Chapter V: Changes

In response to comments, we made these changes in Chapter V:

- Added a new map showing the Bonneville's current service regions and the counties within the states.
- Added information showing how much of our right-of-way crosses what kinds of vegetation (grasslands, shrublands, etc.).
- Updated the currently listed Threatened and Endangered Species Tables (including adding the newly listed Canadian lynx on Table V-6 and removing the American peregrine falcon from Table V-7).
- Added in a previously missing (unnamed) sole-source aquifer.
- Added discussion of "Other Federal Lands."
- Corrected names in the list of the Tribes on the ten Indian reservations crossed by Bonneville facilities and added list of other Tribes in the Pacific Northwest.

Some small changes were also made to make the document clearer and easier to read. For specific comments and responses, please see Chapter VII.

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. Currently, Bonneville has divided the service territory into seven regions for management purposes. (See Figure V-1, Bonneville Regions.)

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-2 illustrates the Pacific Northwest geography.

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

1) rights-of-way (about 13,740 km or 8,540mi. of corridor) (including access roads),
2) electric yards (about 350 substations and switchyards), 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-3, 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

About 1,360 km (850 mi.) of our corridor crosses **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

Bonneville Regions

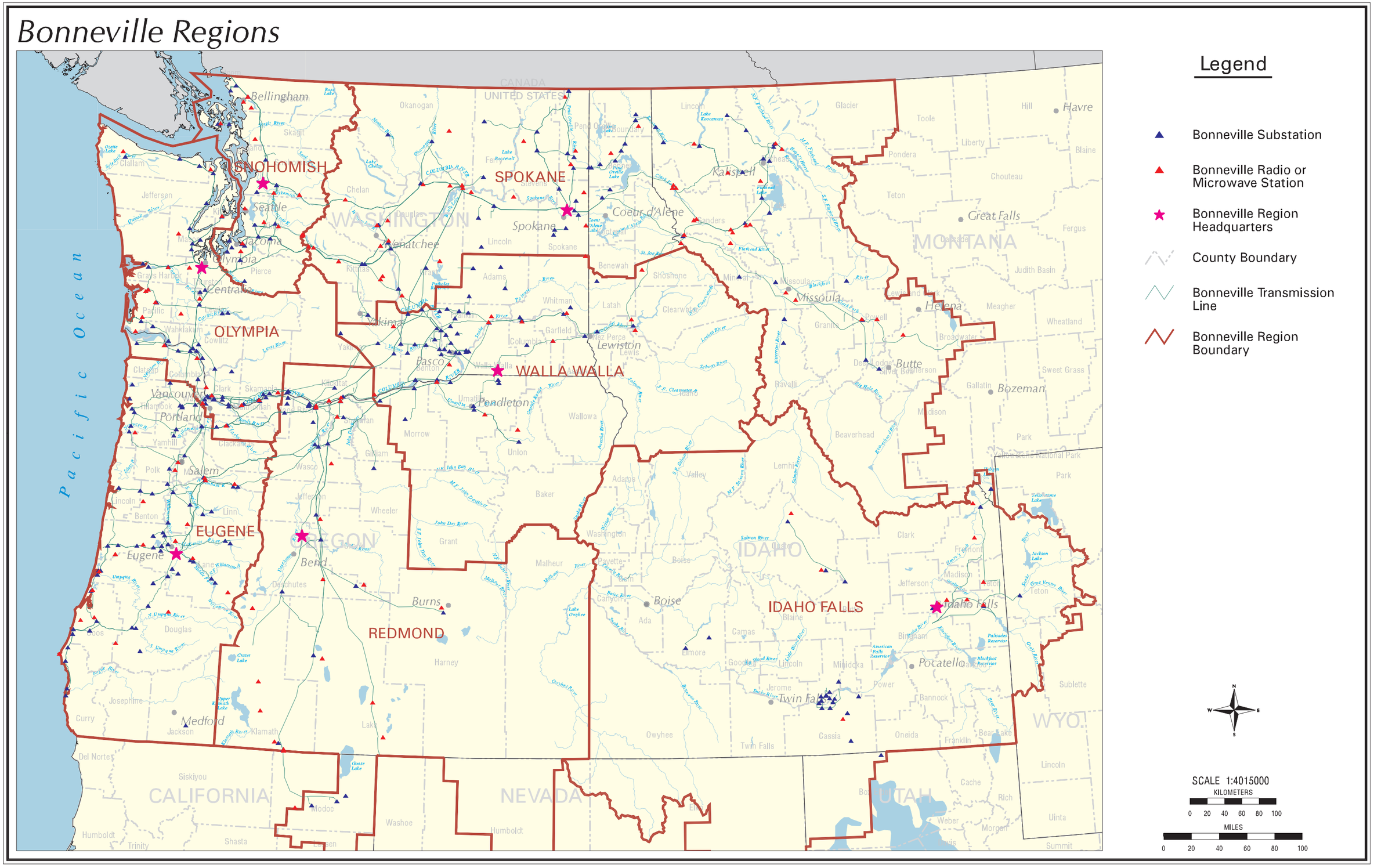
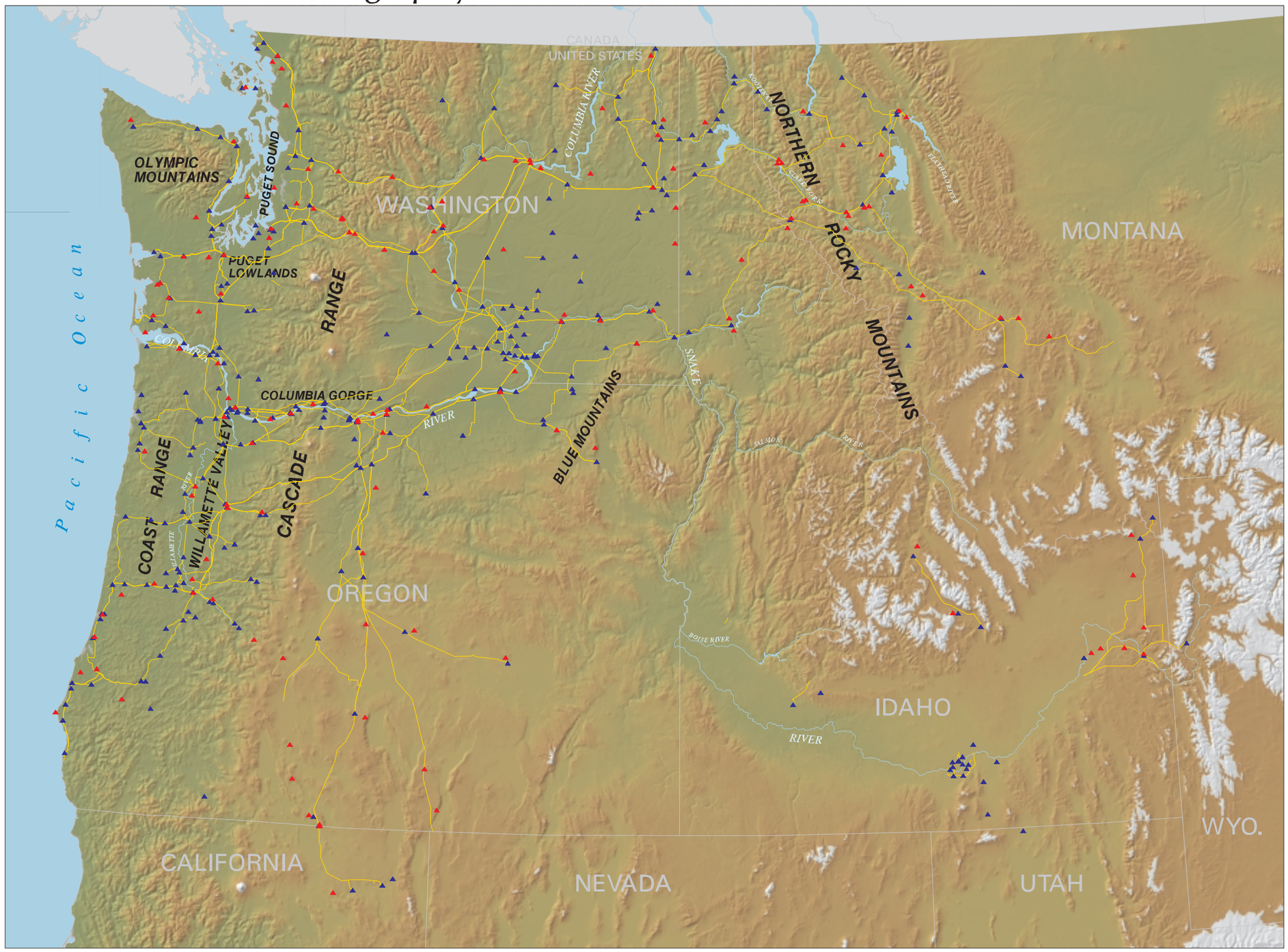


Figure V-1 Bonneville Regions

Pacific Northwest Geography



Legend

- Bonneville Substation
- Bonneville Radio or Microwave Station
- Bonneville Transmission Line

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MILES

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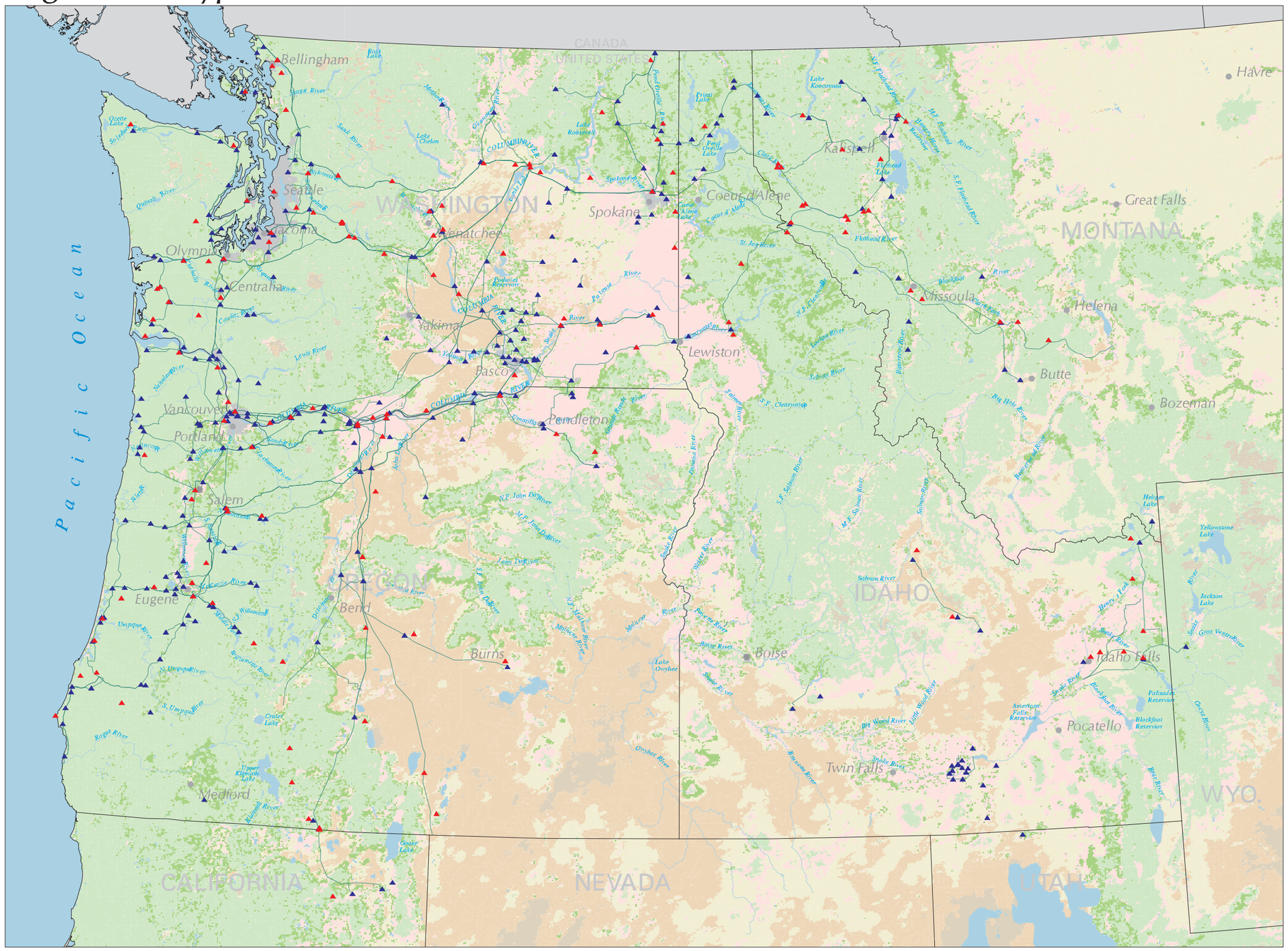
Figure V-2 PNW Geography

Vegetation Type



Legend

- Bonneville Substation
- Bonneville Radio or Microwave Station
- Bonneville Transmission Line
- Urban
- Grassland
- Shrubland
- Agricultural Lands
- Forest - Majority Conifer
- Forest - Majority Deciduous
- Barren or Sparsely Vegetated

Source: Land Cover data from U.S. Geological Survey, EROS Data Center, 1-km land cover characteristics data set, 1992

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Figure V-3 Vegetation Type

eastern Washington, Oregon, Southern Idaho and intermountain valleys of Montana. These communities include orchard grass, ryegrass, Idaho fescue and wheatgrass, as well as forbs that are flowering plants such as yarrow, plantain, Arrowleaf balsamroot and lupine.

Shrublands

About 1790 km (1,120mi.) of corridor cross **shrublands.** These include shrubby areas located on mountains and in low-lying areas, rangeland, and shrub-steppe vegetation. Typically, these areas have few 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, juniper, and willows.

Forests

About 7, 810 km (4,850mi.) of our corridors cross **forested** areas. These 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. It is in forested 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 and Washington	Sitka spruce*, western hemlock*, Douglas-fir*, western redcedar*	red alder*, Douglas-fir*, grand fir*, bigleaf maple*, salmonberry, elderberry	red alder*, western redcedar*, black cottonwood*, Oregon ash*, willows*, huckleberry, salmonberry
Coast ranges, western Cascade range, western Columbia Gorge	Douglas-fir*, western hemlock*, western white pine* (Puget Sound area), shore pine*	red alder*, bigleaf maple*, western hemlock*, snowbrush ceanothus, Douglas-fir*, vine maple, salmonberry, salal, huckleberry	red alder*, western redcedar*, bigleaf maple*, Oregon ash*, willows*, black cottonwood*
Subalpine areas of Cascade and Olympic ranges	silver fir*, mountain hemlock*, western white pine*, noble fir*	subalpine fir*, lodgepole pine*, huckleberry, salmonberry, elderberry, Englemann spruce* (Cascade range)	black cottonwood*, Sitka alder, quaking aspen*, thimbleberry
Eastside Cascade Range, mid-elevations of Blue Mountains	Douglas-fir*, western larch*, ponderosa pine*, lodgepole pine*	lodgepole pine*, western larch*, grand fir*, Englemann spruce*, mountain maple, huckleberry, ceanothus, elderberry	black cottonwood*, paper birch*, quaking aspen*, Sitka alder
Lower east side of Cascade Range, lower elevation of Blue Mountains and western Rocky Mountains	ponderosa pine*, bitterbrush, snowbrush, chokecherry, Idaho fescue, Oregon white oak (eastern Cascades), juniper	bunchgrasses, ceanothus, blackhawthorne	quaking aspen*, lodgepole pine*, black cottonwood*
Rocky Mountains of Northern Idaho & W. Montana (mid-elevations)	Western redcedar*, western hemlock*, western white pine*, ponderosa pine*	grand fir*, Douglas-fir*, birches*, western larch*, lodgepole pine, Sitka alder, thimbleberry	western redcedar*, devil's club, Sitka alder, willows, quaking aspen*
Subalpine areas of northern Rocky Mountains, Blue Mountains, Okano-gan Highlands	Englemann spruce*, subalpine fir*, subalpine larch*, mountain hemlock*	lodgepole pine*, Oregon boxwood, Englemann spruce*, rusty menziesia, huckleberry	black cottonwood*, Sitka alder, elderberry, quaking aspen*, paper birch*
Siskiyou Mountains of Southwestern Oregon	Douglas-fir*, incense-cedar*, sugar pine*, white fir*, tanoak, madrone, ponderosa pine*, Oregon white oak*, golden chinkapin	ceanothus, manzanita, tanoak, Douglas-fir*, Oregon white oak*, golden chinkapin	Oregon ash*, white alder*, bigleaf maple*
Willamette Valley of Western Oregon	Oregon white oak*, Douglas-fir*, grand fir*, ponderosa pine*, western hemlock*	Oregon white oak*, poison-oak, blackberry	black cottonwood*, Oregon ash*, red alder*, willows, western redcedar*

* Indicates tall-growing species.

Threatened and Endangered Plants

Threatened or endangered (T&E) 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 ensure 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-4 (after page 126) shows T&E plant observation areas.

Table V-2: Currently Listed Threatened and Endangered Plants

Common Name	Scientific Name	Status	State
Ute ladies' tresses	*Spiranthes diluvialis*	T	MT, ID, WA
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, ID
Howell's spectacular thelypody	*Thelypodium howllii ssp. Spectabilis*	T	OR

T = Threatened E = Endangered

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

Even though we routinely clear and control vegetation, T&E and sensitive 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 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

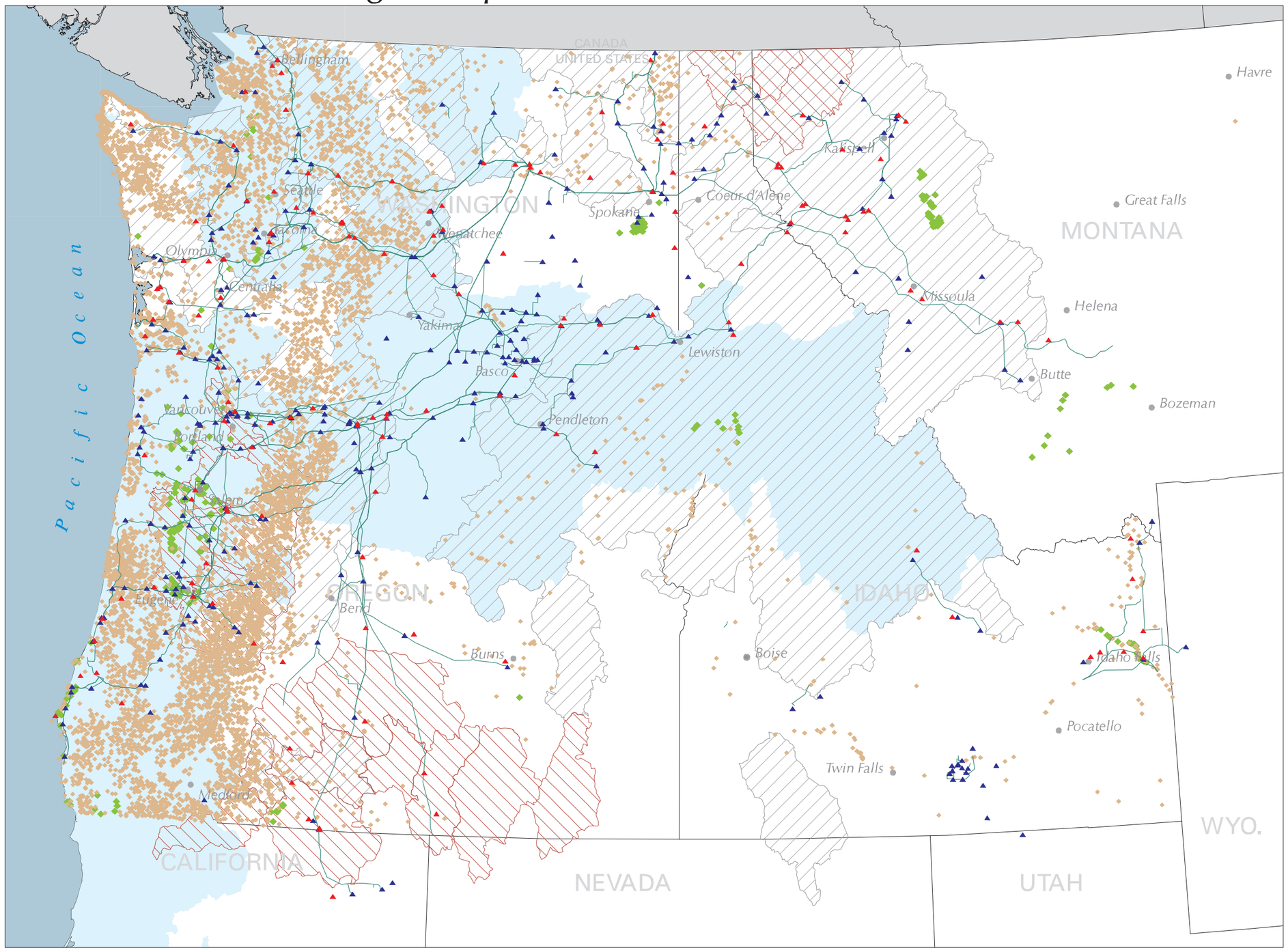
The soil in which vegetation grows is a complex system of physical and biological elements and processes. It is essential for plant life, and has a major role in defining local ecosystems. It is vital for crop, forage, and timber production.

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 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. *(con't)*

Threatened and Endangered Species



Legend

- Bonneville Substation
- Bonneville Radio or Microwave Station
- Threatened or Endangered Plant Observation
- Threatened or Endangered Animal Observation
- Watersheds with Threatened or Endangered Anadromous Fish
- Watersheds with Threatened Bull Trout
- Watersheds with Threatened or Endangered Resident Fish
- Bonneville Transmission Line

Source: Threatened/Endangered observations from State Heritage database of Oregon, Washington, Montana, Idaho, 1998.

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Figure V-4 T&E Species

Type	Description
	The soils often occur at higher elevations in the mountains of Washington, Oregon, and northern Idaho.
Entisols	Soils of relatively recent origins, and 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 could 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 or is adjacent to 10 sole-source aquifers: the Cedar Valley, Central Pierce County, Cross Valley, Eastern Columbia Plateau, Eastern Snake River Plain, 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 and along the Idaho-Oregon and Idaho-Washington borders, as well as the Kootenai, 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 is called non-point pollution. Point pollution [e.g., industrial waste] comes from a defined place such as 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-4 shows watersheds with T&E species.

Sensitive Fish Species

The FS 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. Each state may also have sensitive species lists.

Table V-4: Currently Listed Threatened and Endangered 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
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: Currently Listed Threatened and Endangered Aquatic Invertebrates

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

Common Name	Scientific Name	Status	State
Bruneau Hot Springsnail	*Pyrgulopsis bruneauensis*	E	ID
Snake River Physa Snail	*Physa natricina*	E	ID
Idaho Springsnail	*Fontelicella idahoensis*	E	ID
Vernal Pool fairyshrimp	*Branchinecta lynchi*	T	OR

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.
- **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.

[1] As defined by Thomas (1979).

- **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-4 (after page 126) 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: Currently Listed Threatened and Endangered Mammals

Mammals Common Name	Scientific Name	Status	State
Grizzly Bear	*Ursus 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
Canada Lynx	*Lynx canadensis*	T	OR, MT, WA, ID

Table V- 7: Currently Listed Threatened and Endangered Birds and Insects

Birds Common Name	Scientific Name	Status	State
Western Snowy Plover	*Charadius 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 occidentali*	E	OR, WA
Aleutian Canada Goose	*Branta canadensis leucopareia*	T	OR, WA
Northern Spotted Owl	*Strix occidentalis caurina*	T	OR, WA
Piping Plover	*Charadrius melodus*	T	MT
Insect	**Scientific Name**	**Status**	**State**
Oregon Silverspot Butterfly	*Speyeria zerne 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 FS 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 favorable 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-5 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 FS- 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.

Land Ownership

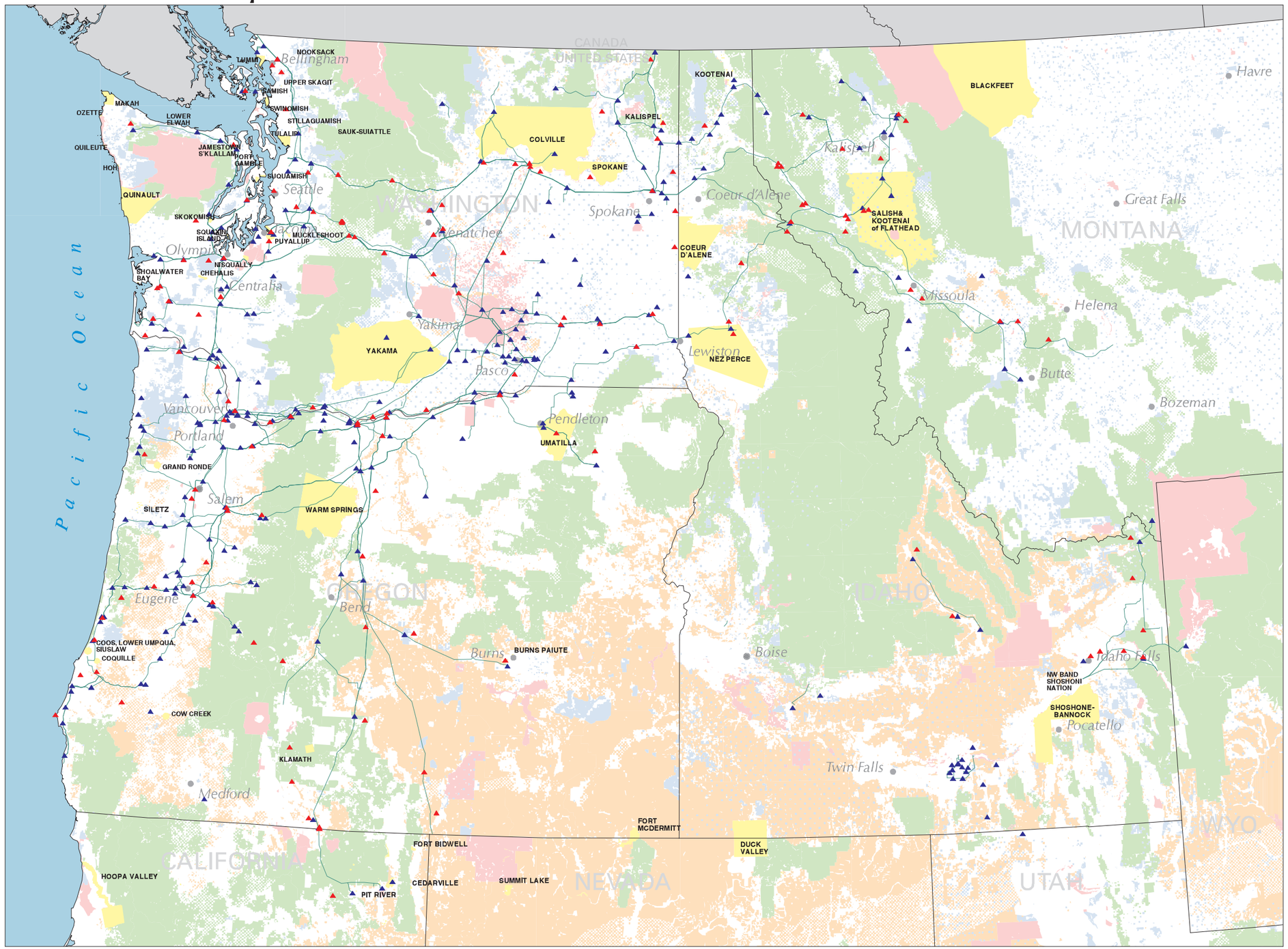
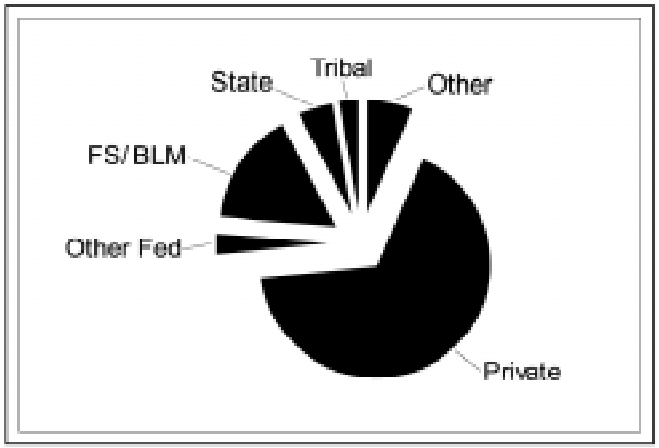


Figure V-5 Land Ownership

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.

Figure V-6: Land Ownership by Percentage along Right-of-way 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**.)

FS- and BLM-managed Lands

About 1368 km (850 mi.) or 16% of Bonneville's transmission-line corridors are located on lands managed by the FS. 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* FS land.

Figure V-7 shows FS- 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 FS 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 FS can be affected by Bonneville's vegetation management of electric facilities

on their lands. The FS and BLM are cooperating on this EIS as a step toward addressing each other's needs.

FS 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 FS requirements vary from Forest to Forest, or District to District for the BLM. Vegetation management projects are covered by several different FS and BLM environmental documents and decisions. The primary documents are noted in **Chapter I** and described in greater detail in **Appendices F and G**, FS and BLM background.

Table V-8: FS National Forests with Bonneville Transmission Facilities

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

BLM- and FS-managed Lands

Figure V-7 BLM- & FS-managed Lands

Forest	State and Forest
Region 6	**Washington** Columbia River Gorge NSA** Colville NF Olympia NF ** Okanogan NF (1 radio sta.) ** Mt Baker - Snoqualmie NF ** Wenatchee NF **
Region 6 (con't)	**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

State	District
Idaho	Lower Snake River Upper Snake River Upper Columbia-Salmon/Clearwater
Washington	Spokane
Oregon	Coos Bay ** Eugene ** Medford ** Roseburg ** Salem ** Lakeview** Burns Prineville Vale
California	Susanville (Substation)
Montana	Butte

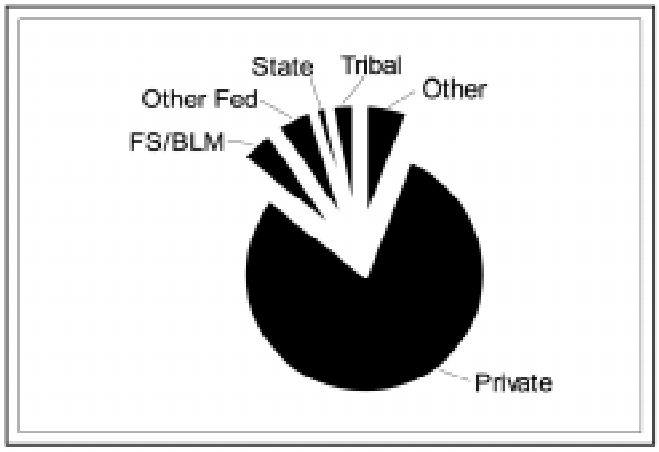
** included in regulations from Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA/FS and USDOI/BLM, 1994b).

Other Federal Lands

Bonneville's facilities are also found on a variety of other Federal lands, including National Recreation Areas, National Grasslands, National Wildlife Refuges, the Fort Lewis Army Base, the Umatilla Army Depot, and the Hanford Nuclear Reservation.

The federal agencies that manage these lands are also required to comply with Federal laws such as NEPA and the ESA. These lands may also have additional plans governing their uses.

Figure V-8: Land Ownership by Percentage around Substation Property



Tribal Lands

Bonneville's facilities also cross the reservations of ten Indian Tribes, as follows:

- Confederated Salish and Kootenai Tribes of the Flathead Indian Reservation,
- Yakama Nation,
- Nez Perce Tribe,
- Nisqually Indian Tribe of the Nisqually Reservation,
- Kootenai Tribe of Idaho
- Confederated Tribes of the Colville Indian Reservation,
- Confederated Tribes of the Warms Springs Reservation,
- Confederated Tribes of the Umatilla Reservation,
- Puyallup Tribe of the Puyallup Reservation, and
- Muckleshoot Indian Tribe of the Muckleshoot 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.

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. Below is a list of Tribal Reservations in the Pacific Northwest (excluding those

Tribes with lands crossed by Bonneville facilities—see list above). Tribal reservations are shown on Figure V-5, after page 140.

Blackfeet Tribe of the Blackfeet Indian Reservation

Burns Paiute Tribe of the Burns Paiute Indian Colony

Cedarville Rancheria of the Northern Paiute Indians

Coeur d'Alene Tribe of the Coeur d'Alene Reservation

Confederated Tribes of the Chehalis Reservation

Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians

Confederated Tribes of the Grand Ronde Community

Confederated Tribes of the Siletz Reservation

Coquille Tribe

Cow Creek Band of Umpqua Indians

Crow Tribe

Fort Bidwell Indian Community of Paiute Indians of the Fort Bidwell Reservation

Fort McDermitt Paiute and Shoshone Tribes of the Fort McDermitt Indian Reservation

Hoh Indian Tribe of the Hoh Indian Reservation

Hoopa Valley Tribe of the Hoopa Valley Reservation

Jamestown S'Klallam Tribe

Kalispel Indian Community of the Kalispell Reservation

Klamath Indian Tribe

Lower Elwha Tribal Community of the Lower Elwha Reservation

Lummi Tribe of the Lummi Reservation

Makah Indian Tribe of the Makah Indian Reservation

Nooksack Indian Tribe

Northwester Band of Shoshoni Nation

Pit River Tribe (includes Big Bend, Lookout, Montgomery Creek and Roaring Creek Rancherias, and XL Ranch)

Port Gamble Indian Community of the Port Gamble Reservation

Quileute Tribe of the Quileute Reservation

Quinault Tribe of the Quinault Reservation

Samish Indian Tribe

Sauk-Suiattle Indian Tribe

Shoalwater Bay Tribe of the Shoalwater Bay Indian Reservation

Shoshone-Bannock Tribes of the Fort Hall Reservation

Shoshone-Paiute Tribes of the Duck Valley Reservation

Skokomish Indian Tribe of the Skokomish Reservation

Spokane Tribe of the Spokane Reservation

Squaxin Island Tribe of the Squaxin Island Reservation

Stillaguamish Tribe

Summit Lake Paiute Tribe

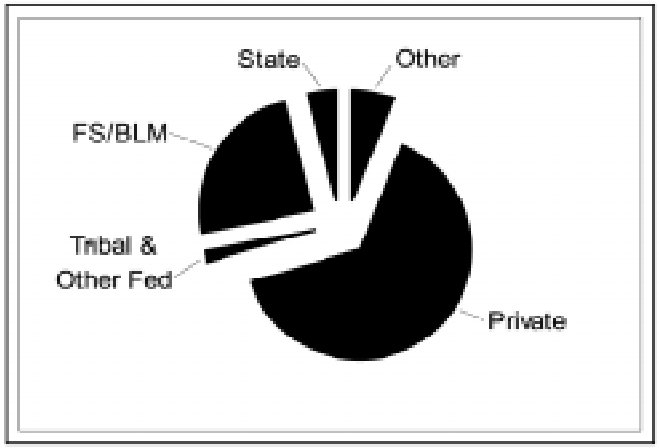
Suquamish Indian Tribe of the Port Madison Reservation

Swinomish Indians of the Swinomish Reservation

Tulalip Tribes of the Tulalip Reservation

Upper Skagit Indian Tribe

Figure V-9: 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 developed by EPA are summarized in **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 neighbor- hoods, 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).

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