose soil to noxious weed invasion. The ash from burning can increase nutrient levels needed by some plants. However, burning of plant debris also causes nitrogen and carbon to evaporate, which can diminish soil productivity.

In the rare event that fire escapes from a burn pile, surrounding vegetation would definitely be affected by a potential wildfire. Careful monitoring of slash-pile burns and adherence to safety procedures would reduce the likelihood of such events.

If tractors or other heavy equipment were used to stack debris, rutting and compaction, which could adversely affect soil productivity, could potentially affect plant growth.

Chipped debris can crush, smother, and shade plants if the chips are laid on the plant. Using heavy equipment for chipping can also crush non-targeted vegetation or affect the soil in which it grows through compaction and rutting.

Mitigation Measures

The following mitigation measures would be observed to reduce impacts on vegetation:

- Consider the following steps or mitigation measures to promote a semi-stable low-growing plant community:

1. Remove existing tall-growing vegetation. If using manual methods to eliminate deciduous (resprouting-type) species, do follow-up herbicide treatments to ensure that the roots are killed.
2. Replant or reseed with ground cover if none exists or if there is a low potential for natural revegetation by low-growing species (and a high potential of natural revegetation by tall-growing species).
3. Maintain, by selectively eliminating tall-growing vegetation before it reaches a height or density to begin competition with low-growing species.
4. As much as practical, be careful not to disturb low-growing plants. When possible, use only selective vegetation control methods (such as spot herbicide applications) that have little potential to harm non-target vegetation.

- Avoid removing vegetation where it will not grow up into the safety zones for the transmission line.
- Cut conifers below the lowest live limb to eliminate the continued growth of lateral branches.
- Use only those biological control agents (insects) that have been tested to ensure they are host-specific.
- Take full responsibility for controlling noxious weeds on fee-owned property.
- Enter into active noxious weed control programs with land owners/managers or county weed control districts where Bonneville activities may have caused or aggravated an infestation.
- *Where appropriate*, provide herbicides or biological control agents to landowners.
- *Consider, when practical*, washing vehicles that have been in weed-infested areas (removing as much weed seed as possible) before entering areas of no known infestations.
- *Consider, when practical*, re-seeding soil disturbed areas with approved weed-free seed.
- Determine whether any T&E plant species are potentially present in the project area (through the use of T&E maps, specialist's determination, or T&E list from the USFWS).

- *If T&E plant species are potentially present in the project area,* determine whether they are likely to be affected. If project is likely to affect but not *adversely* affect T&E species, obtain concurrence from the USFWS.
- *If it is determined that the project is likely to adversely affect T&E plant species,* initiate formal consultation with the USFWS and prepare a Biological Assessment according to 40CFR Part 402.
- Apply mitigation measures (such as timing restrictions, or specific method use) resulting from T&E determinations or consultations.
- Follow herbicide product label directions for appropriate uses, restrictions etc.
- Use herbicide-thickening agents (as appropriate), label instructions, and weather restrictions to reduce the drift hazard to non-target plants.
- Ensure that there is no danger of granular herbicides being washed from the areas of application.
- Do not apply pellet herbicides within three times (3X) the crown width (or dripline) of an off-right-of-way tree.
- *In the rare case of an herbicide spill,* follow all herbicide spill requirements including containment and clean-up procedures.
- Visit rights-of-way after treatments to determine whether target vegetation was controlled and whether non-target plants were affected.
- Where cost-effective and to the extent practicable, *use regionally native plants for landscaping.*

Water

Controlling the growth of vegetation can affect surface water (such as streams, rivers, ponds, lakes, and wetlands) and can potentially affect groundwater (aquifers and wells). Vegetation management is not expected to affect floodplains (it would not change land contours or affect floodwater flow).

The following section discusses general impacts of vegetation management on surface water and groundwater resources.

General Impacts

Removal of streamside (or riparian) vegetation, regardless of the method used, can affect surface water by the following:

- increasing surface runoff;
- promoting erosion and sedimentation, which reduces water quality;
- reducing shading and increasing water temperatures; and
- limiting organic plant debris, and thus the amount of nutrients, entering the water.

Any impacts on water can in turn affect fish and other aquatic species (such as invertebrates, beavers, nutria, salamanders, turtles, and plants), as well as people (drinking water, swimming, fishing, etc.).

Potential groundwater impacts would be herbicide-method-specific, and impacts are discussed under that section.

The following sections discuss method-specific impacts of vegetation management on water.

Manual Impacts

Manual techniques, especially hand methods, are very selective and have a low potential to affect aquatic resources. The greatest potential impacts would be the chance of minor fuel or oil spills from power tools and the release of bar oil during operation of the equipment.

Mechanical Impacts

Because some large machinery used to control vegetation disturbs the soil (either by scraping it or by compaction or rutting from the wheels of the tractors), this method has the greatest potential to cause erosion, which can directly or indirectly affect water quality. Erosion can affect water quality by causing increased turbidity (sediments suspended in water), sedimentation (sediments that settle to the bottom), and/or surface-water run off.

Wetlands can be affected by machines compacting the typically soft, saturated soils. Small, non-distinct streams and wetlands have the greatest potential to be affected because they are small and can be overlooked.

As with manual techniques (chainsaws), mechanical machinery has the potential for oil leaks and spills that could contaminate water.

Biological Impacts

Insects that are used to eat target vegetation would have little or no effect on the aquatic environment.

Herbicide Impacts

Herbicides could affect water resources if the herbicide were to reach those resources. The herbicides proposed for Bonneville use are limited to terrestrial use and would not be applied to water. The potential for a land-applied herbicide to reach water would depend on the herbicide's physical properties and the site conditions. Using herbicide-free buffer zones around water sources is an effective means of keeping herbicides out of water bodies (Norris and Charlton, 1995).

The four most significant means of offsite movement are runoff, leaching, drift, and misapplication/spills. **Runoff** is the surface or lateral migration through rainfall or erosion. **Leaching** is the downward (or vertical) migration through the soil. **Drift** is the airborne movement of herbicides through wind or evaporation. **Misapplications** and **spills** are caused by not following the label instructions/restrictions or by the accidental spilling of a herbicide during mixing, application or equipment cleaning.

Surface water could be affected by any of these means of herbicide movement, whereas groundwater would be potentially affected only by leaching.

Runoff and Leaching

There are three physical properties which, when combined with site conditions such as climate and geology, determine the runoff and leaching potential of a herbicide. They are:

- **Persistence** - Persistence is the length of time a chemical stays active. It is measured by its half-life. The longer the half-life of a chemical, the more persistent it is. The half-life is affected by many variables, including sunlight, microorganisms, chemical degradation, etc
- **Soil Adsorption** - Soil adsorption is the tendency of a chemical to bind to soil particles. Soil adsorption is expressed as: K(oc) = conc. adsorbed/conc. dissolved/% organic carbon in soil.
- **Solubility** - Solubility is the tendency of a chemical to dissolve in water. Solubility is expressed as the amount of a chemical dissolved in a known amount of water measured in mg/l (ppm).

Herbicides have to be relatively persistent in order to have either leach or runoff potential (non-persistent herbicides do not stay active long enough to create a risk). If an herbicide has a high soil adsorption, it is more likely to run off with soil movement. If it has low soil adsorption, it is more likely to leach down through the soil. If a herbicide is highly soluble in water it is more likely to leach; with low solubility, it is more likely to run off. Table VI–1, next page, shows how the various factors combine for leach or runoff potentials. See Table VI-6 (page 175) for the physical properties and off-site movement potentials (leaching and runoff) for each proposed herbicide.

Table VI-1: Runoff and Leach Potential

Main Physical Properties	Leach Potential	Runoff Potential
Persistence	Persistent *half-life greater than 100 days*	Persistent *half-life greater than 100 days*
Soil Adsorption	Low soil adsorption *K(oc) less than 500*	High soil adsorption *K(oc) greater than 500*
Solubility	High solubility *greater than 30 mg/l*	Low solubility *less than 30 mg/l*

Even if an herbicide has runoff or leaching potential, the likelihood of it reaching a water body also depends on site characteristics such as climate and geology. For example, if a persistent herbicide with a high potential for leaching to groundwater were used at a site with low annual precipitation, and the depth to groundwater was over 30 m (98 ft.), the overall potential for that herbicide ever to reach groundwater before complete degradation is quite low. Conversely, the same herbicide, applied at a site with high annual rainfall, coarse underlying soils, and groundwater depths less than 30 m (98 ft.) would have a higher relative potential of reaching groundwater. No one factor can be used to anticipate the ultimate behavior of a herbicide. By understanding these factors, following label instructions and restrictions and applying herbicide-free buffers, applicators can virtually eliminate the potential of herbicides reaching water bodies.

Herbicides used at the level and intensity typical for Bonneville vegetation management do not tend to pose substantial risks of leaching into groundwater. In western Oregon and Washington, the many soil microorganisms and high precipitation levels combine to degrade and/or dilute herbicides to the level where little or no trace would occur in groundwater. In other portions of Bonneville's service area, low precipitation, combined with deep groundwater aquifers, prevents herbicides from reaching ground water (BLM, 1985: p. 40).

Application technique can also have a slight impact on leaching and runoff potential. Applications that are applied to an area (broadcast and aerial techniques) tend to also have herbicide applied to soils and are more likely to run off or leach than techniques that apply herbicide to the plant only (spot or localized techniques).

Drift

Herbicides can also reach water through drift—the airborne movement of herbicides beyond the intended contact area. The three primary factors that contribute to drift are as follows: (1) application technique, (2) weather conditions, and (3) applicator error. Aerial and broadcast applications are more likely to reach water through drift, because the herbicide is sprayed from a helicopter/plane or through a large hose and must settle through the air to reach the target. Spot and localized applications are less likely to cause drift because these applications are targeted to specific plants and the volume of herbicide sprayed through the air is less.

Wind speeds and air temperatures (and their effect on herbicide evaporation) affect the potential for herbicides to drift. With winds over 5 mph and/or high temperatures, drift is likely.

Misapplications and Spills

Misapplications and spills are caused by failure of the applicator to follow label instructions and restrictions and by applicator carelessness. Most experts agree that misapplications and spills are the leading cause of impacts on non-target resources. The impacts of herbicide spills would depend on the persistence and mobility of the spill, as well as on how quickly and thoroughly a spill is cleaned up.

Site Conditions

Site conditions also determine the likelihood of herbicide reaching water resources. **How close herbicides are applied to water resources** determines the potential for herbicides to reach water. Buffers (defined widths of non-treated land) are the most common mitigation measure used to protect such environments. Bonneville must use prescribed no-spray or limited-herbicide-use buffers. Because of this, herbicide use generally does not occur near water systems, thereby reducing greatly the potential for contamination.

The **type of water resource** determines the potential for contamination if herbicide were to reach the water body. Small, still water bodies (such as ponds and small wetlands) are the most likely to be affected: if herbicide were to reach the water, there would be little movement or volume of water to help disperse or dilute the chemical. By contrast, large fast-moving rivers would be less likely to be affected because the amount and turbulence of the water would help dilute the herbicide quickly.

Rainfall is a major factor: with heavy rainfall, herbicides are more likely to be washed from the targeted site toward water bodies, particularly when granular formulations of herbicides are used.

The vegetation, ground cover, or soil type between a sprayed area and a water body can affect whether herbicide movement will reach water. Thick vegetation might block drift or absorb an herbicide moving through water or ground before it reaches a water body. On the other hand, if no vegetation existed, the herbicide would have a greater potential to wash toward the water body.

From a watershed perspective, the **concentration and amount of the herbicide applied** can influence the risk of water contamination. Because powerlines are linear in nature, the area of land treated with herbicides would be relatively small (narrow strips across the landscape) compared to the surrounding area. The ratio of treated to untreated surface area in any given watershed is usually sufficiently low to permit rapid dilution. This ratio is much lower than that for the concentrated areas or blocks of land typical of herbicide treatments in agricultural and forestry practices.

For example, across a "section" (a 259-ha or 640-ac. block of land), aerial application of herbicides on a right-of-way (30 m or 100 ft. wide) would result in about 2-to-3% of the section being treated. By contrast, treatment areas of 10-to-25% per section can occur in forestry practice, and areas greater than 75% per section are common in agricultural treatments.

A right-of-way treatment using spot or localized applications would result in an even lower percentage of treated area.

If an herbicide does reach water, the toxicity determines what kind of impact it might have. For example, all chemicals can be toxic to aquatic organisms if present in high enough concentrations (please see **Fish** for more information on impacts of herbicides in surface water, and Table VI-6, page 175, for herbicide ecological toxicity).

Debris Disposal Impacts

Debris disposal would affect surface water if the cut vegetation or wood chips were put into the water. Clumps of vegetation could cause or contribute to debris torrents (rapid flows of a mixture of water, soils, rock, and organic debris). These debris torrents tend to occur during heavy rainfall, where tree-clearing operations have taken place on mountainsides or where stream channels have been clogged by debris. Vegetation debris should not be disposed of in water.

Mitigation Measures

The following mitigation measures would be applied for water resources.

- In riparian areas, use selective control methods and take care not to affect non-target vegetation.
- In riparian areas, leave vegetation intact, where possible.
- Recognize that any discharge of material (displaced soils) within a water of the U.S. may be subject to U.S. Army Corps of Engineers regulations under the Clean Water Act.
- Do not permit debris from tree falling, cutting, or disposal to fall into or be placed in any watercourse, spring, pond, lake, or reservoir, *unless* there is approval from the appropriate authorities for stream habitat projects.
- *If burning piled vegetative debris,* do not burn in or next to watercourses.
- *For all methods using machinery or vehicles (i.e. chainsaws, trucks, graders)* keep the equipment in good operating condition to eliminate oil or fuel spills.
- Do not wash equipment or vehicles at a stream.
- Follow herbicide product label directions for appropriate uses, restrictions etc.
- Use herbicide thickening agents (as appropriate), label instructions, and weather restrictions to reduce the drift hazard to water resources.
- Ensure that there is no danger of granular herbicides being washed from the areas of application.
- Notify inspector and the State of any amount of herbicide spill in or near water.
- Always use siphon prevention devices/methods when filling herbicide tanks from domestic water supplies.
- Consider climate, geology and soil types in selecting the herbicide with lowest relative risk of migrating to water resources.
- Protect surface water and groundwater by observing all riparian buffer zones and pesticide-free zone guidelines. Tables VI-2 and VI-3 below list required water buffer widths to be used for the specified method or herbicide application technique.

- *Before herbicide application*, thoroughly review the right-of-way to identify and mark, if necessary, the buffer requirements.

Table VI-2: Riparian Buffer Zones

Method	Buffer Width From Habitat Source, i.e., Stream or Wetland
Ground-disturbing Mechanical Methods	
Slopes under 20%	10.7 m (35 ft.)[1]
Slopes over 20%	No disturbance.
Herbicide Application Methods	
Spot	3 m (10 ft.)[2] (Standard may be relaxed for capsule injection of glyphosate up to the water's edge.)
Localized	10.7 m (35 ft.)[1]
Broadcast	15.2 m (50 ft.)[3]
Aerial	30.5 m (100 ft.)[2]
Mixing, Loading, Cleaning	100 m (328 ft.)[3]

[1] USDA, NRCS, Conservation Practice Standard, Riparian Forest Buffer, Code 391A, 1997
[2] USDOI-BLM Standard
[3] USDOE-BPA Best Management Practice

Table VI-3: Herbicide-free Zones

Zone	Buffer Width
Agricultural Irrigation Source (Wet or Dry)	30.5 m (100 ft.)[1]
Domestic Water Well	30.5 m (100 ft.)[1]
Public Water Intakes/Spring Developments	100 m (328 ft.) Upslope[1]
Secondary Containment Liners, Vaults and Lagoons	Up to Edge of Containment Feature[1]
Storm Drains that Discharge Offsite	2 m (6 ft.) Radius[1]

[1] USDOE-BPA Best Management Practice

These are generalized standards. Other Federal agencies, as well as State and local authorities, may have stricter or more relaxed buffer zone requirements for the protection of these and other resources, such as sole-source aquifers, fisheries, recreation areas, etc.

- Monitor to determine whether desired results for water resources were achieved or whether follow-up mitigation measures are necessary (e.g., erosion control measures).
- *For electric yards within 100 m (328 ft.) of wells, streams, rivers, or wetlands,* determine whether the water body should be monitored for potential herbicide contamination.
- *Where cost-effective and to the extent practicable,* seek to minimizing runoff from non-electric facilities' landscaping.
- *Where cost-effective and to the extent practicable,* implement water-efficient practices at non-electric facility landscaping, (such as the use of mulches, efficient irrigation systems, audits to determine exact landscaping water-use needs, and recycled or reclaimed water and the selecting and siting of plants in a manner that conserves water and controls soil erosion).

Soils

The following section discusses general impacts of vegetation management on soils.

General Impacts

The removal of vegetation, regardless of the method used, can affect soil through erosion and by altering soil nutrients.

Erosion

The degree of soil erosion varies throughout the Bonneville service area: erosion depends on differences in climate, vegetation, soil properties, and land-use patterns. Climate affects erosion primarily through intense individual storms rather by yearly precipitation totals.

West of the Cascade Mountains, the climate is maritime. The moist and relatively warm climate fosters the development of deep soils, while rainfall rates are generally slow enough to allow water to soak into the soil. However, slopes cleared of vegetation are susceptible to erosion by water; mass movement is also a dominant erosion process.

East of the Cascades, a drier, more continental climate predominates. Vegetation is a mosaic of grasslands, with coniferous forest present at higher elevations. Intense storms are common; they produce significant amounts of rainfall during a relatively short time. Soils in the eastern, more arid portions of the Bonneville service area are also subject to wind erosion from strong steady winds over areas of sparse ground cover.

Erosion is a natural ongoing process. However, erosion rates can markedly increase when vegetation is cleared, regardless of the method used. Vegetation cover is important in controlling erosion. The vegetative canopy and the organic layers covering the soil dissipate the erosive energy of raindrops and reduce runoff. Plant roots also strengthen and bind the soil together.

If a great deal of vegetation were cleared or damaged on steep slopes, soils could destabilize and cause erosion in a variety of ways. Both runoff and soil moisture content can increase. Increased runoff, combined with the removal of vegetation and protective soil organic layers, can result in elevated erosion levels. In addition, more water would stay in the soils (instead of being taken up by the plants that have been removed) and add to the soil mantle weight, heightening the potential for mass movement.

Erosion from direct physical disturbance during vegetation clearing depends on the control method that is used. **See discussions of the methods below.**

Nutrients

Vegetation management can alter the chemistry of the soil. For example, removing nitrogen-fixing plants, such as red alder or ceanothus, can reduce soil nitrogen and associated plant productivity. Removing brush cover can eventually reduce the quantity of carbon in the soil if revegetation does not occur. Removing logs and other plant material deprives soils of the nutrients and structural components provided by decaying organic material. Removing vegetation can also reduce evapotranspiration (if revegetation does not occur) which allows more water to leach soluble nutrients from the soil and decomposing organic matter, reducing productivity. In addition, soil erosion often increases after removing vegetation. Erosion can transport organic matter and nutrients off-site.

The following sections discuss method-specific impacts of vegetation management on soils.

Manual Impacts

Manual impacts on soil include disturbance of the duff layer in only a very small area, not enough to cause substantial impacts on the soil as a resource. There is some potential for soil contamination from chainsaw oil.

Mechanical Impacts

Mechanical techniques, especially blading or soil-disturbing type equipment, have the greatest impacts on soils. Ground-disturbing heavy equipment can expose soils, compact soils, and disturb the physical arrangement of soils.

Exposing soils can make them vulnerable to erosion and/or drying out. Soil compaction increases soil density by compressing soil particles together, reducing the volume of unoccupied air spaces. Compaction reduces the soil's ability to take in water, thus increasing surface runoff and higher erosion levels. Compaction also possibly inhibits growth of beneficial fungi (known as mycorrhizal fungi) that provide nutrients to plant roots. Plant development is also restricted in compacted soils: aeration is poor and root growth is impeded. As a result, soil productivity is adversely affected

Disturbing the physical arrangement of soils (e.g., displacing topsoil or removing the organics-rich duff layer) can both increase erosion and slow plant growth and regeneration potentials.

Mowers are one of the most common mechanical techniques used to clear vegetation along Bonneville-maintained access roads. The vehicle (typically a tractor) generally remains on the road while the mower swings to the side to cut roadside shrubbery to the desired level. While soils can be disturbed, they tend to be less disturbed than if equipment were driven directly over vegetation.

Biological Impacts

Insects used to control noxious weeds would not affect soils.

Herbicide Impacts

When herbicides are used, some of the chemical can end up in the soil. Once in the soil, herbicides can reduce soil microbes' numbers and/or change species composition. This reduction and change can affect soil productivity, including the ability of soils to support certain vegetation. Many herbicides, such as 2,4-D, glyphosate, and mefluidide, break down quickly and have very temporary effects on soil microbes. Herbicides that do not break down relatively quickly (e.g., isoxaben, tebuthiuron) may have longer-lasting effects. For instance, if an area is re-treated often and regularly, herbicides may build up in the soils and can reduce soil productivity before breaking down.

The potential effects on soil microbes can also depend on the application technique. Since aerial broadcast application typically covers a much broader treatment area, affected microbe populations might take longer to recover because there will be fewer adjacent populations to recolonize. Conversely, spot and localized applications affect much smaller areas: microbes might quickly recolonize affected soils from adjacent, unaffected areas.

The effect on soil microbes also depends on the existing vegetation, climatic factors, and soil properties.

Rights-of-way would be treated with relatively small amounts of herbicide with long-time spans between treatments, so there would be little potential for impacts on soil microbes.

In electrical yards, the soil is treated intentionally to keep plants from growing, and the regular use of herbicides would affect the microbes within the electrical yard. If herbicides were to migrate offsite into adjacent soils, microbes (and thus soil productivity) could be affected.

Debris Disposal Impacts

Large amounts of woody debris scattered on the surface can decrease the amount of soil nitrogen available for plant growth until debris decomposition is nearly complete, and can temporarily (a year or so) increase soil moisture

Burning piles of debris would affect the small pile area by possibly killing soil microbes, making soils hydrophobic (unwettable), and creating a bare exposed area vulnerable to erosion. If tractors were used to pile debris, equipment traffic could compact soils and reduce soil productivity. Rutting caused by heavy equipment traffic could also concentrate runoff and cause localized increases in erosion. Destruction of soil organic matter from hot slash fires also reduces the soil stability, which can lead to substantial localized erosion. Ash created from burning can add to soil nutrients, but burning of organic matter also causes nitrogen and carbon to evaporate, which can diminish soil productivity

Adding large amounts of organic debris from chipping might reduce the availability of soil nitrogen to plants and inhibit plant growth until decomposition of organic debris is almost complete. Equipment traffic could also cause compaction and rutting and result in a localized loss of productivity and increased erosion.

Mitigation Measures

The following mitigation measures would be observed to reduce impacts on soils:

- Do not use ground-disturbing mechanical equipment to clear on slopes over 20%.
- Use mechanical clearing or heavy equipment when the ground is sufficiently dry to sustain the equipment and excessive rutting will not occur.
- Consider reseeding or replanting seedlings on slopes with potential erosion problems.

- *If burning vegetative debris piles,* keep piles relatively small to keep intense and prolonged heat from damaging the soil horizons.
- *For non-electric facilities and where cost-effective and to the extent practicable,* implement water-efficient practices at non-electric facility landscaping in a manner that controls soil erosion.

Fish and Other Aquatic Species

General Impacts

Potential impacts on aquatic species are closely related to those just described under **Water Quality** and **Soils**. Erosion impacts on soil cause water-quality problems; whenever the water quality of a fish-bearing stream is affected, so are fish. Specifically, fish are affected by turbidity, sedimentation, loss of large organic debris, loss of shading (and associated temperature increases), and exposure to hazardous substances.

As with water-quality and soil impacts, general vegetation control causes loss of tree-shading and some erosion impacts, regardless of the method used. Erosion increases turbidity and sedimentation that can reduce fish feeding success. In severe cases, sedimentation can keep fry (early-stage fish) from emerging, or fill in or reduce the deeper pools preferred by fish, especially trout.

If large trees are cut down and removed within riparian zones, stream shading could be lost immediately, and the large woody debris that would later fall into streams and provide shelter for fish (an important component of aquatic systems) would be removed. Reduced shading can increase stream temperatures.

However, because rights-of-way are linear, they tend to have little impact on stream temperatures—usually less than a hundred meters (about 300 feet) of any stream is typically affected. Loss of shading generally gains importance only if it occurs where other activities are also causing losses in riparian shading at a watershed level. A study of right-of-way crossings in forested areas in New York found that water temperatures were not significantly greater in right-of-way reaches than in forested reaches (Peterson, 1993).

Loss of in-stream woody debris can reduce salmonid population, eliminate spawning beds (the debris plays a role in sedimentation storage), reduce pool area, reduce fish cover, and cause sudden flows of sedimentation (Burns, 1972; Heede, 1972; House and Boehne 1985; Lisle 1986).

A study conducted on right-of-way crossings of headwater trout streams in forested areas in New York (Peterson, 1993) found a greater abundance of fish within rights-of-way stream reaches than in forested reaches. This was attributed to the greater water depth and pools in the right-of-way.

The study suggested that removal of the forest canopy in rights-of-way caused the significant increase in sunshine, which in turn encouraged dense low-growth vegetation on streambanks and in-stream bars. In contrast, the forested streambanks usually held only scattered herbs and an occasional sapling or mature tree, and in-stream bars were unvegetated. Added rootmass of the forb and shrub layer appears to have stabilized the streambank and increased resistance to erosion.

The stabilized banks restricted increases in stream width during peak flows and instead probably resulted in increased streambed erosion. That increase is the probable cause of the observed increase in depth and pools.

The following sections discuss method-specific impacts of vegetation management on water.

Manual Impacts

Power-tool use near water can potentially cause water contamination with minor amounts of chainsaw oil or minor fuel spill. An oil skim on water, while highly unlikely, can deplete oxygen levels and cause fish kills. This impact is more likely for fish living in ponds than for fish living in rivers or streams, since the flow of water in streams would move and disperse small amounts of oil.

Mechanical Impacts

Because some mechanical methods of clearing or cutting vegetation can disturb or compact soils, these methods are most likely to cause erosion-related fish impacts (in addition to the potential erosion caused by general tree removal). Fish are temporarily affected when water is affected by turbidity, sedimentation, and local increases in surface-water runoff from mechanical techniques. Some equipment, such as walking brush-cutters, minimizes ground disturbance.

Biological Impacts

No additional impacts would result from this technique. Insects used for noxious weed control could potentially be an additional food source for fish.

Herbicide Impacts

If herbicides were to reach water bodies, fish and other aquatic species could potential be affected. (Please see **Water** for the potential for herbicides to reach water bodies.) The potential for an herbicide to have detrimental effects on fish or aquatic species depends on the toxicity of the herbicide and the sensitivity of the species, and the amount of herbicide present and how much the fish is exposed (how quickly the herbicide dissipates or is broken down).

Many of the herbicides proposed for Bonneville use are *low in toxicity* to fish. Table VI-4 shows the ratings used by scientists in determining the toxicity categories for aquatic species. The ratings are based on the amount of herbicide product (in milligrams) that would be needed in a liter of water in order create a toxic impact on fish. Generally, the more herbicide that it takes to kill a fish, the less toxic the herbicide is on that fish. Please see Table VI-6 (page 175), for the toxicity ratings of the proposed herbicides on aquatic species.

Table VI-4: Herbicide Toxic Ratings for Aquatic Species

Risk Category	Aquatic (mg/l)
Very Highly Toxic	<0.1
Highly Toxic	0.1 - 1
Moderately Toxic	>1 – 10
Slightly Toxic	>10 – 100
Practically Non-toxic	>100

There is little potential for fish to be exposed to herbicides: mitigation measures would keep herbicide out of water (buffer zones and label instructions), and only a relatively small amount of area would be treated within a landscape (a linear right-of-way strip of land, or an electrical facility). If there were exposure, the amount of time a fish would be exposed to herbicides would be low, because of dilution. The turbulent action of streams and rivers and the large water volumes of lakes would rapidly dilute herbicides (unless the water body was still or small). If contamination occurred from runoff caused by heavy precipitation, the precipitation would add large quantities of water directly to the water body, further diluting the herbicide. Avoiding those herbicides that are more toxic to fish in the vicinity of fish-bearing lakes or ponds would reduce the potential for adverse effects.

An herbicide's label is its primary communication to users. It reflects the numerous scientific studies and regulatory reviews generated by EPA's registration process, which provides assurance that the potential benefits of use outweigh any potential risks: that, when used according to label directions, it will not cause unreasonable adverse effects on humans, fish, or the environment. The law requires herbicide users to read and follow label specifications. Through specific and general language, the label addresses potential and actual risks to fish (e.g., a label might state that drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas).

Debris Disposal Impacts

Debris disposal techniques have little additional impact on fish (as long as the debris does not get into the water), because a small portion of the area is treated. Deliberate placement of large woody debris in streams can, in some cases, benefit fish. Large logs create cover and sediment storage, helping to offset the loss of trees naturally falling into the water.

However, large masses of small, leaf-bearing branches can completely block channels and reduce dissolved oxygen levels by rapid decomposition of leaves (Bryant, 1983), a negative impact for fish.

Mitigation Measures

The following mitigation measures would apply for fish and aquatic species.

- Apply all appropriate mitigation measures for water bodies.
- Apply all appropriate T& E mitigation measures outlined in **Wildlife** section.

Wildlife

The following section discusses general impacts of vegetation management on wildlife.

General Impacts

Managing vegetation along rights-of-way and access roads can affect wildlife in two fundamental ways: (1) by directly disturbing or harming animals during treatments and/or (2) by changing habitat conditions.

Direct Disturbances

General direct disturbances from managing the vegetation on the right-of-way include removing trees that have nesting birds in them or other animals that use them for shelter. The presence of humans can scare animals and birds, causing them to flee or be stressed.

Animals such as deer, elk, and moose can be affected if clearing interrupts their wintering or birthing habitats.

Habitat Changes

The most obvious habitat changes from vegetation management occur in forested areas. About 13,680 km (8500 mi.) of Bonneville's transmission-line corridors cross forested areas. Removing trees changes habitats if the trees have been used for nesting, perching places, homes for small animals (such as squirrels), a food source, or protection or cover. Trees might be removed in forested areas along rights-of-way, and in riparian and wetland habitat where trees that were allowed to grow too close to the conductors need to be cut.

An obvious habitat change is where mature trees or snags (standing dead trees) used for nesting or cover need to be cut. Large trees are more likely to provide nesting habitat than saplings growing in the right-of-way.

During maintenance, any large mature trees that we would remove would, in most cases, be those that had become "danger trees" and were next to the right-of-way. These trees might have developed root-rot (their roots weakened and the tree becoming susceptible to falling) and/or might have been struck by lightning and now lean toward the transmission line.

In forested areas, maintaining low-growing plants within a right-of-way maintains an **edge effect,** a place where two differing habitats meet, which was created when the transmission line was built. For some animals that live in the forest, but like to use adjacent open areas such as a right-of-way for foraging and hunting, this edge effect is beneficial.

For some animals, a treeless swath through a forest can divide or fragment their habitat. The animals might be unlikely to cross through the right-of-way to get to the other side, especially in the winter. Without tree cover, winter snow depth can increase (because there is no tree canopy to catch and hold the snow), as can exposure to wind, lessening protective hiding places.

In Québec, white-tailed deer use of a 30-m-wide right-of-way was restricted in winter, presumably due to increased snow depth and exposure to wind (Doucet et al., 1987). Another study (Doucet and Brown, 1997) suggests that a denuded right-of-way might represent a barrier to small animal (hares, red and grey squirrel) movements in winter. However, rights-of-way are rarely, if ever, completely denuded of vegetation. Activity levels were higher when some vegetation was showing through the snow.

Questions have been raised about whether rights-of-way create a clear corridor in which animals are more prone to being shot by hunters. One study on moose found that there were no more moose killed within the right-of-way than off. This nine-year study in Québec (Ricard and Doucet, 1993) showed that the number of moose harvested by recreational hunters in rights-of-way was not statistically different from that in control areas.

As noted under **Vegetation**, noxious weeds tend to invade newly disturbed ground. Noxious weed infestations can cause long-term reductions in wildlife habitat values as native vegetation on which the native wildlife depend for food or cover decreases. Some noxious weeds are palatable but have no nutritional value. When animals eat these plants they become full, but might suffer depletion of necessary vitamins and minerals (akin to humans consuming "junk food").

Threatened and Endangered Species

T&E bird and animal species could potentially be affected, as are the bird and animal species discussed above. The bird species (such as the northern spotted owl, marbled murrelet, peregrine falcon, bald eagle, northern goshawk, Colombian sharp-tailed grouse, and several species of woodpeckers) could be affected by eliminating habitats (cutting of nesting trees) or disturbing during courting or nesting times. The peregrine falcon and bald eagle tend to forage in open areas and have been seen perching on transmission towers within our rights-of-way. The creation of the edge effect in forested areas might be slightly beneficial to these species.

The threatened and endangered animal species include the grizzly bear and gray wolf. Presence of human activity could make these animals temporarily leave the area.

Vegetation maintenance in threatened and endangered species habitats would be scheduled for times that would not disturb these species; Bonneville would consult with the USFWS for timing or action restrictions. Also, Bonneville has standards for conducting tree removal within the range of the northern spotted owl (Beak Consultants, 1993) and for marbled murrelets.

Wildlife species with limited home ranges (i.e. within a right-of-way corridor) are most affected by the habitat changes from vegetation management. Because of the narrow, linear nature of rights-of-way, species whose home ranges are well beyond the managed area would be only temporarily displaced.

The following sections discuss method-specific impacts of vegetation management on wildlife.

Manual Impacts

The main impact directly associated with manual methods of clearing (primarily chainsaw) is noise. Chainsaw noise could disturb animals, causing them to flee the area. Because manual clearing is very selective, with little-to-no long-term impact on non-target vegetation, this method would potentially have less impact on the right-of-way habitat than other methods of clearing.

However, if manual cutting of deciduous trees were used *without* follow-up herbicide applications to kill the trees, the right-of-way would require more frequent maintenance cutting cycles, increasing the human presence and animal disturbance.

Mechanical Impacts

Generally, the impacts from mechanical methods are short-term, so long as soils are not compacted and/or severely disturbed. Mechanical methods (especially blading) can disturb soil, and therefore can disturb and potentially kill soil-dwelling species such as ground squirrels, pocket gophers, moles, and salamanders. Ground nesting birds, such as ruffed grouse, dark-eyed junco, and several species of sparrows, can also be disturbed during mechanical vegetation removal. Seasonal timing can be used to minimize or eliminate impacts on breeding animals.

Because most mechanical techniques are non-selective and can cause losses of non-target vegetation, they also cause losses in wildlife habitat, including reduced or eliminated food sources, cover, and perches within treated areas.

As with manual methods, if mechanical cutting of deciduous trees were used *without* follow-up herbicide applications to kill the trees, the right-of-way would require more frequent maintenance cutting, increasing the human presence and animal disturbance.

Biological Impacts

In some cases, insects brought in to control weeds might provide additional forage for birds and other wildlife, but, in most cases, this effect would be negligible.

Herbicide Impacts

Some herbicides can potentially affect wildlife. The potential for wildlife to be affected depends on whether the animal is exposed, whether the exposure amount is enough to cause effects, and the toxicity of the herbicide to the animal species.

EPA standards for formula registration and application methods are intended to reduce risks in the environment to an acceptable level.

Animals can be exposed to herbicides by the following means:

- being directly sprayed,
- inhaling spray mist or vapors,
- drinking contaminated water,
- feeding on or otherwise coming into contact with treated vegetation or animals that have been contaminated, and
- directly consuming the chemical if it is applied in granular form.

The potential for an animal exposed to herbicide to experience toxic effects depends on the toxicity of the herbicide and the amount of chemical the animal was exposed to. Many of the herbicides proposed for Bonneville use are *low in toxicity* to wildlife. Herbicides are designed to be toxic to plants—not animals—and contain chemicals that target plant physiological processes. *Insecticides,* on the other hand, usually involve chemicals that react with the central nervous system of animals and are therefore potentially much more toxic to animals than herbicides.

Table VI-5 shows the ratings used by scientists in determining the toxicity categories for mammal and bird species. The ratings are based on the amount of herbicide product (in milligrams) that would be needed per kilogram of animal body weight in order create a toxic impact on the animal. Generally, the more herbicide that it takes to kill an animal, the less toxic the herbicide is to that animal. Please see Table VI-6 (page 175) for the toxicity ratings of the proposed specific herbicides on mammals and birds.

Table VI-5: Herbicide Toxic Ratings for Mammals and Birds

Risk Category	Mammals (Acute Oral mg/kg)	Birds (Acute Oral mg/kg)	Birds (Dietary mg/kg)
Very Highly Toxic	<10	<10	<50
Highly Toxic	10 – 50	10 – 50	50 – 500
Moderately Toxic	51 – 500	51 – 500	501 – 1,000
Slightly Toxic	501 – 2,000	501 – 2,000	1,000 – 5,000
Practically Non-toxic	>2,000	>2,000	>5,000

Raptors (e.g., hawks and owls), small herbivorous mammals, medium-sized omnivorous mammals, and birds that feed on insects are more susceptible to herbicide exposure. These animals either feed directly on vegetation that might have been treated or they feed on animals that feed on the vegetation. In general, smaller animals are more at risk because it takes much less substance to affect them.

Generally, wildlife is prevented from entering in electrical and non-electric sites (although birds and small mammals are sometimes able to enter these facilities). Most potential impacts on wildlife from vegetation management in these areas would occur only if herbicides were to move off the treatment area and affect habitat or wildlife in surrounding areas. Those impacts would be the same as those discussed above.

Debris Disposal Impacts

Lopping and scattering vegetation that is cut, including stacking or dragging logs to areas just off the right-of-way, creates woody debris (fallen, rotting logs) used by a variety of wildlife. These include amphibians, reptiles and small mammals, as well as numerous other types of organisms (e.g., plants and fungi).

Burning vegetation debris would have little impact on wildlife. Animals might flee the area while the pile is burning.

Noise from chipping machines would most likely disturb animals, causing them to temporarily leave the immediate area.

Mitigation Measures

The following mitigation measures would apply for wildlife species.

- Determine whether any T&E species or designated T&E critical habitats are potentially present in the project area.
- *If T&E species or designated critical habitats are potentially present in the project area,* determine whether they are likely to be affected. If project is likely to affect but not adversely affect T&E species, obtain concurrence from the USFWS and/or NMFS.
- *If it is determined that the project is likely to adversely affect T&E species or their designated critical habitats (other than marbled murrelet and spotted owl, already formally consulted),* initiate formal consultation with the USFWS and/or NMFS and prepare a Biological Assessment according to 40CFR Part 402.
- Apply mitigation measures (such as timing restrictions, or specific method use) resulting from determinations or consultations.

Table VI-6: Herbicide Ecological Toxicities and Characteristics

Herbicide	Acute Toxicity				Physical Properties[4,5]			Off-site Movement Potential[4,5]	
	Mammals[1]	Avian[1]	Aquatic[1]	Microorganisms[2,3]	Persistence	Solubility (mg/l)	Adsorption (K(oc))	Groundwater Leaching	Surface Water Runoff
2,4-D	Practically Non-Toxic to Slightly Toxic	Practically Non-Toxic to Moderately Toxic Depending on Formulation and Species	Practically Non-Toxic to Highly Toxic, Depending on Formulation and Species	Practically Non-Toxic to Highly Toxic, Depending on Formulation and Species	Low: 10 days	Acid: 890 Salt: 796,000 Ester: 100	80 20 20	Moderate Moderate Moderate	Low Moderate Moderate
Benefin	Practically Non-Toxic	Practically Non-Toxic	Highly Toxic	*data not available*	Moderate: 40 days	0.1	9000	Low	High
Bromacil	Slightly Toxic	Practically Non-Toxic	Slightly Toxic	Bees: Practically Non-Toxic	Moderate: 60 days	700	32	High	Moderate
Chlorsulfuron	Practically Non-Toxic	Practically Non-Toxic	Practically Non-Toxic	*data not available*	Moderate: 40 days	7000	40	High	Low
Clopyralid	Practically Non-Toxic	Slightly Toxic	Practically Non-Toxic	*data not available*	Moderate: 40 days	300,000	6	High	Low
Dicamba	Slightly Toxic	Practically Non-Toxic	Practically Non-Toxic to Aquatic Invertebrates; Slightly Toxic to Fish and Amphibians	Bees: Practically Non-Toxic Earthworm: Low	Low: 14 days	400,000	2	High	Low
Dichlobenil	Slightly Toxic	Slightly to Moderately Toxic	Moderately Toxic	Bees: Practically Non-Toxic	Moderate: 60 days	21	400	Moderate	Moderate
Diuron	*data not available*	Slightly Toxic	Moderately Toxic to Fish and Highly Toxic to Aquatic Invertebrates	Bees: Practically Non-Toxic	Moderate: 90 days	42	480	Moderate	High
Glyphosate	Practically Non-Toxic	Practically Non-Toxic	Moderately Toxic	Bees: Practically Non-Toxic	Moderate: 47 days	900,000	24,000	Low	High
Halosulfuron-Methyl	Slightly Toxic	*data not available*	*data not available*	*data not available*	Moderate: 55 days	*data not available*	*data not available*	High	*data not available*
Hexazinone	Slightly Toxic	Practically Non-Toxic	Practically Non-Toxic to Slightly Toxic Depending on Species	*data not available*	Moderate: 90 days	33,000	54	High	Low
Imazapyr	Practically Non-Toxic	Practically Non-Toxic	*data not available*	*data not available*	Moderate: 90 days	>11,000	100	High	Low
Isoxaben	Practically Non-Toxic	Practically Non-Toxic	Moderately Toxic	Earthworm: Low	High: 100 days	1	1400	Low	High
Mefluidide	Slightly Toxic	Practically Non-Toxic	Practically Non-Toxic	Earthworm: Low	Low: 4 days	180	200	Low	Moderate
Metsulfuron-Methyl	Practically Non-Toxic	Practically Non-Toxic	Practically Non-Toxic	*data not available*	Moderate: 30 days	9500	35	High	Moderate
Oryzalin	Practically Non-Toxic	Slightly Toxic	Moderately Toxic	Bees: Practically Non-Toxic	Low: 20 days	2.5	600	Low	High
Paclobutrazol	Slightly Toxic	Practically Non-Toxic	Slightly Toxic	*data not available*	High: 200 days	35	400	High	
Pendimethalin	Slightly Toxic	Slightly Toxic	Highly Toxic	Bees: Practically Non-Toxic Earthworm: Low	Moderate: 90 days	0.3	5000	Low	High
Picloram	Practically Non-Toxic	Practically Non-Toxic	Moderately Toxic.	Bees: Practically Non-Toxic	Moderate: 90 days	200,000	16	High	Low
Sulfometuron-Methyl	*data not available*	Practically Non-Toxic	Slightly Toxic	*data not available*	Low: 20 days	70	78	Moderate	Moderate
Tebuthiuron	Moderately Toxic	Slightly Toxic	Slightly Toxic	*data not available*	High: 360 days	2500	80	High	Low
Triclopyr Variety TEA Variety BEE	 Practically Non-Toxic Practically Non-Toxic	 Slightly Toxic Slightly Toxic	 Practically Non-Toxic Highly Toxic	 Bees: Practically Non-Toxic Bees: Practically Non-Toxic	 Moderate: 46 days Moderate: 46 days	 2,100,000 23	 20 780	 High Low	 Low High
Trifluralin	Practically Non-Toxic	Practically Non-Toxic	Very Highly Toxic	Bees: Practically Non-Toxic	Moderate: 60 days	0.3	8000	Low	High
Trinexapac-Ethyl	Practically Non-Toxic	Practically Non-Toxic	Slightly Toxic	*data not available*	*data not available*	*data not available*	*data not available*	Moderate	*data not available*

[1] See individual herbicide references in **References**. [2] Tew, James E, Protecting Honeybees from Pesticides, Alabama Cooperative Extension System, ANR-1088, April 1998 [3] Townsend, Lee, et al., Earthworms: Thatch-Busters, University of Kentucky, January 1994
[4] Mahler, Robert L., et al., Pesticides and Their Movement in Soil and Water, University of Idaho, Quality Water For Idaho CIS 865, September 1998 [5] Vogue, P.A., et al., Oregon State University Extension, Pesticide Properties Database, July 1994

Marbled Murrelet

- *If a tree needing removal is greater than 80 cm (32 in.) diameter at breast height and has suitable nest tree characteristics,* initiate formal consultation with the USFWS.
- *During core breeding season, from April 1- August 5,* do not carry out maintenance activities (e.g., chainsaw work) that produce noise above ambient noise levels, within 0.4 km (0.25 mi.) of known marbled murrelet habitat or occupancy (based on marbled murrelet maps).
- *During the late breeding season, from August 6 - September 15,* do not carry out maintenance activities using motorized equipment within 0.4 km (0.25 mi.) of marbled murrelet habitat or occupancy within two hours after sunrise or within two hours before sunset.

Spotted Owl

- *Where opportunity exists,* suspend vegetation management activities within 0.4 km (0.25 mi.) of spotted owl critical habitat between March 1 and June 30, unless the owls are shown not to be nesting.
- Examine any large trees (greater than 8″ diameter at breast height East of the Cascades or 11″ diameter at breast height West of the Cascades) that need to be removed in spotted-owl habitat for evidence of owls. If a tree has evidence of owl nesting activity, conduct formal consultation with the USFWS.
- *In case of an emergency danger tree removal—a tree suddenly becoming an imminent threat to the line, posing a danger to life and property*—immediately examine the felled tree for evidence of owl nesting. If such evidence is found, start emergency consultation with the USFWS, or, if the situation occurs during off-duty hours, conduct after-the-fact emergency consultation the next business day.

Agriculture

The following section discusses general impacts of vegetation management on agriculture.

General Impacts

Bonneville minimally manages vegetation in crop, range, or orchard areas. Where these land uses are actually within the right-of-way (such as when a transmission line crosses a grass turf field), the farmer is the one who manages the grass or other crop on the right-of-way.

On these farmed lands, the issue is the vegetation that grows around the base of the tower legs. Because tilling and farming close to the tower legs are difficult, and could potentially damage wood-pole transmission structures, these small areas are left unfarmed. The unfarmed areas become a prime spot for noxious weed invasion or growth of other nuisance plants, such as blackberries.

Where agricultural lands are next to the rights-of-way, care needs to be taken so that the agricultural plants are not harmed while vegetation on the right-of-way or access road is controlled. Also, if noxious weeds are allowed to spread on the right-of-way, they might spread into agricultural areas and invade crops.

Other issues, not specific to a method, are the maintenance of Christmas tree farms and orchards within the right-of-way. If the farmer does not keep the Christmas trees harvested or orchard trees trimmed, these trees can grow into or close to the lines, causing safety problems and outages—technically not an environmental problem caused by our maintenance, but a problem caused by failure to maintain. Landowner agreements are very important in these areas to insure that tree height criteria are maintained. (See **Appendix E** for more information on clearance criteria.)

The following sections discuss method-specific impacts of vegetation management on agriculture.

Manual Impacts

Manual techniques would have no additional impact.

Mechanical Impacts

Bonneville would not use mechanical techniques *in* agricultural areas, but might use them *next* to agricultural areas. Impacts would be the potential for increased water runoff or soil movement into agricultural fields from disturbed or compacted soils.

Biological Impacts

Biological methods would not be used *in* areas of agriculture.

Herbicide Impacts

Bonneville minimally manages vegetation in crop, range, or orchard areas, as described above, under **General Impacts**. If herbicides were used near crop- or rangelands, drift or potential herbicide migration through water runoff could kill crop plants or expose range animals (sheep, cows, and horses). In areas of organic farming practices, where often strict testing is carried out to ensure the crops are not exposed or grown with the use of chemicals, potential drift of herbicides from an adjacent right-of-way could severely affect crop fields.

Debris Disposal Impacts

There would be little debris disposal necessary in agricultural lands. Care would need to be taken to ensure that debris from right-of-way maintenance would not be left in an adjacent farmland. On grazing lands, pine needles left on the ground can cause 1) a reduction in grass growth due to their acidic property, and 2) abortion in cows if the cows consume a significant amount of the needles (Gardner, 1996, 1998).

Mitigation Measures

The following mitigation measures would apply to agricultural areas.

- Prevent the spread of noxious weeds by cleaning seeds from equipment before entering cropland.
- *If on grazing lands and there is potential for pine needle poisoning,* do not lop and scatter pine tree vegetative debris—machine-chip or haul debris off-site.
- *If using herbicides on grazing lands*, comply with grazing restrictions as required per herbicide label.
- *For rights-of-way adjacent to agricultural fields*, observe appropriate buffer zones necessary to ensure that no drift will affect crops.
- *If using herbicides near crops for consumption*, comply with pesticide-free buffer zones, if any, as per label instructions.
- *For rights-of-way near organic farms*, observe appropriate buffer zones, or provide for the owner to maintain the right-of-way, by way of a vegetation management agreement.
- *If reseeding*, determine whether any of the adjacent properties are being, or will in the immediate future be, used for growing grass seed, especially high-purity strains.
- *If reseeding near grass seed fields*, consult with the area seed certification and registration authority to determine whether buffer zones are necessary, appropriate grass mixtures allowed, and appropriate modes of seeding used.

Timber Production

The following section discusses general impacts of vegetation management on timber production.

General Impacts

Maintaining the vegetation on a right-of-way that crosses timber-producing lands means that periodically some trees must be cut. Trees next to the corridor that have become danger trees might need to be cut before they are ready for harvest.

The following sections discuss method-specific impacts of vegetation management on timber production.

Manual/ Mechanical/ Biological Impacts

There would be no additional impact on timberlands by using manual, mechanical or biological methods of controlling vegetation on the right-of-way.

Herbicide Impacts

Herbicide use on these lands could potentially affect timber production if any drift, overspray or spills were to move off the right-of-way and affect timber trees. The potential of drift or overspray is greater with broadcast or aerial spraying than with spot or localized application methods. On other electric facilities, herbicides that potentially could run off or leach out of the yard to surrounding timber areas could have an effect.

Debris Disposal Impacts

Debris disposal would cause no additional impacts on timberlands.

Recreation

The following section discusses general impacts of vegetation management on recreation.

General Impacts

Transmission lines often cross rivers or are near developed recreational sites (such as campgrounds and parks). Even rights-of-way and access roads that are not near developed parks are used for recreation: hiking, ATV use, snowmobiling, and cross-country skiing.

Most vegetation management activities take place during the growing season; conflicts with winter recreationists (cross-country skiers and snowmobilers) are therefore unlikely to occur. Summer recreationists, on the other hand, might be displaced or excluded from active or recent work sites, might be annoyed by noise and disturbance associated with vegetation management, and might encounter hazards or nuisances resulting from vegetation management.

The following sections discuss method-specific impacts of vegetation management on recreation.

Manual Impacts

Manual techniques are often the method of choice within or near developed recreation sites. The use of power tools, such as chainsaws, can be noisy and annoying to recreationists and can detract from outdoor experiences. However, manual techniques are generally less intrusive and less intensive than mechanical techniques.

Mechanical Impacts

Heavy equipment also can disturb recreationists through noise and exhaust fumes. There is also some danger of people in the area being hit by rocks or pieces of wood that might be thrown by the equipment. (See also the discussion under **Public Health and Safety**.)

Mechanical cutting or chopping machines cut all vegetation in the vicinity and leave slash cut up in varying sizes, from finely shredded/mulched bits (most often) to long pieces. In a few cases, the remaining debris can be difficult to cross by walking, biking, all terrain vehicles (ATVs), motorcycles, and so on.

Biological Impacts

Biological methods of vegetation management would have little impact on recreation. However, aesthetics might be affected if large numbers of insects were present on noxious weeds.

Herbicide Impacts

The recreational experience of a site might be diminished because the landscape becomes less attractive as the vegetation turns brown after being treated. These impacts are generally temporary, as desired vegetation replaces undesirable vegetation that has been killed. (See **Public Health and Safety** for any potential impacts on people from exposure to herbicides.)

Debris Disposal Impacts

Slash burn piles would generate smoke and unsightly burnt areas. Lopped-and-scattered vegetation is difficult to walk or ride bikes over and might discourage recreational activities until the vegetation debris begins to break down.

Residential, Commercial, and Industrial

General Impacts

The following section discusses general impacts of vegetation management on residential, commercial, and industrial resources.

Visual, health and safety, noise, and landscaping effects are the potential impacts of managing vegetation on rights-of-way in residential, commercial, and industrial areas. (See **Visual** and **Public Health and Safety** for impacts on those resources.)

Noise or presence of maintenance crews can disturb people in homes or businesses. Routine vegetation maintenance work would take place during normal worktime (8am to 5pm). These disturbances would be relatively short-term, one or two days in any specific location.

Bonneville's clearing needs can often conflict with a property owner's landscaping needs or desires. Property owners have powerline easement documents that outline provisions for Bonneville's legal right and obligation to clear "on" right-of-way trees that threaten the lines. Trees that are located "off" the right-of-way might also pose a threat to the power line. Once identified, these "off" the right-of-way danger trees are marked, and we start a process with the property owner to have them removed.

Removing these trees can have varied effects on property owners varies. Some people are happy to have someone else pay to have a tree removed. In other cases, a tree might have personal history or an emotional tie, or might be highly valued for aesthetic or other reasons. The impact on the property owner, in this case, can be great.

To lessen this impact, we are in some cases using herbicides that are growth regulators—they slow the growth of vegetation—on landscape trees so they don't become a threat to the line. Trimming or topping trees is often not very feasible because it is very labor-intensive and might require yearly trimming.

The following sections discuss method-specific impacts of vegetation management on residential, commercial, and industrial resources.

Manual Impacts

Noise generated from chainsaws and other hand tools might temporarily disturb people.

Mechanical Impacts

Mechanical techniques are also noisy, and often generate dust and can disturb people in houses, schools, and businesses.

Biological Impacts

Biological techniques have no effect on land uses, other than potentially reducing noxious weeds on adjacent lands.

Herbicide Impacts

Some land uses that might occur next to Bonneville facilities might preclude the use of herbicides, especially aerial application. For example, we would consider it a major impact if accidental spraying or spray were to drift onto residential areas, schools, recreation sites, and other land uses where people are concentrated—even if the chemicals involved were benign. Because of this, chemical techniques must be very controlled when necessary in or near areas where people are concentrated (for example, spot chemical treatments rather than broadcast).

Debris Disposal Impacts

Most debris in these areas would be removed from and disposed of off-site. Burning would probably not be appropriate in these areas because of the nuisance and potential health and safety effects of the smoke. (Please see **Visual** and **Public Health and Safety** for impacts of burning vegetation debris.)

The following mitigation measures would apply in residential/ commercial or industrial areas.

- Evaluate, generally, existing land uses (e.g., agriculture, residential) along a right-of-way or surrounding a facility needing vegetation control to determine any constraints on vegetation control.
- *To the extent practicable*, identify casual informal use of the right-of-way by non-owner publics to determine any constraints on vegetation control.
- Determine, generally, landowners or land managers (i.e., private residential, timber company, Federal, state) in or around the facility needing vegetation control.
- Determine whether there are any existing landowner agreements with provisions that need to be followed regarding the vegetation maintenance of a specific portion of line.
- Determine appropriate level of public involvement, notification or coordination that may be necessary.
- *If needed*, use public contact to help find out about any special uses of the land, or other issues or concerns that might need consideration when determining or scheduling vegetation control.

- *Where appropriate*, assign responsibility for tall-growing species on the rights-of-way to the underlying property owner (i.e., to owners of orchards or Christmas tree farms).
- *If appropriate*, offer to replace trees (with a low-growing species), or use tree growth regulators instead of removing a tree.

USFS- and BLM-managed Lands

The following section discusses general impacts of vegetation management on USFS- and BLM-managed lands.

General Impacts

The USFS and BLM manage lands for a variety of functions, including habitat, riparian reserve and ecosystem protection. Because much of the management is for protection or enhancement of the environment, these lands are often pristine and contain lots of natural resources and species, including wildlife, protected habitat, threatened, endangered, or protected plant and animal species, and high-quality rivers or streams. The vegetation control impacts on these natural resources would be no different than the impacts discussed under the natural resource sections in this EIS. However, the potential of encountering these resources is greater on these lands.

Management Areas

There are also potential impacts on how an area within a Forest or BLM district is managed.

The USFS and BLM have many plans, guidance, and regulations to help ensure appropriate land and resource management. Other land users (such as Bonneville transmission corridors) are to abide by those plans and guidance. Plans specify how various areas of the Forest or District are to be managed.

For example, a Forest might have a resource management area for grizzly bear habitat. This area will have standards and guidelines specifying acceptable actions in that area to maintain or restore the habitat for grizzly bears.

In some cases, controlling vegetation along a right-of-way may conflict with the management of an area, especially if the management requires that tall-growing vegetation cannot be removed.

In other cases, such as the grizzly bear habitat, vegetation control would be consistent with the management as long as seasonal and timing restrictions were followed so as not to disturb the animals.

Some Forest Plans designate Resource Management Areas for utility corridors, such as one of our rights-of-way. Utility Resource Management Areas have standards and guidelines specific to maintaining a safe reliable right-of-way, including the cutting of trees or brush that might threaten the operation of the line. In these areas, although potential resources in the area still are considered, because there is a common goal for utility corridor management, there is no potential management conflicts or impacts.

Compliance with NEPA

The USFS, BLM and Bonneville all must also comply with NEPA to ensure that the environmental impacts of their actions are considered before taking the action. The differences among the three agencies come in the implementation of NEPA. Each agency has its own NEPA Implementing Regulations that guide the level of environmental analysis for certain activities the agency should conduct.

In general, the decisions on vegetation management of rights-of-way across USFS or BLM managed-lands are Bonneville's and, therefore, Bonneville is responsible for complying with NEPA. The USFS or BLM is responsible for ensuring that the proposed vegetation management is consistent with their plans and regulations. The USFS or BLM usually would not have a decision to make (that would trigger their NEPA process) unless the proposed vegetation management were not consistent with their existing plans and regulations. If the proposed vegetation management were inconsistent, then a new decision by the USFS or BLM would have to be made to allow that action, triggering NEPA processes for those agencies.

Method-specific impacts related to BLM- or USFS-managed lands are listed below.

Manual Impacts

Manual cutting is often the preferred method of vegetation management on National Forests or BLM lands. Because manual methods can be very selective, there is minimal potential to affect non-target resources.

Mechanical Impacts

Mechanical vegetation clearing is an available treatment method on the USFS and BLM land; however, it is to be used primarily on relatively flat terrain, and relatively dry stable soils.

Biological Impacts

Controlling noxious weeds with insects is promoted by the USFS and BLM.

Herbicide Impacts

Herbicide use is also possible on most USFS and BLM lands. Both these agencies have their own list of herbicides approved for use on their lands. The list can vary by region, and even by Forest. Some BLM lands are still under an injunction that does not allow any herbicide use. Both agencies also have additional direction (such as buffer zones, and reporting requirements) regarding the use of herbicides.

Debris Disposal Impacts

Debris disposal depends on the need of the Forest. In some places there is concern about leaving vegetation debris on the right-of-way because of the potential for forest fires—dead vegetation adds fuel to the fire. In other places, leaving large woody debris is promoted for wildlife habitat.

Mitigation Measures

The following mitigation measures would apply to USFS-managed lands.

- Use, update, or develop site-specific vegetation management plans for rights-of-way that cross USFS-managed lands.
- Review existing site-specific vegetation management plans for consistency with USFS-specific mitigation measures identified in **Appendix F**. This EIS does not supercede or revoke any existing agreements or site-specific vegetation management plans. However, if appropriate, work with local Forest Officer in revising existing plans to achieve consistency.
- Develop site-specific vegetation management plans (where they do not exist) using the Planning Steps and mitigation measures in this EIS, including the USFS-specific measures in **Appendix F**. Conduct appropriate NEPA analysis and documentation (see Planning Step #7).
- Contact the local Forest Supervisor's or District Ranger's office, before implementing vegetation management activities on national Forest System lands (or follow direction in site-specific vegetation management plans for notification procedures). Notification should be made as far in advance of the planned date of on-the-ground implementation as is reasonably possible.
- *If expecting the USFS to conduct environmental data collection for evaluation,* allow more than one year for completion, and be prepared to reimburse the USFS for the costs in conducting such activities.

The following mitigation measures would apply to BLM-managed lands.

- Use, update, or develop site-specific vegetation management plans for rights-of-way that cross BLM-managed lands.
- Contact the local BLM office, before implementing vegetation management activities on BLM lands (or follow direction in site-specific vegetation management plans for notification procedures). Notification should be made as far in advance of the planned date of on-the-ground implementation as is reasonably possible.
- *For NEPA compliance on BLM-managed lands,* use the Planning Steps and mitigation measures in this EIS, including the BLM-specific mitigation measures (see **Appendix G**) and appropriate NEPA analysis and documentation (see Planning Step #7).
- Consult with appropriate BLM regarding presence of natural resources and features and appropriate buffers or other mitigation measures.

The following mitigation measure would apply to other Federal lands.

- Notify, consult and cooperate with other Federal agencies (such as the Corps) when scheduling right-of-way vegetation control activities on their lands.

Tribal Lands

The following section discusses general impacts of vegetation management on Tribal lands.

General Impacts

On ceded Tribal lands and in usual and accustomed areas, vegetation management could encroach on Tribal rights to traditional use activities. (See the section on **Cultural and Historical Resources** in this chapter for discussion of potential impacts on traditional cultural plants and places.)

Additionally, on Tribal reservations, vegetation management must be consistent with applicable Tribal land-management policies and plans. Tribes might elect to exercise rights to employ Tribal members for work performed on Tribal reservations.

Potential encroachment on Tribal rights could be avoided, and consistency with Tribal policies and plans ensured, by consulting with local Tribal governments and traditional leaders in developing site-specific vegetation management plans.

The following sections discuss method-specific impacts of vegetation management on Tribal lands.

Manual Impacts

The more labor-intensive methods of manual vegetation management would have greater potential for employment of Tribal workers on reservations.

Mechanical Impacts

Except as described in the section on **Cultural and Historical Resources** in this chapter, there are no known impacts unique to Tribal lands.

Biological Impacts

Methods involving natural biological selection might be favored by some Tribes.

Herbicide Impacts

Use of herbicides might be inconsistent with Tribal land management policies, and might encroach on Tribal rights if herbicides should adversely affect traditional use plants.

Debris Disposal Impacts

Except as described in the section on **Cultural and Historical Resources** in this chapter, there are no known impacts unique to Tribal lands.

Mitigation Measures

The following mitigation measures would apply for Tribal Reservations.

- If possible and practical, develop a cooperatively written right-of-way management plan with the Tribe. The plan should address specific land-use or environmental resources along the corridor that need consideration, including appropriate mitigation measures identified in this EIS.
- If possible, consider working with Tribes for replanting of traditional use plants. Low-growing traditional-use plants may include blue camas, bitter root, wild celery, biscuit root, Canby's desert parsley, Indian carrot/false caraway, field mint, blue huckleberries.

City, County, and State Lands

Cities, counties and states might have their own plans or requirements for managing vegetation or for the use of herbicides. If those plans are consistent with the Federal requirements to which

Bonneville would adhere, then there would be no conflict. If they are much more stringent, then there might be conflicts in management.

Letters to these governments when their lands are crossed should elicit potential inconsistencies to be considered.

Most issues or concerns would not be unique to local government-owned lands.

Cultural and Historical Resources

The following section discusses general impacts of vegetation management on cultural and historic resources.

General Impacts

Vegetation management activities could damage or expose Native American or historical archeological sites, could harm plants having traditional cultural value, or could visibly or audibly impose on places of traditional cultural value. Vegetation management methods that could cause erosion have a relatively greater potential to disturb sub-surface cultural and historical resources (see the section on **Soils** for discussion of erosion potential). Similarly, noisy activities could audibly impose on ceremonies or other uses of places with traditional cultural values (please see the section on **Noise** for more information).

Potential adverse impacts on cultural and historical resources could be substantially reduced or avoided by (1) consultation with the State (or Tribal) Historic Preservation Office (SHPO) and local Tribal leaders in developing site-specific vegetation management plans; and (2) adoption of site-specific geographic and/or timing constraints on vegetation management activities.

The following sections discuss method-specific impacts of vegetation management on cultural and historic resources.

Manual Impacts

Pulling vegetation from the soil could lead to erosion and could disturb sub-surface artifacts. Cutting and steaming methods would have less potential for disturbing the sub-surface. The more labor-intensive methods of manual vegetation management would have greater potential for vandalism or inadvertent damage by workers.

Mechanical Impacts

Mechanical vegetation management methods that disturb soils could also erode soils and disturb sub-surface artifacts. Some kinds of heavy machinery might also compact soils and sub-surface cultural and historical resources.

Biological Impacts

Biological methods of vegetation management have little potential to adversely affect cultural or historical resources because those methods target noxious weeds and do not disturb soils.

Herbicide Impacts

Herbicides could harm traditional use plants, or threaten the health of people gathering, handling, or ingesting recently treated plants. The less selective broadcast application methods, especially aerial broadcast, would have greater potential to inadvertently affect non-target traditional use plants.

Debris Disposal Impacts

Lopping and scattering cut vegetation might visually intrude on a traditional-use place. Because it contrasts in color with surrounding live vegetation, the unnatural appearance of large vegetation debris could incrementally increase the visibility of unnatural features from places where nature has traditionally spiritual significance.

Reseeding and Replanting

Reseeding and replanting low-growing vegetation species with traditional cultural value would potentially benefit traditional cultural uses.

Mitigation Measures

The following mitigation measures would apply to cultural resources.

- *When using mechanical ground-disturbing vegetation control methods,* review the right-of-way for potential existence of historic and cultural resources. The State Historic Preservation Officer is to be consulted, as appropriate.
- *On Tribal reservation lands and public lands,* consult (visit) with the appropriate Tribe regarding potential impacts on traditional plants. Restrictions such as seasonal constraints for vegetation control, avoidance of certain areas, or using methods that do not affect non-target plants may be required.

Worker Health and Safety

The following section discusses general impacts of vegetation management on worker health and safety.

General Impacts

This section addresses the potential health and safety impacts on workers managing the vegetation on our facilities. Some of these workers are Bonneville employees; some of them are under contract to do the work for us. The impacts can be divided into physical injury risks and health risks. In general, all techniques carry some degree of physical injury risks. Risks to health include herbicides, exhaust gasses, fuels and smoke from burning.

Indirect impacts on workers include the following: dehydration, heat exhaustion, insect stings, falls, and exposure to poisonous snakes and plants.

The following sections discuss method-specific impacts of vegetation management on worker health and safety.

Manual Impacts

Manual techniques include use of non-powered and powered hand-operated tools. Non-powered tools include axes, brush hooks, hoes, hand girdlers, and hand clippers. Powered tools include chainsaws and motorized brush cutters.

Use of these tools can result in worker injuries such as minor cuts, blisters, sprains, abrasions, bruises, muscle strains, exposure to equipment noise, exposure to exhaust gases and fuel vapors, flying debris, and falling trees.

Minor injuries from use of manual techniques will occur; however, severe injuries are rare when standard safety procedures are followed. From 1993 to 1997, Bonneville employees had 22 recorded injuries while using manual techniques on the rights-of-way. They varied from lower back pain, to poison oak reaction, to cuts requiring stitches. In 1997 there were two separate contractor accidents during manual vegetation management, resulting in one fatality and one electrocution with disability.

Mechanical Impacts

Potential direct impacts on worker health and safety from operating heavy equipment include injuries as a result of equipment malfunctions, equipment overturns, loss of control of the equipment, equipment noise, equipment vibration, exposure to exhaust gases and fuel vapors, flying debris, and falling trees.

Minor injuries are bound to occur when mechanical techniques are employed. On the other hand, according to the USFS (USDA/USFS, 1991a), severe injuries are relatively rare if workers adhere to standard safety procedures associated with heavy machinery operation. From 1993 to 1997, there was one recorded Bonneville employee accident associated with mechanical brush control.

Biological Impacts

There are no specific worker health or safety impacts associated with the use of biological controls. Injury could result from the use of equipment such as trucks or aircraft.

Herbicide Impacts

Herbicide methods may require use of heavy machinery, which could involve the potential impacts described above for mechanical methods. The main potential impact associated with the use of herbicide methods is exposure to the compounds (herbicides, carriers, dyes, and adjuvants).

Twenty-four different herbicide compounds would be used to various degrees to control vegetation. See Table VI-7, pages 197-199.

Carriers used by Bonneville include mineral oil and limonene (Bonneville does not use diesel oil or kerosene, two carriers in relatively common use in the United States).

Appendix H contains fact sheets that provide herbicide human health risk assessment information, plus application and safety guidelines. Some of the facts sheets are from EPA's Reregistration Eligibility Decision (R.E.D.); some were developed from a Risk Assessment for Herbicide Use in Forest Service Regions 1, 2, 3, 4 and 10 and on Bonneville Power Administration Sites (Labat-Anderson, Inc., 1992); and some were developed specifically for this document.

Information on the carriers' limonene and mineral oil are also provided. Each fact sheet provides an assessment of the general and systemic toxicity (both acute and chronic), including potential effects on reproduction, carcinogenicity, teratogenicity and mutagenicity. Table VI-7 summarizes this data.

These chemicals can all be toxic to workers, to varying degrees. (Any chemical poses a health risk at a sufficient dose.) Most clinical reports of herbicide effects are of skin and eye irritation. Some herbicides, such as dicamba, hexazinone, chlorsulfuron, and triclopyr, can be severe skin irritants; others, such as 2,4-D and metsulfuron methyl, can be severe eye irritants.

Short-term effects of excessive exposure to herbicides include nausea, dizziness, or reversible abnormalities of the nervous system (reversible neuropathy). In extreme cases of prolonged, repeated, and excessive exposure (resulting from careless and/or negligent work habits), longer-term health problems can result, including: organ damage, immune system damage, permanent nervous system damage, production of inheritable mutations, damage to developing offspring, and reduction of reproductive success. It is important to note that EPA evaluates and registers herbicides according to a uniform, health-based standard to ensure a "reasonable certainty of no harm" to consumers. The EPA is responsible for restricting a product's use according to its potential impacts on human health and the environment. Much of that restriction is done through the product label, which states the precautions that must be taken, and how and where to apply a certain herbicide. In most cases, the hazards involved are comparable to or less than the risks associated with other methods.

Herbicides have an added safety advantage over insecticides: since herbicides are designed to be toxic to plants, not animals, most herbicides present little risk to workers when used properly. Few of the herbicides available for use on Bonneville facilities are possible carcinogens (bromacil, and trifluralin).

Occupational exposure to herbicides varies with the method of application. The greatest risk occurs when the worker must directly handle and/or mix chemicals. Spot and localized herbicide applications—including use of backpack sprayers, aerial mixers/loaders, and stem injection—require the most hands-on use of herbicides and, therefore, carry the greatest risk of exposure (and require the greatest amount of worker precaution and use of safety equipment, such as respirators).

Under all application categories, workers can be exposed to herbicides from accidental spills, splashing, leaking equipment, contact with the spray, or by entering treated areas. Exposure can occur either through skin or through inhalation. Adherence to operational safety guidelines, use of protective clothing, equipment checks, and personal hygiene can prevent incidents from occurring. The herbicide label and corresponding material safety data sheets detail these application requirements in addition to safety guidelines.

Debris Disposal Impacts

Risks of lopping and scattering would be due to flying debris from use of machines.

Workers involved in pile-burning of vegetative debris can experience short-term effects, such as minor burns, smoke irritation of the eyes and throat, coughing, and shortness of breath. In extreme cases, workers can experience more severe, long-term effects, such as permanent tissue damage from serious burns, inhalation of toxic agents from poison oak and/or fire starting material, and inhalation of particulates that can have acute irritant effects. The small size of the slash pile burns would help preclude such impacts.

Between 1993 and 1997, three injuries occurred while Bonneville employees were in the process of chipping brush on the right-of-way.

Mitigation Measures

The following mitigation measures would apply for worker health and safety.

- *For safety,* cut all brush stumps flat where possible. (Angular cuts leave a sharp point that could cause injuries if fallen upon.)
- *For cutting trees close to "live" power lines,* use only qualified personnel.
- *If burning vegetation debris piles,* burn off the right-of-way. Do not burn debris close enough to the right-of-way or facility where smoke could provide a conductive path from the transmission lines or electric equipment to the ground.
- Ensure that all herbicide applicators have received training and are licensed in appropriate application categories.
- Follow all herbicide label and material safety data sheet (MSDS) instructions regarding worker safety standards. These include the following:
  - ➢ Wear appropriate protective equipment;
  - ➢ Do not eat, drink or smoke when handling herbicides;
  - ➢ Avoid spilling herbicides on skin or clothing (promptly change any clothing substantially contaminated by a herbicide);
  - ➢ Cleaning and wash protective equipment daily;
  - ➢ Have ready access to clean water and first aid supplies;
  - ➢ Have access to emergency medical facilities; and
  - ➢ Observe specified restricted entry intervals.
- Use self-contained herbicide handling equipment when appropriate and available to reduce worker exposure during herbicide mixing and handling.

Public Health and Safety

The following section discusses general impacts of vegetation management on public health and safety.

General Impacts

This section discusses the potential health and safety impacts on the general public from managing vegetation around our facilities. The impacts can be divided into two categories: physical injury risks and exposure risks. In general, all techniques carry some degree of physical injury risks. Risks of exposure include herbicides from chemical techniques and smoke from burning.

The following sections discuss method-specific impacts of vegetation management on public health and safety.

Manual Impacts

People who come near workers clearing a right-of-way can be exposed to exhaust gases and fuel vapors, flying debris, and falling trees.

Impacts on the public's health and safety are negligible because the public has limited access to Bonneville facilities and because manual clearing is closely supervised and would prevent exposure.

Mechanical Impacts

As with manual techniques, people near the right-of-way during clearing operations can be exposed to exhaust gases and fuel vapors, flying debris, and falling trees. However, heavy equipment could also run over people if the operator does not see them. Proper supervision would prevent exposure to the public.

Impacts on the general public's health and safety would be minor because of limited access and remote location of many of the activity sites. However, use of equipment on access roads used by the public presents an increased risk in vehicle accidents.

Biological Impacts

Biological techniques pose little health or safety risk to workers or the general public.

Herbicide Impacts

While most chemical techniques require use of heavy machinery and thus incur similar basic risks, the major concern with herbicide application is accidental exposure to the compounds (herbicides, carriers, dyes, and adjuvants). Exposure can occur from being accidentally sprayed, from entering areas soon after treatment (eating berries or other foods collected from the right-of-way, touching sprayed vegetation), or drinking contaminated water. The general public, both visitors and residents, is less likely to receive repeated exposures than vegetation management workers; the right-of-way locations are remote, a variety of herbicides would be used, and the timing of treatments would be widely spaced.

If the public were exposed to herbicides repeatedly, the impacts would be like those described in **Worker Health and Safety**.

Risks of Accidental Drift/Spraying

Members of the public, both visitors and nearby residents, could potentially be exposed to herbicides from drift or accidental spraying, if they were in the area at the time of application. Since aerial and broadcast applications have a higher *potential* for drift, these application techniques might create a higher potential for public exposure. However, aerial spraying would only be done in more remote unpopulated areas and broadcast herbicide spraying would not be done in highly populated areas or suburbs. Potential public exposure from spot or localized drift is extremely low because the application usually takes place close to the target plant, so the herbicide is airborne for only a very short moment.

Should a person be accidentally sprayed, then the person's skin and/or eyes might be irritated, depending on the particular herbicide formula. Individuals have reported chronic nausea, dizziness, and other symptoms following accidental exposure to herbicides. Laboratory tests on animals have shown that most herbicides are not carcinogenic, even at doses and repeated exposures well above that which could occur accidentally as part of vegetation management activities. As stated under **Worker Health and Safety,** herbicides are designed to act on plants, not animals, so that the toxic effects generally do not affect the central nervous system or other vital functions.

Risks of Contact after Spraying

Regardless of application method, the general public might also be exposed through contact with recently sprayed vegetation, consumption of recently sprayed berries or other plant materials, drinking contaminated water, or through consumption of contaminated fish. The application guidelines are designed to prevent such accidental exposures to water and fish.

Debris Disposal Impacts

There would be little potential impact on public health or safety due to debris disposal. Potential impacts on people from pile burning smoke and decreased air quality is discussed in the **Air Quality** section. Wildfires started by burn piles that escape pose a risk to nearby residents. With close supervision, the potential for vegetation debris pile burns to escape and cause wildfires would be low.

Mitigation Measures

The following mitigation measures would apply for public health and safety:

- Evaluate, generally, existing land uses (e.g., agriculture, residential) along a right-of-way or surrounding a facility needing vegetation control to determine any constraints on vegetation control.

Table VI-7 Human Health Toxicology Assessment

Herbicide	Acute Toxicity								Chronic Toxicity			
	Eye	Skin	LD50 (mg/kg)	Comments	LD50 (mg/kg)	Comments	LC50 (mg/l)	Comments	Carcinogenicity	Teratogenicity	Reproductive	Mutagenicity
2,4-D												
Acids, Salts	Toxicity Category I: Highly Toxic	Toxicity Category III Slightly Toxic	Rat >1000	Toxicity Category III Slightly Toxic	Rabbit >1000	Toxicity Category II Moderately Toxic	Rat (4-hour) >2.1	Toxicity Category III Slightly Toxic	Group 2B by IARC Possibly carcinogenic to humans	Animal studies indicate limited ability to cause birth defects	Evidence suggests adverse effects at moderate doses	Evidence suggests adverse effects to human chromosomes
Esters and others	Toxicity Category III Slightly Toxic	Toxicity Category III Slightly Toxic	Rat >800	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >0.8	Toxicity Category II Moderately Toxic	Same as above	Same as above	Same as above	Same as above
Benefin	Toxicity Category III Slightly Toxic	Toxicity Category III Slightly Toxic	Rat 2000	Toxicity Category III Slightly Toxic	Rabbit 5000	Toxicity Category III Slightly Toxic	No data due to course granular nature of formulations		Evaluation and determination not complete	No adverse effects	No adverse effects	No adverse effects
Bromacil												
Liquid (lithium salt)	Toxicity Category II Moderately Toxic	Toxicity Category III Slightly Toxic	Rat 1414	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category II Moderately Toxic	Rat (1-hour) >10	Toxicity Category III Slightly Toxic	Group C by EPA-OPP – Possible human carcinogen	Repeated high doses caused fetal abnormalities in rats.	No adverse effects	No adverse effects
Solid	Toxicity Category III Slightly Toxic	Toxicity Category III Slightly Toxic	Rat (female) 1300	Toxicity Category III Slightly Toxic	Rabbit >5000	Toxicity Category III Slightly Toxic	Rat (4-hour) >4.8	Toxicity Category III Slightly Toxic	Same as above	Same as above	No adverse effects	No adverse effects
Chlorsulfuron	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Rat (female) 2341	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) 5.9	Toxicity Category III Slightly Toxic	No adverse effects	No adverse effects	Slightly decreased fertility at doses of 2500 mg/kg in 3-generation study	No adverse effects
Clopyralid-Methyl	Toxicity Category II Moderately Toxic	Toxicity Category IV Practically Non-Toxic	Rat >5000	Toxicity Category III Slightly Toxic	Rabbit >5000	Toxicity Category III Slightly Toxic	Rat >3.0	Toxicity Category III Slightly Toxic	No adverse effects	Caused birth defects in animals at greatly exaggerated doses	No adverse effects	No adverse effects
Dicamba	Toxicity Category I Highly Toxic	Toxicity Category IV Practically Non-Toxic	Rat >757	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >5.3	Toxicity Category III Slightly Toxic	No adverse effects	No adverse effects	No adverse effects	No adverse effects
Dichlobenil	Toxicity Category IV Practically Non-Toxic	Toxicity Category IV Practically Non-Toxic	Rat 4250	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >3.3	Toxicity Category III Slightly Toxic	Group C by EPA-OPP – Possible human carcinogen	No adverse effects	No adverse effects	No adverse effects
Diuron	Toxicity Category III Slightly Toxic	Toxicity Category III Slightly Toxic	Rat (female) 1300 Rat (male) 2300	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >3.5	Toxicity Category III Slightly Toxic	Proposed Revised Guidelines by EPA-OPP as a Known/Likely Carcinogen	Teratogenic in mice and rats at doses of 250 mg/kg/day	Significant decrease in weight of offspring in 2nd and 3rd litters. Unlikely to effect humans at expected doses.	No adverse effects
Glyphosate												
I-Salt	Toxicity Category II Moderately Toxic	Toxicity Category IV Practically Non-Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit >5000	Toxicity Category IV Practically Non-Toxic	Rat (4-hour) >1.3	Toxicity Category III Slightly Toxic	Group E by EPA-OPP – evidence of human non-carcinogenicity	Diarrhea, decreased body weight gain, nasal discharge and death in high dose animal studies	Kidney and digestive effects and decreased body weight gain in high dose animal studies	No adverse effects
M-Salt	Toxicity Category IV Practically Non-Toxic	Toxicity Category IV Practically Non-Toxic	Rat 4613	Toxicity Category III Slightly Toxic	Rabbit >5000	Toxicity Category IV Practically Non-Toxic	Rat (4-hour) >1.9	Toxicity Category III Slightly Toxic	Same as above	Same as above	Same as above	Same as above
Halosulfuron-Methyl	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Rat 1287	Toxicity Category III Slightly Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rat (4-hour) >5.7	Toxicity Category IV Practically Non-Toxic	No adverse effects	Rat studies indicate decreases in mean body weight and soft tissue and skeletal variations	No adverse effects	No adverse effects

Herbicide	Acute Toxicity								Chronic Toxicity			
	[illegible]		[illegible]		[illegible]		[illegible]					
	Eye	Skin	LD50 (mg/kg)	Comments	LD50 (mg/kg)	Comments	LC50 (mg/l)	Comments	Carcinogenicity	Teratogenicity	Reproductive	Mutagenicity
Hexazinone	Toxicity Category I Highly Toxic	Toxicity Category IV Practically Non-Toxic	Rat 1200	Toxicity Category III Slightly Toxic	Rabbit > 5278	Toxicity Category IV Practically Non-Toxic	Rat (4-hour) 3.94	Toxicity Category IV Practically Non-Toxic	Group D by EPA-OPP – not classifiable as a human carcinogen	Some effects at high dose levels	Some effects at mid- and high dose levels	Positive in one study and negative in others: suggests slight or nonmutagenic effects
Imazapyr	Toxicity Category I Highly Toxic	Toxicity Category IV Practically Non-Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >1.3	Toxicity Category III Slightly Toxic	Group E by EPA-OPP – evidence of human non-carcinogenicity	No adverse effects	No adverse effects	No adverse effects
Isoxaben	Toxicity Category II Moderately Toxic	Toxicity Category III Slightly Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >2.6	Toxicity Category III Slightly Toxic	Group C by EPA-OPP – Possible human carcinogen	Has caused birth defects in animals at high doses	Has been shown to interfere with reproduction in animals	No information available
Mefluidide	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Mice 1920	Toxicity Category III Slightly Toxic	Rabbit > 4000	Toxicity Category III Slightly Toxic	Rat (4-hour) >8.5	Toxicity Category III Slightly Toxic	Possible oncogenic effects in tests on mice	No adverse effects	No adverse effects	No adverse effects
Metsulfuron Methyl	Toxicity Category II Moderately Toxic	Toxicity Category III Slightly Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >5.3	Toxicity Category III Slightly Toxic	No adverse effects	No adverse effects	No adverse effects	No adverse effects
Oryzalin	Toxicity Category III Slightly Toxic	Study requested by EPA	Rat >10,000	Toxicity Category IV Practically Non-Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat >3.17	Toxicity Category III Slightly Toxic	Group C by EPA-OPP – Possible human carcinogen	Reduced maternal and fetal body weight and increased runts and bone development effects at high dose levels	Increase in liver and kidney weights and decreased food consumption and body weight gain at high dose levels	No adverse effects
Paclobutrazol	Toxicity Category II Moderately Toxic	Toxicity Category III Slightly Toxic	Rat 2150	Toxicity Category III Slightly Toxic	Rabbit > 4000	Toxicity Category III Slightly Toxic	Rat (4-hour) >250	Toxicity Category IV Practically Non-Toxic	No adverse effects	Caused birth defects in lab animals at doses toxic to the mother	No adverse effects	No adverse effects
Pendimethalin	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Rat male 1250 Rat (female) 1050	Toxicity Category III Slightly Toxic	Rabbit > 5000	Toxicity Category IV Practically Non-Toxic	Rat (4-hour) 5.35	Toxicity Category III Slightly Toxic	Group C by EPA-OPP – Possible human carcinogen	No adverse effects	No adverse effects	No adverse effects
Picloram K-Salt	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Rat (female) 3536	Toxicity Category III Slightly Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >1.63	Toxicity Category II Moderately Toxic	Group E by EPA-OPP – Evidence of non-carcinogenicity	Body weight gains/losses, abortions, excess salivation	Effects not reported	No adverse effects
T-Salt	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >0.07	Toxicity Category II Moderately Toxic	Study not required by EPA	Same as above	Effects not reported	No adverse effects
Sulfometuron-Methyl	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >5.1	Toxicity Category III Slightly Toxic	No adverse effects	No adverse effects	Decreased number of off-spring at levels toxic to the mother	No adverse effects
Tebuthiuron	Toxicity Category III Slightly Toxic	Toxicity Category IV Practically Non-Toxic	Rat (male) >2000 Rat (female) > 1000	Toxicity Category III Slightly Toxic	Rabbit > 2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >2.0	Toxicity Category III Slightly Toxic	Group D by EPA-OPP – not classifiable as a human carcinogen	No adverse effects	No adverse effects	No adverse effects

Herbicide	Acute Toxicity								Chronic Toxicity			
	Eye	Skin	LD50 (mg/kg)	Comments	LD50 (mg/kg)	Comments	LC50 (mg/l)	Comments	Carcinogenicity	Teratogenicity	Reproductive	Mutagenicity
Triclopyr												
TEA	**Toxicity Category I Highly Toxic**	**Toxicity Category IV Practically Non-Toxic**	**Rat 1847**	**Toxicity Category III Slightly Toxic**	**Rabbit >2000**	**Toxicity Category III Slightly Toxic**	**Rat (4-hour) >2.6**	**Toxicity Category IV Practically Non-Toxic**	**Group D by EPA-OPP – not classifiable as a human carcinogen**	**Positive for adverse developmental effects**	**Positive for adverse reproductive effects**	**No adverse effects**
BEE	**Toxicity Category III Slightly Toxic**	**Toxicity Category IV Practically Non-Toxic**	**Rat 803**	**Toxicity Category III Slightly Toxic**	**Rabbit >2000**	**Toxicity Category III Slightly Toxic**	**Rat (4-hour) >4.8**	**Toxicity Category IV Practically Non-Toxic**	**Same as above**	**Same as above**	**Same as above**	**No adverse effects**
Trifluralin												
Liquid	Toxicity Category III Slightly Toxic	Toxicity Category III Slightly Toxic	Rat 3700	Toxicity Category III Slightly Toxic	Rabbit >5000	Toxicity Category III Slightly Toxic	Rat (4-hour) >5.5	Toxicity Category III Slightly Toxic	Group C by EPA-OPP – Possible human carcinogen	No adverse effects	Increased kidney and liver weights, renal lesions, reduced litter sizes in test animals at doses lethal to mother	No adverse effects
Solid	Toxicity Category II Moderately Toxic	Toxicity Category IV Practically Non-Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >4.6	Toxicity Category III Slightly Toxic	Same as above	Same as above	Same as above	Same as above
Trinexapac-Ethyl	**Toxicity Category II Moderately Toxic**	**Toxicity Category III Slightly Toxic**	**Rat >5000**	**Toxicity Category IV Practically Non-Toxic**	**Rabbit >2000**	**Toxicity Category III Slightly Toxic**	**Rat (4-hour) >2.7**	**Toxicity Category III Slightly Toxic**	**Slight increase in stomach tumors in male mice at high doses**	**Effects not reported**	**None observed**	**None observed**
Mixtures												
2,4-D + Dicamba	Toxicity Category I Highly Toxic	Toxicity Category III Slightly Toxic	Rat 1150	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >20	Toxicity Category IV Practically Non-Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
2,4-D + Glyphosate	Toxicity Category I Highly Toxic	Toxicity Category III Slightly Toxic	Rat 3860	Toxicity Category III Slightly Toxic	Rabbit >6366	Toxicity Category IV Practically Non-Toxic	Rat (4-hour) >1.8	Toxicity Category II Moderately Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
2,4-D + Picloram	Toxicity Category II Moderately Toxic	Toxicity Category II Moderately Toxic	Rat >2600	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >1.8	Toxicity Category II Moderately Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
2,4-D + Triclopyr	Toxicity Category III Slightly Toxic	Toxicity Category III Slightly Toxic	Rat >2000	Toxicity Category III Slightly Toxic	Rabbit >2000	*Toxicity Category III Slightly Toxic*	Rat (4-hour) >4.9	Toxicity Category III Slightly Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
Benefin + Oryzalin	Toxicity Category II Moderately Toxic	Toxicity Category III Slightly Toxic	Rat 3750	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	No data	No data	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
Bromacil + Diuron	Toxicity Category III Slightly Toxic	Toxicity Category III Slightly Toxic	Rat >1200	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) 4.8	Toxicity Category III Slightly Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
Clopyralid + Triclopyr	Toxicity Category I Highly Toxic	Toxicity Category IV Practically Non-Toxic	Rat >1500	Toxicity Category III Slightly Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >2.6	Toxicity Category III Slightly Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
Chlorsulfuron + Metsulfuron Methyl	Toxicity Category II Moderately Toxic	Toxicity Category III Slightly Toxic	Rat >5000	Toxicity Category IV Practically Non-Toxic	Rabbit >2000	Toxicity Category III Slightly Toxic	Rat (4-hour) >5.3	Toxicity Category III Slightly Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above
Isoxaben + Trifluralin	Toxicity Category II Moderately Toxic	Toxicity Category III Slightly Toxic	Rat >2500	Toxicity Category III Slightly Toxic	Rabbit >5000	Toxicity Category III Slightly Toxic	Rat (4-hour) (female) >0.5 (male) >4.6	Toxicity Category II Moderately Toxic	See individual chemical above	See individual chemical above	See individual chemical above	See individual chemical above

Notes:

Unless otherwise noted, toxicity data are for technical forms of the herbicide (that is, the grade used for toxicology studies), not formulated (brand-name) products; data for specific formulated products might be different than that shown.

LC50 = lethal concentration 50; the concentration of a material in air that on the basis of laboratory tests (respiratory route) is expected to kill 50% of a group of test animals when administered as a single exposure (1 hour or 4 hours as indicated in the table).

LD50 = lethal dose 50; the dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route (other than inhalation) when given all in one dose. (Source: MSDS Pocket Dictionary, Genium Publishing Corporation 1988)

Toxicity Categories: Category I indicates the highest degree of acute toxicity, Category IV the lowest.

- *To the extent practicable*, identify casual informal use of the right-of-way by non-owner publics to determine any constraints on vegetation control.
- Determine, generally, landowners or land managers (i.e., private residential, timber company, Federal, state) in or around the facility needing vegetation control.
- Determine whether there are any existing landowner agreements with provisions that need to be followed regarding the vegetation maintenance of a specific portion of line.
- Determine appropriate level of public involvement, notification or coordination that may be necessary.
- *If needed*, use public contact to help find out about any special uses of the land, or other issues or concerns that might need consideration when determining or scheduling vegetation control.
- Protect drinking water sources by following all buffer zone restrictions.
- Ensure that all herbicide applicators have received training and are licensed in appropriate application categories.
- Observe restricted entry intervals specified by the herbicide label and post public warning signs where required.
- Follow all herbicide label and MSDS instructions regarding mixing and application standards to reduce exposure to the public through drift and misapplication.
- Ensure the use of EPA-approved herbicides that have been reviewed by Bonneville for effectiveness and environmental considerations.
- *If using herbicides near crops for consumption*, comply with pesticide-free buffer zones, if any, as per label instructions.
- Never leave herbicides or equipment unattended in unrestricted access areas.
- Closely follow all equipment cleaning standards required by the herbicide label.
- In the event of a spill, immediately notify potentially affected parties.

Visual Resources

The following section discusses general impacts of vegetation management on visual resources.

General Impacts

Vegetation management activities can change the appearance of the landscape and introduce visual contrasts, such as contrasts in color and/or vegetation height.

Several factors influence the effect of vegetation management on visual resources, including the setting (e.g., rural, urban, agricultural, mountainous), season, type of vegetation present, landscape color (e.g., soils, vegetation, surface geology), and type and amount of public use. In addition, the technique employed and scope of the project greatly determine the level of potential impact.

The setting can include land use patterns, as well as vegetation structure present (e.g., forested or not). In some urban settings, rights-of-way provide green belts appreciated by residents of the area. Visual impacts can be great in forestlands that are within view of major highways or residential areas.

A loss of tall vegetation can have a sudden temporary visual impact on people who see the view often. Long-term impacts can occur if the vegetation formerly screened either aesthetic or unpleasant views. For example, danger trees cut along a road might reveal a view of a mountain or valley not seen before. Alternatively, the tree cutting might reveal large lattice-steel transmission structures. (What people find aesthetically pleasing is also a matter of taste. Many of our electrical engineers think transmission towers are an aesthetically pleasing sight.)

The scope of the clearing necessary also affects the visual impact. If a right-of-way has not been cleared for some time, and a number of small trees and brush needs cutting, the change—and therefore the visual impact and contrast—would be great.

The season, or time of year, that vegetation management activities take place can also determine potential impact on visual resources. During late-fall and winter, brown colors of treated vegetation might blend naturally with the surrounding colors, while in spring or summer, the same colors might contrast.

Potential impacts on visual resources also depend on the colors of the existing landscape, where areas dominated by green vegetation might show signs of vegetation management more than those areas where browns, grays, and other earth tones dominate.

Managing vegetation at non-electric facilities, landscaping, and parking lots, by keeping weeds removed, mowing lawns and keeping shrubbery healthy, is intended make these facilities look better. There would be no difference in visual quality associated with choice in management method.

The following sections discuss method-specific impacts of vegetation management on visual resources.

Manual Impacts

Manual techniques do not create any visual impacts particularly unique to the method. However, the greater control allowed by manual methods can serve to minimize incidental disturbances to non-target vegetation and associated impacts on visual quality.

Mechanical Impacts

Some mechanical methods such as tilling and mowing have the potential to scarify the landscape, leaving swaths of bare soil or dead vegetation that contrasts with surrounding colors. (Use of walking brush-cutters can reduce this soils impact.) Mowing can also create an uneven, ragged appearance along roadsides. Because of these effects, some mechanical techniques might be considered inappropriate for some sensitive visual quality areas (David Evans and Associates, 1996). These impacts would be temporary (one or two years) until vegetation is re-established.

Biological Impacts

Insects or pathogens do not greatly affect visual quality of the landscape. These techniques are used in large areas or noxious weed areas. The weeds tend to die slowly, so the plant might look ill for some time before other plants could take over and gain dominance. The potential for contrast between the vegetation surrounding the treatment areas and the post-treatment vegetation would exist, though the transition would be less noticeable than with other management techniques.

Herbicide Impacts

The use of chemical techniques to control vegetation can create visually unappealing brownout areas immediately following herbicide applications. This impact can be heightened if applications prevent seasonal vegetation changes (i.e., spring flowers or fall colors). As with herbicide impacts associated with recreation, these impacts on visual quality would be temporary. Vegetation would reestablish itself, and thus lessen the color contrast between treated areas and the adjacent landscape.

Debris Disposal Impacts

Scattering cut branches tends to look unkempt and disturbed.

The burning of slash piles would generate relatively minor amounts of smoke and would leave a residual blackened area of soil. The minor generation of smoke would temporarily affect visual quality. Most pile-burning occurs during fall, when winds can quickly disperse smoke.

Spread-out wood chips can create a visually appealing park-like look.

Mitigation Measures

The following mitigation measures would apply in visually sensitive areas:

- Limit use of broadcast foliar application of herbicide to reduce the creation of large areas of browned vegetation.
- *At road crossings, highways or visual overlooks,* leave sufficient vegetation, where possible, to screen view of right-of-way.
- *If the area is a very sensitive visual resource,* consider (1) planting low-growing tree seedlings adjacent to the right-of-way (or providing low-growing seedlings to landowner for planting); (2) softening the straight line of corridor edge by cutting some additional trees outside the right-of-way; or (3) if possible, leaving some low-growing trees within the right-of-way.

Air Quality

The following section discusses general impacts of vegetation management on air quality.

General Impacts

The primary potential impact on air quality, regardless of the method for clearing, would be a less-than-significant impact on Global Warming. In general, clearing results in the release of carbon dioxide from cleared vegetation into the atmosphere. Additionally, clearing reduces the carbon storage capacity of the affected land because large trees, which store carbon, are not allowed to reach maturity.

The following sections discuss method-specific impacts of vegetation management on air quality.

Manual Impacts

Dust and chainsaw exhaust generated during manual clearing activities would be localized and short-term in nature.

Mechanical Impacts

Dust and offroad-vehicle exhaust generated during mechanical cutting would be localized and short-term in nature. Emissions are expected to be slightly higher than those from manual clearing; however, the impacts on air quality due to mechanical emissions remain less-than-significant.

Biological Impacts

There would be no effect on air quality from biological methods.

Herbicide Impacts

Herbicide use does not affect overall air quality. Please see **Worker Health and Safety** for potential impacts of herbicide vapors on workers located in the immediate area. The use of mechanical means to apply herbicide would have the same impacts on air quality as mechanical methods discussed above.

Debris Disposal Impacts

Woody debris from lop-and-scatter would be left onsite to degrade gradually. Carbon contained in the debris would either be reabsorbed by new growth (approximately 50% - USEPA, 1994) or gradually released to the atmosphere as carbon dioxide. Carbon dioxide is one of the most common greenhouse gasses and is linked to global warming.

Carbon dioxide emissions from line maintenance activities would be partially offset by the regrowth of low-growing vegetation and, if some larger trees are marketed as lumber, the permanent storage of carbon in that lumber.

Burning debris would emit particulate matter, carbon monoxide, carbon dioxide, semi-volatile and volatile organic compounds. The exact amount emitted depends on the quantity and the moisture content of the debris being burned. It is important to note that only *unmarketable* debris is considered for burning (typically, 40% of the mass of a tree is marketable).

Generally, Bonneville avoids burning because soot from fires can cause flashovers from one transmission line to another, resulting in outages. Burning would not be conducted in nonattainment or maintenance areas or in areas that could affect visibility in national parks, wilderness areas, or monuments. In the unlikely event that burning is used, Bonneville will obtain burning permits from the appropriate authorities and, in Montana, join the Smoke Management Plan. If implemented, burning could have a short-term marginal impact on air quality.

Chipping would produce the same air emissions as lop-and-scatter, except that the carbon contained in chips would be released over a shorter period of time than that contained in unchipped debris.

Off-site disposal includes recycling, landfilling, and combustion in a biomass burning facility. In all three cases, carbon would be released to the atmosphere in the form of carbon dioxide. The recycling and landfilling options would release carbon slowly and would have the same impact as lop-and-scatter and chipping. The biomass burning scenario would have the same impact as on-site burning.

Mitigation Measures

The following mitigation measures would apply for public health and safety:

- Avoid removing vegetation where it will not grow up into the safety zones for the transmission line.
- *For all methods using machinery or vehicles (i.e. chainsaws, trucks, graders)* keep the equipment in good operating condition to eliminate excess exhaust.
- *Before pile burning is attempted off the right-of-way,* secure from the applicable fire control agency any required permits for burning.
- *If burning,* do not use oil, diesel, or rubber to start pile burn fires.

Social and Economic Resources

The following section discusses general impacts of vegetation management on social and economic resources.

General Impacts

The maintenance of vegetation near Bonneville facilities provides a major benefit to society and the economy by ensuring safe and reliable power. Bonneville facilities provide much of the electricity within the service area, and the maintenance of vegetation within these facilities allows for their safe and reliable operation, which in turn provides a critical resource to the economic functioning of the region. As stated in Purpose and Need (**Chapter I**), a major electric power outage occurred on August 10, 1996, caused in part by trees that had grown too close to transmission lines. The effects of this outage were widespread and illustrated the importance of reliable electricity for the everyday functioning of the region.

Other than the overall benefit of safe and reliable power, none of the alternatives is expected to significantly influence social and/or economic factors because the facilities and associated vegetation management is ongoing. In the numerous environmental studies reviewed as part of this EIS project, very few impacts on social or economic values were identified. Nevertheless, vegetation management can influence social and economic factors to some degree. For example, Bonneville's vegetation management often involves contract workers. The Program therefore provides a moderate level of employment, although (in relation to the overall economic base of Bonneville's service area) the amount of employment provided is negligible.

Impacts on socioeconomics are tied to impacts on agriculture and timber production (see **Agriculture** and **Timber Production** sections). In some cases, Bonneville vegetation management can affect adjacent commercial production of crop or forestlands. As stated elsewhere, many types of crop production are very compatible with Bonneville rights-of-way, so that those crops can be grown within the maintained corridor with little or no effect on their value or production costs. Occasionally, crops might be damaged during certain management activities. For example, fruit trees might require removal. In such cases, Bonneville compensates the landowners for the lost value. Vegetation management might also increase forage production in forested regions or, conversely, can reduce forage where non-target vegetation is removed incidentally.

Vegetation management can provide some opportunities for minor social and economic benefits associated with vegetation removal. Firewood can be made available where trees have been removed. Other forest products, including landscaping trees, can be made available to commercial and/or private collectors within maintained rights-of-way. In addition, as mentioned under **Recreation/Visual**, rights-of-way are often used by people for recreation. In urban areas, rights-of-way can provide open space and green-belt vegetation.

Noxious weeds affect economics by competing with agriculture. As stated in the **Vegetation** section, Bonneville works with local and state agencies on programs to control noxious weeds.

The following sections discuss method-specific impacts of vegetation management on social and economic resources.

Manual Impacts

As the most selective of the techniques, manual methods tend to have little effect on people, although, as with mechanical techniques, use of chainsaws and other hand tools can temporarily disturb people.

Mechanical Impacts

One of the most common mechanical treatments, mowing of roadsides, has little or no social or economic effect. However, this and other mechanical techniques can be quite noisy, and, as discussed under **Land Use**, can temporarily disturb people in their homes, work places, or while recreating.

Biological Impacts

Because of required precautions associated with biological techniques, and because of the species-specific nature of this technique, little or no adverse effect on social or economic values is anticipated, other than the potential beneficial effect of controlling noxious weeds.

Herbicide Impacts

Impacts from chemical techniques would occur if there were a spill or if spray were to drift and affect crops, grazing grasses, timber production, landscaping, or water resources. The economic impacts would be the loss of production. For example, if herbicide spray on the right-of-way drifted to adjacent timber production land and timber trees were accidentally killed before growing large enough for harvest, money would be lost from the potential sale.

Bonneville once misapplied a herbicide on a maintenance site. The herbicide ran off to a nearby stream, traveled downstream and killed many trees in its path, including some in people's yards. The economic impacts of tree replacement fell on Bonneville. The social impact of this incident on the people in the neighborhood was the anger and fear that the mistake of one person could affect them and their surroundings.

Debris Disposal Impacts

Debris disposal would have little potential social or economic impact. Some revenues and public opportunities might be foregone should wood suitable for commercial or firewood use be burned or chipped.

Consequences of Right-of-way Management Approach Alternatives

This section discusses the impacts specific to the implementation of the management approach alternatives.

Alternative MA1: Time-driven

If rights-of way were managed on a time-driven basis, vegetation would be cut or controlled on a cyclical schedule based on when the tallest trees were a near threat to a line. The maintenance activities would involve the removal of relatively tall trees (about 14 ft).

With this alternative, there is no attempt to change the vegetation structure of the right-of-way. Trees would sprout on the corridor through blown seed or root suckers. If deciduous trees dominated, cutting of those trees without herbicide treatment to stop root growth would create more densely sprouting trees. Sapling-filled corridors could develop, requiring the same or increasingly intensive maintenance with each maintenance cycle. With each cycle, there would be repeated disturbance of the right-of-way.

The environmental impacts of this repeated disturbance include potentially affecting the following: non-target vegetation (crushing, accidental treatment or removal); soils (disturbance and erosion through vegetation removal, maintenance traffic and clearing activities); water (sedimentation through erosion, increased surface runoff until revegetation); fish (temporary sedimentation reduces feeding success in the short-term); wildlife (disturbance or removal of habitats).

Impacts on land uses and land owners/managers (Agriculture, Timber, Recreation, Residential, Commercial, Industrial, USFS- and BLM-managed lands, Tribal, City County, and State) specific to this management approach would come from the repetitive and intensive maintenance disturbance on the rights-of-way (noise, dust, debris disposal, access, coordination efforts). Cultural and Historical Resources would not be specifically affected through this management approach.

Impacts on worker health and safety specific to this approach would be the potential for accidents related to working with dense, tall vegetation. Public health and safety impacts would be the slight potential for accidents to the public (such as being hit by flying vegetative debris, hurt by felling of trees, exposed to herbicide applications) during maintenance of dense tall vegetation.

Impacts of visual resources by this approach would be the drastic visual difference of clearing tall vegetation from a site and the disturbance of the right-of-way until revegetation occurs.

Impacts on air quality would be due to the repetitive maintenance activities (exhaust, dust) and the debris left to decompose, releasing carbon dioxide into the atmosphere.

This approach is not specific to the method(s) that would need to be used. Impacts associated with methods would depend on which methods were used.

Alternative MA2: Promotion of Low-growing Plant Communities

This management approach would promote the establishment of low-growing plant communities within the right-of-way. Maintenance would be conducted in a manner conducive to that establishment, including removing or treating tall-growing vegetation before it is tall enough to shade or out-compete low-growing vegetation, and being careful not to disturb low-growing vegetation during maintenance activities.

The impacts associated with this approach would be similar to those of MA1 during the first few years of implementation: the impacts of removing dense, tall vegetation. During early implementation there would also be more potential maintenance impacts and human presence on the rights-of-way to treat small trees. Once low-growing plants began to establish themselves on the rights-of-way, impacts associated with tree removal would lessen because there would be fewer trees.

The impacts of this approach would be more noticeable in forest areas. In these areas the impacts would be associated with changing the vegetation structure from one that constantly reverts back to a forest, to a structure of low-growing plants—shrubs, grasslands. This change could affect the following: vegetation (vegetation structure is changed by reducing the natural rate of tree regeneration; the area becomes a shrub- or grassland); soils (potential for soil erosion would decrease by decreasing soil exposure and creating root mats that hold soil and water); water (less erosion lessens potential sedimentation and turbidity); fish (decreased erosion-related impacts would decrease impacts on fish); and wildlife (habitat is changed to low-growing and is not in constant disturbance of cutting cycles).

Impacts on land uses and land owners/managers (Agriculture, Timber, Recreation, Residential, Commercial, Industrial, USFS- and BLM-managed lands, Tribal, City County, and State) specific to this management approach would include those associated with MA1 (noise, dust, debris disposal, access, coordination efforts). However, these impacts would decrease over time, as rights-of-way needed less intensive maintenance.

As low-growing plant communities became established, potential impacts on worker and public health and safety would decrease (less maintenance necessary means less potential for impacts).

Impacts on visual resources would be most noticeable in forested areas. The rights-of-way would be changed to low-growing vegetation cover, which might/might not be more appealing-looking than a right-of-way with a large number of saplings growing. With fewer maintenance activities needed, the right-of-way would look less disturbed.

Air quality impacts would decrease over time with the fewer maintenance activities (exhaust, dust) and relatively little debris to decompose and contribute to carbon dioxide release into the atmosphere.

The impacts of this approach associated with methods would depend on the methods used, and would categorically include impacts of herbicide methods. This approach would require, at a minimum, herbicide applications for deciduous species. Without herbicide treatment of these fast-growing species, the roots will resprout creating more dense growth with each cutting (see the **Vegetation** section, **Manual Methods,** in this chapter for details) and the establishment of low-growing plant communities would be very difficult.

As with all the methods, the use of herbicides would decrease over time as low-growing plant communities establish.

Consequences of Right-of-way Methods Package Alternatives

This section discusses the impacts specific to the implementation of the right-of-way methods package alternatives.

Alternative R1: Manual, Mechanical, Biological

Alternative R1 relies heavily on manually controlling tall-growing vegetation, with some use of mechanical methods. Noxious weed control would be done with manual and mechanical methods, and biological agents. No herbicides or growth regulators would be used.

Short-term Impacts

Short-term environmental impacts of this alternative would result from the use of manual (chainsaws) or mechanical (heavy equipment) methods to remove tall-growing vegetation.

Non-target vegetation could be crushed through tree felling, use of mechanical clearing and debris disposal. Soils are usually disturbed only slightly by manual methods (the top duff layer can be rearranged), while soil-scraping mechanical methods can cause erosion. Erosion is also possible through vegetation removal, maintenance traffic, and debris disposal. If erosion occurs, then potential sedimentation could occur if there are water bodies nearby.

Surface runoff could increase until revegetation. Oils or fuel from equipment could also potentially enter waterbodies.

Temporary sedimentation could reduce fish feeding success in the short-term. Wildlife would be disturbed through chainsaw and mechanical equipment noise. Maintenance activities could also potentially remove habitats, and soil-scraping mechanical equipment could affect soil-dwelling species.

Impacts on land uses and land owners/managers (Agriculture, Timber, Recreation, Residential, Commercial, Industrial, USFS- and BLM-managed lands, Tribal, City County, and State) would include noise, dust, debris disposal, access, and coordination efforts.

If soil were disturbed, then subsurface cultural resources might be exposed or damaged (more likely with mechanical methods than manual methods).

Worker health and safety impacts would include those for manual (chainsaw accidents, felling of trees) and mechanical (heavy equipment accidents) methods, and with working in dense vegetation. It is potentially more dangerous to cut trees on steep terrain, compared to spraying a tree with herbicide and leaving it standing. Public health and safety impacts would be the slight potential for accidents to the public (such as being hit by flying vegetative debris, hurt by felling of trees).

Vegetation disturbance (stumps and branch debris) could cause impacts on visual resources until revegetation occurs. Impacts on air quality would include exhaust, dust, and slight carbon dioxide release into the atmosphere due to debris left to decompose.

Since herbicides would not be used, there would not be the potential impacts of herbicide use, such as potential contamination.

Long-term Impacts

The indirect or long-term environmental impacts would occur in areas of deciduous vegetation, similar to the impacts of management approach MA1. When cut, deciduous vegetation would resprout with an increased number of stems, creating more thickly vegetated rights-of-way that would need to be managed even more intensively. The right-of-way would then need more extensive clearing (more vegetation per acre to be cut and removed) each maintenance cycle. When densely vegetated areas were cleared, environmental impacts would be more drastic compared to the selective removal of trees or brush. More habitat would be affected and more soil disturbed; non-target plants that have grown in shade-tolerant situations would suddenly be exposed; maintenance worker presence on the right-of-way would increase; and visual impacts would be more dramatic. Increased deciduous brush densities could also decrease vegetation diversity, and in turn decrease wildlife use of the right-of-way.

Noxious Weeds

Without the use of herbicides with this alternative, noxious weed control would be difficult, especially for weeds that do not have an approved biological control. If such weeds cannot be controlled, and spread, impacts would occur for vegetation (loss of diversity), agriculture (competition with crops), and wildlife (loss of habitat and food sources). Because such weeds are very resilient and capable of resprouting through roots, as well as from seed, mechanical or manual techniques are not very effective.

The use of biological methods (where applicable) tends not to have any adverse environmental impacts. There could be some noise disturbance if helicopters apply biological agents. Insect agents might be a food source for birds or fish. There would be no soil or water disturbance.

Mitigation Measures

With this alternative, all the mitigation measures listed in **Chapter III** would apply, with the exception of the measures for herbicide use (since this alternative does not include herbicide use).

Alternative R2:
Manual, Mechanical, Biological + **Herbicide – *spot and localized application***
(Environmentally preferred alternative)

Alternative R2 would use all methods (manual, mechanical, biological, and herbicide), but would use only spot and localized herbicide applications. Most tall-growing vegetation would be manually removed (cut with chainsaws). Spot and localized herbicide applications would be the next most used method. Mechanical methods would be used very rarely. Noxious weeds would be managed primarily with localized herbicide treatments and some biological treatments.

Short-term Impacts

The short-term manual and mechanical impacts would be similar to those of Alternative R1. However, because those methods would be used less, the impacts associated with those methods would be less.

The difference between R1's and R2's short-term impacts spring from the use of spot and localized herbicide applications. These application treatments can be very selective, so that non-target vegetation is not harmed. The slight potential for an herbicide spill would cause the biggest impact on non-target plants as well as water bodies. Applicators must take care not to apply sloppily to maintain selectivity. Herbicides have a slight potential to affect soil productivity by reducing soil microbes in small areas, but the local and spot treatments would allow the microbes to quickly recolonize from adjacent, unaffected areas. There is the potential for herbicides to wash off sprayed plants through heavy rains or over-applications and reach water bodies and fish. Herbicide movement through water runoff could kill crop plants, expose range animals, or affect timber production. Mitigation measures that include no-spray buffers around water bodies and careful consideration of weather before applying should eliminate this risk. Herbicide use could have a slight potential for wildlife poisoning.

Spot treatments of stumps have no particular visual impacts. Spot injection treatments of large trees and localized applications (i.e., backpack spraying) on clumps of vegetation can leave standing dead plants that are not visually appealing.

Worker impacts include potential repeated exposure to herbicides, especially if appropriate precautions are not taken. Exposure to herbicides could cause short-term nausea, dizziness, or reversible abnormalities of the nervous system. Prolonged, repeated, and excessive exposure can cause organ damage, immune system damage, permanent nervous system damage, production of inheritable mutations, damage to developing offspring, and reduction of reproductive success. The option to use spot or localized herbicide applications in areas of steep terrain or where it may be dangerous to fell a tree near an energized line may lessen potential physical injuries.

The potential for the public to be exposed to herbicide applications on the right-of-way is small. Exposure to herbicides could cause short-term nausea, dizziness, or reversible abnormalities of the nervous system. Herbicide applications on the right-of-way would not cause prolonged or repeated exposure to the public because of the time span between treatment cycles (every 2 – 10 years).

Long-term Impacts

Spot and localized herbicide applications *could* be used to treat deciduous plant species, depending on the Management Approach Alternative and Vegetation Selection Alternative paired with this alternative. If herbicide applications were used to treat deciduous species, then the long-term impacts would be similar to those of the management approach MA1 (Promotion of Low-growing Plant

Communities). As the regrowth of multiple stemmed sprouts is controlled and the right-of-way is converted to a shrub- or grassland, maintenance activities would become less intense and the resulting impacts would lessen over time. Wildlife habitat would also change, as the right-of-way vegetation was converted to shrub- or grassland type habitats.

Noxious Weeds

The amount of use and the impacts of biological methods would be the same with this alternative as with Alternative R1. This alternative would mainly treat noxious weeds with localized herbicide treatments. The ability to control noxious weeds is much greater with herbicides than with manual or mechanical methods; therefore, there would be much less impact due to unchecked growth of noxious weeds

Mitigation Measures

With this alternative, all the mitigation measures listed in **Chapter III** would apply, except those for broadcast and aerial herbicide applications (since these applications are not used in this alternative).

Alternative R3:
Manual, Mechanical, Biological, Herbicide – *spot, localized* + ***broadcast application*** *(current practice)*

Alternative R3 would use all methods (manual, mechanical, biological, and herbicide), with spot, localized, and broadcast herbicide applications. Most tall-growing vegetation would still be manually removed (cut with chainsaws). Spot and localized herbicide applications would be the next most used method. Broadcast herbicide applications would be used very rarely, as would mechanical methods. Noxious weeds would be managed primarily with localized herbicide treatments and some biological treatments.

Short-term Impacts

The short-term manual and mechanical impacts would be similar to those of Alternative R1. However, those methods would be used less with this alternative; therefore the impacts associated with those methods would also be less. Impacts of spot and localized herbicide applications would be the same as under R2.

The impacts specific to this alternative would be due to the additional option to use broadcast herbicide application. The applicability of broadcast is very limited on rights-of-way (the vegetation needing treatment must be close to good truck access), so its use would be small.

Impacts specific to broadcast applications include greater potential to accidentally treat non-targeted plants, because the nature of broadcast is to treat everything in an area. Broadcast applications are usually sprayed from a truck. This application has a greater potential for drift (fine clouds blowing or vaporizing to untargeted areas) than with spot or localized applications. This potential also slightly increases the potential for water contamination, fish mortality, and wildlife poisoning. Mitigation measures that include no-spray buffers around water bodies and careful consideration of weather before applying should eliminate this risk.

Potential worker exposure to herbicides would increase with this alternative because slightly more herbicide would probably be used. However, because broadcast herbicide application is done via a truck (rather than by backpack or hand application), there is actually less potential for worker contact or exposure with the chemical.

There would be a slight increase in possible public exposure, because there is more potential for drift with broadcast herbicide use and a slightly greater potential for accidentally spraying persons on the right-of-way with broadcast (compared to spot or localized herbicide applications). Broadcast treatments can leave large areas of dead standing vegetation that are not visually appealing.

Long-term Impacts

As with R2, the herbicide applications in this alternative *could* be used to treat deciduous plant species, depending on the Management Approach Alternative and Vegetation Selection Alternative paired with this alternative. The long-term impact of treating deciduous species would be similar to the impacts of R2 and of management approach MA2, Promotion of Low-growing Plant Communities (deciduous species controlled, low-growing plant communities developed, and maintenance activity impacts becoming less intense). Broadcast applications would be more likely used for corrective action treatments where large, dense stands of deciduous vegetation need removal.

Noxious Weeds

The use of biological agents and localized herbicide applications would be the same as with Alternative R2. This alternative would make greater use of broadcast treatments for noxious weeds than for tall-growing vegetation, allowing somewhat more flexibility in controlling noxious weeds. The impacts of the herbicide application itself would be as discussed above; however, because noxious weeds tend to be so invasive, there is little chance of accidentally treating non-target vegetation.

Mitigation Measures

With this alternative, all the mitigation measures listed in **Chapter III** would apply, except those for aerial herbicide application (since aerial would not be used in this alternative).

Alternative R4:
Manual, Mechanical, Biological, Herbicide – *spot, localized, broadcast* ***+ aerial application*** *(Bonneville Preferred alternative)*

Alternative R4 would use would use all methods (manual, mechanical, biological, and herbicide), and all herbicide application techniques (spot, localized, broadcast, and aerial). Most tall-growing vegetation would still be manually removed (cut with chainsaws). Spot and localized herbicide applications would be the most used herbicide application techniques. Aerial herbicide applications would be the next used option. Broadcast herbicide applications would be used very rarely, as would mechanical methods. Noxious weeds would be managed primarily with localized herbicide treatments, with some broadcast, aerial, and biological agent treatments.

Short-term Impacts

The short-term manual and mechanical impacts would be similar to those of Alternative R1. However, because those methods would be used less with this alternative, the associated impacts would also be less. Impacts of spot and localized herbicide applications would be the same as under R2 (except that this alternative would use localized applications somewhat less, so associated impacts would also be less). Impacts of broadcast applications would be the same as those under Alternative R3.

The impacts specific to this alternative would spring from the additional option to use aerial herbicide application. Because aerial applications are relatively non-selective, there is greater potential to treat non-target vegetation and soils. This application also has a greater potential for drift (fine clouds blowing or vaporizing to untargeted areas) than with spot or localized applications. Potential drift slightly increases the potential for water contamination, fish mortality, and wildlife poisoning. Mitigation measures that include no-spray buffers around water bodies and careful consideration of weather before applying should eliminate this risk. Additional impacts would include short-term helicopter or plane noise disturbance of wildlife and residential areas.

Where aerial spraying is used, ground-base vegetation removal is not needed, reducing *physical* damage to non-target vegetation and soils.

Less erosion would occur, as well as associated impacts such as sedimentation to water bodies and wetland or habitat degradation.

Worker exposure to herbicides is actually slightly decreased with this alternative. In the areas treated aerially, fewer workers would be involved and there would be little contact with the herbicides. There would also be some risk of aircraft accidents when flying over or under transmission lines.

The areas that would be treated aerially would not be heavily populated, so potential for public exposure shouldn't increase. However, there is a slight possibility of direct sprays if persons are on remote rights-of-way and cannot be seen by helicopter pilots. Aerial herbicide applications can leave large areas of dead standing vegetation that are not visually appealing.

Long-term Impacts

As with the other herbicide alternatives, the herbicide applications in this alternative *could* be used to treat deciduous plant species, depending on the Management Approach Alternative and Vegetation Selection Alternative paired with this alternative. The long-term impact of treating deciduous species would be similar to the impacts of R2, R3 and of the management approach MA2 (Promotion of Low-growing Plant Communities). Aerial applications would be more likely used for corrective action treatments where large, dense stands of deciduous vegetation need removal.

Noxious Weeds

The use of biological agents and localized herbicide applications would be the same as with Alternative R2. Broadcast treatments would be the same as with Alternative R3. The addition of aerial applications allows the greatest number of noxious weeds to be treated.

Mitigation Measures

With this alternative, all the mitigation measures listed in **Chapter III** would apply.

Consequences of Right-of-way Vegetation Selection Alternatives

This section discusses the impacts specific to the implementation of the Vegetation Selection Alternatives. These alternatives would be paired with any of the right-of-way methods package alternatives that include herbicide use.

Alternative VS1: Noxious Weeds

With Alternative VS1, herbicides would be used only to treat noxious weeds. The impacts associated with this alternative would be the beneficial impacts of being able to treat noxious weeds, reducing potential infestation impacts on vegetation, agriculture, and wildlife.

Potential impacts of herbicide use would be limited to only those areas of noxious weed treatment. Because herbicides would not be used on deciduous species, there would be environmental impacts associated with the increased maintenance needed to clear densely vegetated areas.

Alternative VS2: Noxious Weeds & Deciduous

The environmental impacts associated with Alternative VS2 include those associated with the use of herbicides in areas with noxious weeds and deciduous species. Impacts would be due to herbicide use, reducing potential noxious weed infestations, and being able to lessen maintenance activities through deciduous species control.

Alternative VS3: Any Vegetation

Alternative VS3 allows herbicide use to be an option to treat any vegetation. This alternative would include the beneficial impacts of reducing potential noxious weed infestations and being able to lessen maintenance activities through deciduous species control. Impacts associated with herbicide use would be greatest with this alternative because herbicides would probably be used more. Worker safety impacts from physical injury could be lessened with this alternative; herbicide treatment could be used where manual cutting might be dangerous (i.e., steep terrain).

Consequences of Electric-yard Alternatives

This section discusses the impacts specific to the implementation of the Electric Yard Program Alternative

Alternative E1: Herbicide Treatment

Under this alternative, pre-emergent herbicides would be used most frequently, with some infrequent use of post-emergent herbicides, weed burners, steamers, and selective hand-pulling.

The main environmental impacts from this alternative would occur if herbicides were to migrate off-site and into surrounding areas or water bodies. Pre-emergents tend to be persistent (remain active for a long time).

If herbicides were to move out of the application area (slight potential for runoff or leaching), non-target vegetation could be affected, water bodies or groundwater could be contaminated, and fish and wildlife could be affected. Mitigation measures, such as following weather restrictions, label instructions and buffer requirements would limit potential off site movement.

Worker exposure during application of herbicides could cause health impacts.

Mitigation Measures

With this alternative, all the mitigation measures for herbicide use listed in **Chapter III** would apply.

Consequences of Non-electric Program Alternatives

This section discusses the impacts specific to the implementation of the Non-electric Program Alternatives. The difference between the alternatives is whether herbicides are used to manage vegetation.

Alternative NE1: Mixed Methods with Herbicides

Under this alternative Bonneville would continue to contract landscaping services, maintain landscaping manually, use herbicides to suppress weeds, and apply fertilizers.

No environmental impacts would occur from hand hoeing, clipping, or weed pulling. If herbicides were to move off-site, through runoff, leaching or drift, vegetation and water resources could be affected. Noise and air pollution could occur from lawn mowers, weed whackers, and leaf blowers. Workers would be exposed to health and safety risks when applying herbicides and operating tools and equipment.

Alternative NE2: Non-herbicide Methods

No herbicides would be used under this alternative. Vegetation would be controlled using only manual methods, mechanical methods where needed, and fertilizer.

Because noxious weeds are difficult to control without the use of herbicides, the potential for noxious weeds to spread would increase under this alternative. Vegetation would have to be managed more frequently under this alternative, and visual quality could be degraded if the management cycle is too long. Noise and pollution could occur from lawn mowers, weed whackers, and leaf blowers. Workers would have some potential to be hurt with sharp objects such as clippers, and to experience back injuries from hoeing or weed pulling.

Cumulative Impacts

Cumulative impacts are defined as the effects on the environment that result from the incremental impact of the proposed action, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR § 1508.7).

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In this EIS, the cumulative impacts are the impacts of a Bonneville vegetation management program, together with impacts of other actions taking place throughout the Northwest.

Forest management, construction, and agricultural activities can cause impacts similar to those of the alternatives in this EIS. Because rights-of-way are linear in nature and spread out over a large geographical area, a vegetation management program would contribute relatively minor impacts when considered together with other actions in the region. For example, soil compaction that may occur where heavy equipment is used may increase erosion and diminish soil productivity. However, compared to erosion and diminished soil productivity caused from construction, farming, or logging activities, impacts caused by the vegetation management would be negligible.

The following is a description of the potential cumulative impacts that could occur from the vegetation management program when added to past, future, and reasonably foreseeable actions.

Cumulative impacts on **vegetation** include decreased plant diversity, colonization of noxious weeds in disturbed sites, the increase of trees prone to windfall along forest edges, and potential herbicide damage on non-targeted plants. **Soils** impacts include increased erosion, increased landslide potential, and reduced soil productivity.

Water bodies could be affected cumulatively through increased surface water runoff and water temperatures, reduced nutrients in water, potential groundwater and surface water contamination, and potential wetland degradation. **Fish and other aquatic species** could be affected through cumulative habitat degradation from decreased water quality (usually less than 300 m [985 ft.] of any stream is typically affected).

Cumulative impacts on **wildlife** include harassment, degraded or modified habitat (most affected in forested areas where habitat can be fragmented and thermal cover lost), and potential wildlife poisoning.

Agriculture could be affected by noxious weed and nuisance plant invasion, and crops could be damaged by potential herbicide movement off target areas. There could be additional impacts on **timber** production from potential herbicide damage on timber trees. **Recreationists** can be temporarily disturbed and displaced, diminishing recreational experiences.

Residential, Commercial, and Industrial resources can be further affected with temporary noise disturbances, conflicts with adjacent property owners' landscaping needs or desires, and increased potential for local herbicide contamination.

Additional impacts on **USFS- and BLM-managed lands** involve including various management needs and conflicts, and making appropriate amendments or changes to existing USFS and BLM resource management plans in order to gain consistency.

Cumulative impacts on **Tribal lands** include encroachment on Tribal rights to traditional use activities on ceded lands and usual and accustomed areas, and potential inconsistency with Tribal land use plans. Impacts on **City, County, and State lands** involve potential conflicts with land use plans.

Cumulative impacts on **cultural and historic resources** include potential damage to or exposure of archeological sites, harm to plants with traditional cultural value, visual intrusions on places of traditional cultural value, and temporary noise impacts in areas of traditional cultural value.

Additional **health and safety impacts** would be due to potential physical injury, and health risks from exposure to exhaust, gases, herbicides, and smoke. **Visual resources** impacts would arise from additional changes in visual contrasts and landscape appearance (most notable in forested areas). Short-term and localized dust and exhaust emissions would temporary increase in particulate emissions, reducing **air quality**.

Social and economic resources are further affected through contribution to employment (benefit), minor impacts on commercial production of crops or forestlands, and contributions to open space and green-belt vegetation in urban areas.

Effects of Short-term Uses of the Environment on Long-term Productivity

NEPA requires that EISs consider the effects of short-term uses on long-term productivity. Short-term uses of the environment are those that occur as discrete events or that can occur on a year-to-year basis. Bonneville's vegetation management program is an assortment of short-term uses: cutting vegetation or treating it to control its growth around facilities.

Long-term productivity refers to the capability of the land to provide resources for future generations. The very existence of the power facilities excludes some land from being used for any other production (in the case of substations or maintenance sites) or certain agricultural production such as timber (on transmission-line rights-of-way). The short-term use of vegetation management on these facilities tends to exclude other uses on the land. Long-term productivity has already been affected with the existing facilities, and the use of the vegetation management program does not enlarge the amount of affected land.

Irreversible and Irretrievable Commitment of Resources

Irreversible commitment of resources refers to the use of non-renewable resources such as minerals and petroleum-based fuels. Bonneville's vegetation management program would use some petroleum-based fuels for vehicles and equipment.

Irretrievable commitment of resources is that commitment that results in the lost production or use of renewable resources, such as timber or rangeland. The vegetation management program would not increase any such commitment beyond what has already occurred through the building of the facilities.

Adverse Effects that Cannot Be Avoided

Alternatives presented in this DEIS for the vegetation management program would have few unavoidable adverse effects. This DEIS has included recommended mitigation measures (see earlier discussions in this Chapter and in **Chapter III**) to avoid or reduce adverse environmental effects. The primary effect that could be considered adverse—limiting the growth of plants within and around the facilities—is intrinsic to the vegetation management program. This is not a choice in this DEIS: it was set forth when the facilities were built. Hand-in-hand with the construction of the facilities came the responsibility that they would have to be maintained, with vegetation kept a certain distance away, with diversity and successional changes affected, and the height of the vegetation controlled.

An adverse effect related to any of the alternatives would be the temporary disturbances of wildlife and their habitat in localized areas from increased human activity during vegetation maintenance activities. The presence of humans in an area is enough to disturb many wildlife species. Any of the methods that would be available for use could potentially disturb wildlife and their habitat in localized areas.

Other possible adverse effects depend on the method used to control the vegetation. With this dependence there is a question of whether or not the effects would be avoidable. For instance, vehicle traffic and some types of mechanical clearing can cause adverse soil compaction in certain soil types. It is possible that the soil compaction could be avoided by using other methods in the areas susceptible to soil compaction or by using equipment such as walking brush-cutters that disturb soils minimally.

List of Preparers and Reviewers

BRUCE ALLEN, Realty Specialist, Special Uses /USDA Forest Service, Region 1. Responsible for: content review. Education: BA History, BFT Foreign Trade. Experience: special use grants, hydroelectric projects; in Special Uses since 1983.

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List of Agencies, Organizations, and Persons Sent the EIS

The project mailing list contains names of more than 1300 interested and affected individuals, Tribes, utilities, public officials, interest groups, businesses, landowners, libraries, media, and local, state and Federal agencies. They have received information on the project. They were given information on how to receive all project information made available so far and will have an opportunity to review the Draft and Final EIS.

Congressional

U. S. Senate

Senator Max Baucus
Senator Conrad Burns
Senator Larry Craig
Senator Slade Gorton
Senator Michael Crapo
Senator Patty Murray
Senator Gordon Smith
Senator Ron Wyden

U. S. House of Representatives

Representative Rick Hill
Representative Helen Chenoweth
Representative Jack Metcalf
Representative Earl Blumenauer
Representative Davis Wu
Representative Greg Walden
Representative Brian Baird
Representative Jay Inslee
Representative Michael Simpson
Representative Peter DeFazio
Representative Richard Hastings
Representative Darlene Hooley
Representative George Nethercutt
Representative Norman D. Dicks
Representative Jim McDermott
Representative Jennifer Dunn
Representative Adam Smith

Federal Agencies

Department of Agriculture

Forest Service

Ashton Ranger District
Avery Ranger District
Barlow Ranger District
Beaverhead DeerLodge National Forest
Bly Ranger District
Boise National Forest
Bridger Teton National Forest
Butte Ranger District
Cabinet Ranger District
Caribou National Forest
Central Zone, Coeur D'Alene
Challis Ranger District
Chetco Ranger District
Clackamas Ranger District
Cle Elum Ranger District
Clearwater National Forest
Coeur D'Alene Kaniksu St Joe National Forests
Columbia River Gorge National Scenic Area
Colville National Forest
Crescent Ranger District
Crooked River National Grassland
Deerlodge National Forest
Deschutes National Forest
Detroit Ranger District
Devil's Garden Ranger District, Modoc National Forest
Doublehead Ranger District, Modoc National Forest
Fisher River Ranger District
Flathead National Forest
Fortine Ranger District
Fremont National Forest
Gallatin National Forest
Hood Canal Ranger District
Hood River Ranger District
Hungry Horse Ranger District
Idaho City Ranger District
Idaho Panhandle National Forest
Intermountain Region, Ogden
Island Park Ranger District
Jackson Ranger District
Kettle Falls Ranger District
Kootenai National Forest
Lake Wenatchee Ranger District
Libby Ranger District
Lochsa Ranger District
Lolo National Forest
Lost River Ranger District
McCall Ranger District
McKenzie Ranger District
Methow Valley Ranger District
Missoula Ranger District
Modoc National Forest
Mon & Challis National Forest
Moose Creek Ranger Station
Mount Baker Snoqualmie National Forest
Mount Hood National Forest
Mountain Home Ranger District
New Meadows Ranger District
Ninemile Ranger District
North Fork John Day Ranger District
Northern Region, Missoula
Ochoco National Forest
Okanogan National Forest
Olympic National Forest
Pacific Northwest Region, Portland
Palisades Ranger District
Payette National Forest
Plains/Thompson Falls Ranger District

Prospect Ranger District
Rogue River National Forest
Salmon & Challis National Forests
Siuslaw National Forest
Skykomish Ranger District
Sullivan Lake Ranger District
Superior Ranger District
Targhee National Forest
Teton Basin Ranger District
Three Rivers Ranger District
Townsend Ranger District
Umatilla National Forest
Wallowa-Whitman National Forest
Wenatchee National Forest
Willamette National Forest
Winema National Forest
Wise River Ranger District
Yankee Fork Ranger District
Zigzag Ranger District

Natural Resource and Conservation Service

California State Conservationist
Idaho State Conservationist
Oregon State Conservationist
Washington State Conservationist
West Regional Conservationist
Wyoming State Conservationist

Department of Interior

Bureau of Land Management

Burley District Office
Burns District Office
Butte District Office
Coos Bay District Office
Eugene District Office
Idaho State Office
Lower Snake River District
Lakeview District Office
Medford District Office
Missoula Field Office
Oregon State Office
Platte River Resource Area
Prineville District Office
Rock Springs District Office
Roseburg District Office
Salem District Office
Spokane District Office
Upper Columbia - Salmon/Clearwater Districts
Upper Snake River District
Vale District Office
Wenatchee Resource Area

Bureau of Indian Affairs

Colville
Portland
Salish Kootenai
Seattle
Yakama
Warm Springs

Bureau of Reclamation

Boise Project Office
Grand Coulee Project Office

Fish and Wildlife Service

Region 1 Headquarters
Eastern Washington Ecological Services Office
Montana Ecological Services Office
Oregon State Office
Sacramento Office
Idaho State Office
Western Washington Office
Wyoming Ecological Services Office

Department of Commerce

National Marine Fisheries Service

Department of Defense

Corps of Engineers, Fort Lewis

Department of Energy

Battelle Labs
Hanford
Los Alamos National Labs
Tennessee Valley Authority
Western Area Power Administration

Environmental Protection Agency

Seattle Region X

Regional Agencies

Northwest Power Planning Council
Columbia River Inter-Tribal Fish Commission

Tribal Government

Alturas Rancheria
Blackfeet Tribe
Burns Paiute Tribe
California Indian Basket Weavers Association
Cedarville Rancheria
Chehalis Business Council
Coeur D'Alene Tribe
Confederated Salish & Kootenai Tribes of the Flathead Reservation
Confederated Tribes of the Colville Reservation
Confederated Tribes of Coos, Lower Umpqua & Siuslaw Indians
Confederated Tribes of the Grande Ronde Tribal Council

Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Coquille Indian Tribe
Cow Creek Band of Umpqua Indians
Cowlitz Indian Tribal Office
Fort Bidwell Reservation
Fort McDermitt Tribal Council
Hoh Tribal Business Community
Hoopa Valley Tribal Council
Jamestown S'klallam Tribal Council
Kalispel Tribe
Klamath General Council
Kootenai Tribe
Lower Elwha Community Council
Lummi Business Council
Makah Tribal Council
Muckleshoot Tribal Council
Nez Perce Tribe
Nisqually Indian Community Council
Nooksack Indian Tribal Council
Pit River Tribe
Port Gamble S'klallam Tribe
Puyallup Tribe of Indians
Quileute Tribal Council
Quinault Indian Nation
Samish Indian Tribe
Sauk-Suiattle Tribal Council
Shoshone Bannock Tribes of Fort Hall
Shoshone Paiute Tribes of Duck Valley
Siletz Tribal Council
Skokomish Tribal Council
Spokane Tribe of Indians
Squaxin Island Tribal Council
Stillaquamish Board of Directors
Summit Lake Paiute Tribal Council
Suquamish Tribal Council
Swinomish Indian Tribal Community
Tulalip Board of Directors
Upper Skagit Tribal Council
Yakama Indian Nation

State Government

California

Department of Agriculture and Weed Control
State Clearinghouse

Idaho

Governor Dirk Kempthorne
Senator Jack Riggs
Senator John Sandy
Senator Denton Darrington
Representative Shirley McKague
Representative Paul Kjellander
Representative John Stevenson
Representative JoAnn Wood
Representative Larry C. Watson
Council on Industry & Environment
Department of Extension Services
Department of Fish & Game
Department of Lands
Department of Water Resources

INEL Oversight Program

Montana

Governor Marc Racicot
Representative John Cobb
Representative Doug Mood
Department of Agriculture and Weed Control
Department of Natural Resources
Local Government Energy Office
Legislative Environmental Quality Council

Oregon

Governor John Kitzhaber
Senator Bill Fisher
Senator David Nelson
Representative Ken Messerle
Department of Agriculture, Weed Control
Department of Fish & Wildlife
Department of State Lands
Public Utilities Commission
Utility Safety & Reliability
Committee on Indian Services

Washington

Governor Gary Locke
Senator Dan Swecker
Senator Pat Thibaudeau
Representative Dawn Mason
Representative Al O'Brien
Representative Mark Schoesler
Department of Community Development
Department of Ecology, Environmental Review Section
Department of State Lands
Energy Facility Site Evaluation Council
Extension Service, County of Benton
Extension Service, Cowlitz County
Extension Service, Ferry County
Washington Conservation Committee/Ecology

Wyoming

Governor Jim Geringer
Wyoming Federal Land Policy Office, State Clearinghouse
Department of Agriculture and Weed Control

Local Government

California

City of Alturas
Modoc County

Idaho

City of Idaho Falls
Bingham County
Bonneville County Weed Board
Bonner County

Boundary County
Butte County
Cassia County
Clearwater County
Custer County
Elmore County
Fremont County
Gem County
Idaho County
Jefferson County
Kootenai County
Latah County
Minidoka County
Nez Perce County
Teton County

Montana

City of Missoula
Broadwater County
Deer Lodge County
Flathead County
Gallatin County
Granite County
Jefferson County
Lake County
Mineral County
Missoula County
Powell County
Ravalli County
Sanders County
Silver Bow County

Oregon

City of Albany
City of Ashland
City of Cascade Locks
City of Drain
City of Eugene
City of Portland
Tualatin Valley Irrigation District
Benton County
Clackamas County
Clatsop County
Columbia County
Coos County
Crook County Weed Board
Curry County
Deschutes County
Douglas County
Gilliam County Weed Board
Harney County
Hood River County, Weed & Pest Division
Jackson County
Jefferson County, Public Works
Klamath County
Lake County
Lane County
Lincoln County
Linn County
Marion County
Morrow County
Multnomah County
Polk County
Sherman County
Tillamook County
Union County
Wasco County, Weed & Pest Division
Wheeler County
Yamhill County

Washington

County of Adams, Weed District
Asotin County Noxious Weed Control Board
County of Benton, Weed Board
Chelan County
Clallam County
Clark County
Columbia County Weed Board

Cowlitz County
Douglas County
Ferry County
Foster Creek Conservation District
Franklin County Noxious Weed Control Board
Garfield County Weed Board
County of Grant, Weed District
Grays Harbor County
Jefferson County
King County
Kitsap County
County of Kittitas, Weed District
Klickitat County Weed Control Board
Lewis County
Lincoln County
Mason County
Okanogan County
Pacific County
Pend Oreille County
Pierce County
Skagit County
Skamania County
Snohomish County
Spokane County
Stevens County
Thurston County
Umatilla County Weed Control
Washkiakum County
Walla Walla County
Whatcom County
Whitman County
Yakima County
Foster Creek Conservation District
Intercounty Weed District
Methow Valley Irrigation District
South Columbia Basin Irrigation District
South Douglas Conservation District

Wyoming

County of Jackson

Businesses

Blake Environmental
Technician Services
Boise Cascade Corporation
Cascade Natural Gas Corporation
Jones & Stokes Associates Inc
Krugel & Associates
MCI Telecommunications
Monroe Telephone Company
North State Telephone Company
Northwest Pipeline Corporation
Oregon Telephone Corporation
Pacific Gas Transmission Company
The Gas Company, Los Angeles

Libraries, Repositories, and Universities

California State Library
Eastern Washington University
Humboldt State University Library
Idaho State University, Oboler Library
Lewis-Clark State College Library
Oregon State Library
Oregon State University, State Extension Service
Oregon State University, Department of Forest Science
Portland State University, Branford Price Millar Library
Shasta County Library
State of Idaho Library
State of Idaho Supreme Court Law Library
State of Washington Regional Depository Library
University of Idaho Library
University of Montana, Mansfield Library
University of Montana, Montana Tech Library
University of Oregon, Department of Geography
University of Oregon, Law Library
Utah State University, Merrill Library
Washington State Library
Washington State University, State Extension Service
Wyoming State Library

Electric Utilities

Blachly Lane County Cooperative Electric Association
Canby Utility Board
Douglas County PUD
Douglas Electric Coop Inc
Grant County PUD
Grays Harbor County PUD
Idaho Power Company
Jefferson County PUD
Kittitas County PUD
Kootenai Electric Cooperative Inc
Lewis County PUD
Lincoln Electric Cooperative Inc
Mission Valley Power
Pacific Gas & Electric Company
PacifiCorp
Pend Oreille County PUD
Sacramento Municipal Utility District
Salem Electric
Sierra Pacific Power Company
Skagit County PUD
Snohomish County PUD
Springfield Utility Board
Stevens County PUD
Vigilante Electric Coop Inc

Interest Groups

Alliance for the Wild Rockies
Association of Idaho Cities
Association of Idaho Counties
Association of Oregon Counties
Association of Washington Cities
Audubon Society, East Lake Washington Chapter
Central Washington Farm Crops Association
Columbia Gorge United
Defender of Wildlife
Ducks Unlimited, Western Regional Office
Edison Electric Institute
Edwall Lions
Electric Power Research Institute
Farmers for Preservation of Wildlife
Federation of Western Outdoor Clubs
Friends of the Earth Northwest
Grassroots for Multiple Use
Heritage Resource Center Coach House
Hillsboro Kiwanis
Idaho Conservation League
Idaho Farm Bureau
Idaho League of Women Voters
Idaho State Historical Society
Idaho Wildlife Federation
Illinois Valley Historical Society
Interior Columbia Basin Project
Intermountain Forest Association
Intermountain Forest Industries Association
International Right-of-way Association
International Society of Arborists (Utility Arborist Association)
Intertribal Timber Council
Keizer Chamber of Commerce
Kittitas Valley Irrigation Association
Klamath Forest Alliance
Lady Lions, Blackfoot
Lane County League of Women Voters
League of Oregon Cities
League of Women Voters of Oregon
Molson Grange No 1069
Montana Association of Counties
Montana League of Cities & Towns
Mount Angel Lions
National Audubon Society
National Conservation Service
National Wildlife Federation
Native Plant Society of Oregon
Nature Conservancy, Idaho
Nature Conservancy, Oregon
Nature Conservancy, Washington
Northwest Coalition for Alternatives to Pesticides
Northwest Environmental Watch

Northwest Farmers Union
Northwest Forestry Association
Northwest Timber Association
Oregon Cattlemen's Association
Oregon Council Federation of Flyfishers
Oregon Farm Bureau Federation
Oregon Natural Desert Association
Oregon Natural Resources Council
Oregon State Federation of Garden Clubs Inc.
Oregon State Grange
Oregon Trout
Oregon Wildlife Federation
Oregon Women for Agriculture
Oregon Women for Timber
Oregonians for Food & Shelter
Salmon Valley Chamber of Commerce
Save Our Ecosystems, Inc.
Sequim Chamber of Commerce
Sierra Club, Boise
Sierra Club, Cascade
Sierra Club, Kalispell
Sierra Club, Northern Rockies
Sierra Club, Oregon
Sierra Nevada Forest Protection Campaign
Society of America's Foresters
Southern Oregon Citizens Against Toxic Sprays
Southern Oregon NW Coalition for Alternatives to Pesticides
State Grange, Washington
Trout Unlimited, Northwest
Trust for Public Lands
Twisp Chamber of Commerce
Washington Association of Counties
Washington Association of Wheat Growers
Washington Cattlemen's Association
Washington Forest Protection Association
Washington Native Plant Society
Washington State Audubon Society
Washington State Grange
Washington State Society of American Foresters
Weiser Chamber of Commerce
Wetlands Conservancy
Wilderness Society
Wildlife Society, Idaho
Wildlife Society, Washington

Individuals

Erwin Bergman
Maura Doherty
Randy Knight
C. Fox
K. O. Rosenberg
Fonya Lee Morris
Logan Norris

Media

Billings Gazette
Casper Star-Tribune
Idaho Statesman
Oregonian
Seattle Times

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GLOSSARY AND ACRONYMS

Glossary

Adaptive Management Areas (AMAs): areas especially designated by the U.S. Forest Service under the Northwest Forest Plan [Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl; April 1994]

Adjuvants: wetting agents, sticking agents, stabilizers or enhancers, thickening agents, and so on, used to enhance the usefulness of herbicides.

Allelopathic: used to describe an interaction between plants, one of which produces a chemical that keeps other plant(s) from establishing themselves nearby.

Backline: the line painted on trees (on or off the right-of-way) that encompasses most of the trees that could fall or bend into a transmission line or that the line could swing into. The line is placed where most of the trees inside the line are dangerous to the transmission line and most of the trees outside the line are safe. All the trees inside the backline would be cut (including safe trees). Individual "danger trees" would then be marked and cut outside of the back line. A "full safe" backline is a line that encompasses all the trees mentioned above. In this case the line would be painted around all the "danger trees" and all trees within the line (including safe trees) would be cut.

Best Management Practices (BMPs): a practice or combination of practices that is the most effective and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

Bioaccumulation: the accumulation of a substance in a living organism.

Biodiversity: a measure of the number of different species in a given area' species richness.

Biological methods: control of vegetation through the planned release of insects that like to feed on undesirable vegetation, and/or through promoting the growth of low-growing vegetation. Also, release of **plant-eating insects or pathogens** (agents such as bacteria or fungus that can cause diseases in target plants) and fostering of low-growing plant communities[1].

Blading: using a steel blade or steel fork attachment on a tracked or rubber-tired vehicle that removes vegetation through a combination of pushing and/uplifting motions.

Compaction: the result of rolling, tamping, or use of heavy equipment on soil. Soils becomes hardened, difficult to cultivate, and impermeable to air and water.

Corrective action: the vegetation management needed on a right-of-way where the target vegetation is tall and dense

Corridor: a strip of land forming a passageway for transportation or utility facilities.

Critical habitat: an area with the physical or biological features essential to the conservation of a threatened or endangered species and that may require special management consideration or protection

Cultural resources: a general term frequently used to refer to a wide range of archeological sites, historic structures, museum objects, and traditional cultural places.

Cumulative impact: according to the Council on Environmental Quality Regulations, "cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of who or what undertakes such actions.

Danger trees: trees that could potentially grow, fall, or bend into the lines from the area next to the right-of-way. They are picked for removal based on the tree's overall condition; the ground around it; the tree species; and any other defect that might cause the tree to be "unstable" and more likely to fall into our transmission line.

Diversity (species): See Biodiversity.

Edge effect: a place where two differing habitats meet, in this case as created when a transmission line is built and maintained over time. This 'edged effect" is beneficial for those animals that live in the forest but like to use adjacent open areas such as a right-of-way for foraging and hunting.

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[1] Promoting low-growing plant communities is classified as a "biological" method in this EIS. It can also be considered a "cultural" method or a "prevention" method.

Endangered species: (see Threatened and endangered species)

Fault: an unintentional short-circuit in a power system, due to a breakdown in insulation and causing abnormal current flow.

Flashover: a disruptive discharge through the air around or over the surface of an insulator. Can result from a lightning surge on a conductor.

Floodplain: that portion of a river valley adjacent to the stream channel that is covered with water when the stream overflows its banks during flood stage.

Girdling: cutting a ring around the trunk of the tree deep into the cambium layer, killing the tree but leaving it standing (see also **Snag**)

Ground mat: a metal grid is buried under substation soil; it protects people from being shocked or injured by electricity "attracted" to a body by the difference in electric potential.

Growth regulator(s): substances that slow or stop the growth of plants (as compared to herbicides, which kill plants)

Herbicide: a chemical substance used to kill, slow, or suppress the growth of plants

Herbicide uses/application:

Aerial spray aerial herbicide applications treat large areas that usually have heavy, dense vegetation needing control, steep slopes that make other methods unsafe, or poor road access. This would frequently include rights-of-way thick with tall-growing vegetation and/or noxious weeds. Aerial applications are always made during the growing season. Herbicide drift is controlled by immediate shut-off devices, close monitoring of weather conditions, and the use of adjuvants to enlarge and weight the herbicide droplet size. Spray may be made by fixed-wing aircraft or by helicopter.

Backpack spray an herbicide spray device worn as a backpack by a worker. Used where localized or spot treatment is needed (not for broadcast application).

Bare-ground (treatment) (1) as a localized treatment, via backpack sprayer, ATV or tractor with a handgun, treats the *ground or soil* to keep any vegetation from growing, rather than treating the vegetation itself. The herbicide used can be in liquid or granular formulations. This technique is used in places like substations and around wooden poles. ***(2)*** as a broadcast treatment, herbicide is sprayed by ATV or tractor with a handgun, or by trucks with mounted booms. As with bare-ground localized treatments, this application treats the ground or soil to keep vegetation from growing.

Basal (treatment) a method of localized treatment. Using a squirt bottle or backpack, workers apply herbicides at the base of the plant (the bark or stem from the ground) up to knee height. The herbicide is usually mixed with an oil carrier to enhance penetration through the bark, and applied to the point short of run-off. These treatments can be done during the dormant season or active growing season.

Broadcast this category of herbicide applications treats an area, rather than individual plants. It is used on rights-of-way with heavy density of stems, for noxious *weeds, and in electrical yards.*

Cut-stubble treatment a broadcast treatment method. Herbicide is sprayed from a truck with a mounted boom over large swaths of freshly mechanically cut areas. It is intended to keep plants from resprouting.

Foliar ***(1)*** "low-volume" foliar is a localized treatment method. using a backpack sprayer, all terrain vehicle or tractor with a handgun, workers apply herbicide to the foliage of individual or clumps of plants during the growing season, just enough to wet them lightly. A relatively high percentage of herbicide is used mixed with water. Thickening agents are added where necessary to control drift. Dyes may also be added to see easily what areas have been treated. ***(2)*** "high-volume" (broadcast) treatments are applied by truck, ATV, or tractor with handgun, broadcast nozzle, or boom. Foliage and stems of target vegetation are sprayed with a mixture of water and a low percentage of herbicide.

Granular ***(1)*** "localized" granular application means that granular or pellet forms of herbicide are hand-applied to the soil surface beneath the driplines of an individual plant, or as close to a tree trunk or stem bases as possible. Herbicide is applied when there is enough moisture to dissolve and carry the herbicide to the root zone—but not so much water that it washes the granules off-site. ***(2)*** "broadcast" granular herbicide is spread by hand, belly grinder, truck or tractor over a large area, such as in an electrical yard, or around tower legs.

Injection treatment a method of spot treatment. Herbicide is injected into the tree around the base.

Localized treatment the treatment of individual or small groupings of plants, normally used only in areas of low to medium target-plant density. See **basal, foliar, granular, and bare-ground** applications.

Notch treatment a method of spot treatment. Herbicide is squirted or sprayed into notches or cups chopped around the base of individual trees or shrubs.

Spot a spot application treats plants using the smallest amount of herbicide possible. The two methods are (1) stump treatment and (2) injection and notch treatment.

Stump (treatment) a method of spot treatment. Herbicide is applied by hand (squirt bottle) or backpack to freshly cut stumps of broadleaf trees and shrubs to prevent resprouting.

Host-specific: insects that feed *only* on a target plant and will not switch to crops, native flora, or endangered plant species when the target vegetation becomes scarce.

Integrated Vegetation Management (IVM): a strategy to control unwanted vegetation by considering the use of all suitable control methods within the context of the whole environment (ecosystem). An array of control methods is used, and methods are chosen based on the vegetation needing control and the environmental conditions present. The goal is to have the most benign overall long-term effect on the ecosystem.

Late successional (reserves) (areas): areas set aside for long-term protection as old-growth forest

Leaching: for this EIS, to move through or from one medium (such as the ground) by the percolating action of water

Lop and scatter: this method cuts (or *lops*) off the branches on two sides of a fallen tree by ax or chainsaw, so the tree trunk lies flat on the ground. The trunks are usually cut in sections. The cut branches are then scattered on the ground, laid flat, and left to decompose.

Low-growing plant communities: a dense population of relatively short plants (e.g., grasses, shrubs, forbs, herbs) that can "out-compete" trees and tall-growing brush for sunlight and nutrients, thereby reducing the presence of trees. Low-growing plants shade the ground and absorb available moisture, making it harder for the trees to germinate underneath the shrubs or to grow up through the low-growing plant cover. This is essentially vegetation "self-management."

Managing vegetation: cutting or killing vegetation, disposing of vegetative debris, and reseeding or replanting vegetation.

Manual methods: the removal or cutting of vegetation using the hand or hand-held tools such as saws, or by burning or steaming it, or by girdling a tree (see **Girdling**)

Mechanical methods: the removal or cutting of vegetation using larger mowing-type equipment on rubber-tired or –tracked tractors.

Microbes : a minute life form; a microorganism.

Mitigation: steps taken to lessen the effects predicted for each resource as potentially caused by a vegetation management program. They may include reducing the impact, avoiding it completely, or compensating for the impact.

Native plant/Native species: species of plants, animals, or birds that originated in a given ecological area. Native plants or species are often best adapted to a given area.

Non-native species: species that have migrated or been imported into an ecological area. Non-native plants or species may compete for space and nutrients with a (more desirable) native species.

Noxious weeds: plants that are injurious to public health, crops, livestock, land, or other property.

Outage: interruption of the power flow such that electric facilities stop operating.

Pathogen: agents such as bacteria or fungus that can cause diseases in target plants

Program E: the alternative vegetation management program that focuses on electrical facilities

Program NE: the alternative vegetation management program that focuses on non-electrical facilities

Program R: the alternative vegetation management program that focuses on transmission line rights-of-way

Pruning: the removal of selected branches from tree trunks, without felling the whole tree.

Residual/ Non-residual: used to describe herbicides. *Residual* herbicides are soil active products that provide total vegetation control. Some residual herbicides are active for 6 to 8 weeks; others are active for 2 to 3 years. These herbicide are often used to treat the ground in electrical yards and create a constant impact on any vegetation that attempts to grow. By contrast, *non-residual* herbicides do not stay active very long, and are used to kill vegetation that is present when it is applied.

Restricted/non-restricted: Environmental Protection Agency terms applied to herbicides or pesticides. "Non-restricted" pesticide products can be purchased at the local hardware store and used by the general public. "Restricted" products are those that cannot be bought by or used by an untrained person.

Resprouting: the sending out of new, often multiple, branches from the cut surface of the stump of a tree or bush.

Right(s)-of-way (ROW)
an easement for a certain purpose over the land of another, such as a strip of land used for a road, electric transmission line, pipeline, and so on.

Riparian: of, or pertaining to, the bank of a river, stream, lake, or other watercourses. Often applied to the characteristic water-loving vegetation of such an area.

Scoping: an early opportunity for the public to tell a federal agency what issues they think are important and should be considered in the environmental analysis of a proposed federal action.

Sensitive species: those plants and animals identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trend in populations or density and significant or predicted downward trend in habitat capability.

Slash: woody debris left after a tree or trees have been felled.

Snag: a tree, or part of a tee, usually dead, that remains upright. Wildlife and birds often use snags as perches, nesting places, and food sources (insects).

Supplement Analysis: an environmental analysis to help determine if there are substantial changes to the proposal in an EIS or significant new circumstances or information relevant to environmental concerns. Department of Energy Regulations 1021.314(a)

Threatened and endangered species [birds/animals/plants]: the Endangered Species Act provided a means to identify, list, and protect certain species whose low population numbers made them vulnerable to extinction. Endangered species are those species officially designated by the U.S. Fish and Wildlife Service that are in danger of extinction through all or a significant portion of their range; threatened species are those so designated that are likely to become endangered within the foreseeable future through all or a significant portion of their range. Both species are protected by Federal law.

Tier/tiering: as used here, to establish a relationship between a broader environmental investigation and a (usually subsequent) more narrowly focused one, so that the focused statement can reference the previous broad study and not repeat material that has already been discussed.

Topping: removing the top one-third or less of an evergreen tree

Toxicity: Tte quality of potential of a substance to cause injury, illness, or other undesirable effects.

Traditional use plants: native plants associated with traditional cultural practices including sustenance, ceremony, medicine, tools, garments, or other uses.

Turbidity: the extent to which a body of water is muddy or cloudy with particles of sediment stirred up or suspended in it.

Unstable (trees): trees that are diseased, dying, or likely to fail into the transmission line. See **Danger tree**

Volatilization: the evaporation of a (usually liquid) substance into a gaseous form

Wetlands: an area where the soil experiences anaerobic (no oxygen) characteristics because water inundates the area during the growing season. Indicators of a wetland includes types of plants, soil characteristics, and hydrology of the area

Woody debris: materials left over from cutting or harvesting, such as limbs of branches of a tree. Woody debris may be placed in stream channels to slow and divert water flow and improve habitat for fish.

Acronyms

Units of Measure

ac.	**acre** 1 ac.	[metric equivalent: = 0.4 ha]
cm	**centimeter** 1 cm	[English equivalent: = 0.4 in.]
ft.	**foot/feet** 1 ft.	[metric equivalent: = 0.3 m]
ha	**hectare** 1 ha	[English equivalent: = 2.5 ac.]
in.	**inch** 1 in.	[metric equivalent: = 2.5cm.
kg	**kilogram** 1 kg.	[English equivalent: = 2.2 lbs.]
km	**kilometer** 1 km	[English equivalent: = 0.6 mi.]
kV	**kilovolts**	
LC50	**lethal concentration 50**	
LD50	**lethal dose 50**	
lb.	**pound** 1 lb.	[metric equivalent: = 0.45 kg]
m	**meter** 1 m	[English equivalent: = 3.3 ft.]
mg	**milligram** 1 mg.	[English equivalent: = 0.015432 grains]
mi.	**mile** 1 mi.	[metric equivalent: = 1.8 km]
mph	**miles per hour**	
ppm	**parts per million**	
yr.	**year**	

Terms and Titles

AMA	Adaptive Management Area
ATV	All-terrain-vehicle
BLM	Bureau of Land Management

BMP	Best Management Practices
Bonneville	Bonneville Power Administration
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
Corps	US Army Corps of Engineers
CWA	Clean Water Act
CX	categorical exclusion
DEIS	draft environmental impact statement
DOE	U.S. Department of Energy
e.g.	Latin, common shorthand meaning "for instance"
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
et al.	*"et alia"* - Latin for "and the others" in cases where a list of authors is too long to put in the text
et seq.	*"et sequens"* - Latin for "and following"
EXTOXNET	Extension Toxicology Network
FACT	Food, Agriculture, Conservation, and Trade Act
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
GAP	Government Agency Plan
i.e.	Latin, common shorthand meaning "that is"
IPM	Integrated Pest Management
IVM	Integrated Vegetation Management
LS/OG	Late Successional/Old Growth
MA	Management Area
MAD	minimum approach distance
MSDS	Material Safety Data Sheet
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code

NF	National Forest
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NSA	National Scenic Area
OSHA	Occupational Safety and Health Administration
PFS	(Bonneville Power Administration) Pesticide Fact Sheets
PLS	pure live seed
PNW	Pacific Northwest
RCRA	Resource Conservation and Recovery Act
RED	[Environmental Protection Agency] Reregistration Eligibility Decision
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-way
SARA	Superfund Amendments and Reauthorizations Act
SHPO	State Historic Preservation Office
SMZ	Streamside Management Zone
SWPP	Storm Water Pollution Prevention plan
T&E	Threatened and Endangered (species)
TES	Threatened, Endangered, and Sensitive [plants]
TSCA	Toxic Substance Control Act
USFS	U.S. Forest Service [also: USDAFS]
USFWS	U.S. Fish and Wildlife Service
WSSA	Weed Science Society of America

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