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 agricultural 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 agricultural 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 controlling 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.

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[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.