Oregon Natural Areas Plan

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CHAPTER 1. INTRODUCTION

The rich diversity of ecosystems and native plants and animals is one of Oregon's most distinctive and valued qualities. Our state contains rain forests, dry forests, oak woodlands, alpine meadows, prairies, deserts, marshes, estuaries, dunes, rocky headlands, lakes and streams. There are a number of reasons it is so diverse. First are the extremes of climate, with rainfall ranging from over 200 inches a year along Oregon’s north coast, to less than 7 inches a year in the Alvord Desert, and temperatures from the very mild banana belt along the coast near the California border to the extremes of the high alpine areas of the Wallowa Mountains. Secondly, Oregon is diverse geographically and geologically, having ancient serpentine landscapes in the Siskiyou Mountains and recent volcanics in the Cascades and the deepest gorge in North America at Hells Canyon. Lastly, Oregon is a floristic crossroads, with arctic boreal species finding their southern limit, Rocky Mountain species common in northeastern Oregon, Great Basin species in southeastern Oregon, and California coastal and Sierra species in the southwest, all mixing with native northwestern taxa to create a wide array of habitats.

Natural Areas

Natural Areas protect the highest quality native ecosystems and rare plant and animal species. Valued for teaching and scientific research, Natural Areas provide a relatively undisturbed setting in which to study native ecosystems and species. Research projects on Natural Areas can provide important answers to statewide land management questions. Native forests, grasslands, tide pools, bogs, and sagebrush communities are protected on Natural Areas in Oregon, as are many of Oregon’s rarest plants and animals.

The Oregon Natural Areas Program History

The Oregon Natural Areas Program in its present form was established by the 1979 Legislature in the Natural Heritage Act (ORS 273.561-.591 [SB 448]), to among other things reinvigorate the natural areas program in Oregon. This legislation was built upon a tradition of natural area inventory and conservation in Oregon. In 1973, the Legislature passed the first natural areas law, the Natural Area Preserves Act, which was the first attempt to engage the state in natural areas conservation. In 1975, scientific professionals and conservationists led by Jerry Franklin of the U.S. Forest Service’s PNW Research Station developed the first Research Natural Area Needs in the Pacific Northwest. This 1975 publication served to guide the establishment of federal natural areas in Oregon until the publication of the first Oregon Natural Heritage Plan in 1981.

After 1979, the Oregon Natural Heritage Information Center (now the Oregon Biodiversity Information Center) staff, along with the Natural Heritage Advisory Council, guided the establishment of natural areas in Oregon with very limited state resources. For the first 14 years of the program, all of the work to establish natural areas was done cooperatively with the Interagency Research Natural Areas committee, an Oregon – Washington partnership staffed by the PNW Research Station, and the natural areas program grew and flourished on federal lands. During this time, no natural areas were established on any state lands in Oregon. After 1993, the Oregon Parks and Recreation Department (OPRD) became the first and only state agency to establish new natural areas. OPRD has since established 10 state park natural areas, and is continually evaluating and acquiring new sites.
The 25-year review of the Oregon Natural Heritage Act and Natural Heritage Program affirmed that natural areas continue to provide important places for public education and baseline research and that it remains important for Oregon to maintain a natural areas program. The review also suggested that the Oregon Parks and Recreation Department is now the best agency to manage the Oregon natural areas program. A description of the program, goals and responsibilities are outlined in this plan.

Goals of the Natural Areas Program

There are three primary goals and three additional principles directing the activities of the Natural Areas Program. The goals are to:

1. Create a discrete and limited system of natural areas representing the full range of Oregon's natural heritage resources. These areas are to be used for scientific research, education and nature interpretation.

2. Establish a process and means for public and private sector voluntary cooperation in the development of a system of natural areas.

3. Provide advice to managers of natural areas on the management and use of such areas and provide information concerning the conservation of natural heritage resources and special species to the state, federal and local agencies that manage lands within Oregon.

The program’s activities are based on the following principles:

1. The Program shall be complementary to and consistent with the Research Natural Area program as implemented on federal lands.

2. All conservation shall be voluntary on the part of the landowner or public land manager. The Program is advisory to those parties.

3. Wherever feasible, a resource shall be protected on public lands allocated primarily to special non-commodity uses, including state and federal parks, natural areas, preserves and wilderness areas, and other areas set aside for conservation purposes.

Natural Areas Plan

The Natural Areas Plan guides the Natural Areas Program’s selection of priority areas for establishment as natural areas. As a first step, the Plan defines the full range of components of Oregon's natural heritage -- the terrestrial, marine, wetland, and aquatic ecosystems that define Oregon's living landscape. Unique geologic formations are included because of their special scientific and educational interest.

In addition to these Natural Resources, the Plan lists special species, including vascular plants, non-vascular plants, vertebrates, and invertebrate animals that need attention in order to survive as components of Oregon's natural heritage.

The Plan also establishes criteria for the selection of natural areas suitable for: 1) inclusion on the Oregon Register of Natural Heritage Resources, 2) dedication as a Natural Area, 3) designation as a Research Natural Area, and 4) inclusion in another designated public or private reserve.

Since so many lands in Oregon have natural values and potential importance for conservation, criteria are needed for selection of a limited number of areas containing the highest natural values. The Plan provides landowners and public land managers with tools to voluntarily designate and protect priority areas. Guidelines for the management of these conservation areas should be consistent with those developed for the research natural area program on federal lands.
There is no requirement to update the Oregon Natural Areas Plan. However, it is anticipated that the plan will be updated every ten years to include new scientific concepts related to natural areas, and to evaluate the effectiveness of the program.

Interagency Strategy for the Pacific Northwest Natural Areas Network

In 2009, the Interagency Research Natural Areas committee published a strategic plan for the Natural Areas Program in Oregon and Washington (Wilson et al. 2009). This document outlines a clear vision which the Oregon Natural Areas Program and the Heritage Advisory Council have adopted. Much of this document is incorporated directly into this 2010 Oregon Natural Areas Plan, including the vision statements identified in each of the strategy chapters.

Key Terms and Definitions

The following terms and definitions are used throughout this Plan:

Aquatic and Wetland Ecosystems -- Distinct freshwater aquatic environments, equivalent to "Aquatic Types" as used in the Oregon Natural Heritage Act, and Wetlands and Deepwater habitats, as defined by the U.S. Fish and Wildlife Service (Cowardin et al. 1979). This category includes wetlands, streams, rivers and lakes. Marine and Estuarine aquatic ecosystems are treated separately.

Biodiversity -- The full range of variety and variability within and among living organisms and the ecological complexes in which they occur. The concept of biodiversity encompasses ecosystem processes, species diversity and genetic variation.

Ecoregion -- A geographic area with characteristic features such as climate, geology, geomorphology, soils, ecosystem processes, and natural assemblages of plants and animals.

Ecosystem -- An assemblage of integrated organisms plus the local environment supporting them. Ecosystems generally have consistent dominant species, food chains, and nutrient flows. Ecosystems in the Natural Areas Plan can vary in size from local plant communities, such as a twenty acre silver sagebrush flat, to a 20,000 acre wetland complex.

Elements -- The basic units of Oregon's ecological and geological heritage. Elements are generally either plant communities, ecosystems or geological formations listed in the Plan as Natural Heritage Resources, or special species.

Geologic Formations -- The rocks and sediments deposited in distinct environments (formations) or the landforms formed by distinct biological, chemical, and/or physical processes (features). These features or formations have been grouped into elements that indicate when they were formed or deposited.

Invasive Species -- Also referred to as exotic species, these are plants or animals occurring in Oregon as a result of introduction or unnatural range expansion. These are species that disrupt natural ecosystem processes and did not occur in Oregon before the arrival of European culture.

Native Species -- Any species known to occur in Oregon before the arrival of European culture or which has moved into Oregon through natural range extension.
**Natural Area** -- A natural area is an area of land managed for scientific research and education, containing important biological or physical attributes. In Oregon, these are lands that are established by an agency or organization for conservation or education.

**Natural Heritage Resources** -- The Terrestrial Ecosystems, Aquatic and Wetland Ecosystems, Special Species and Geological Formations included in the Natural Areas Plan.

**Oregon Register of Natural Heritage Resources** -- A registry maintained by the Natural Areas Program of significant natural areas, voluntarily managed in ways that protect one or more natural heritage resources.

**Plant Community** -- A general term for an assemblage of plants which grow together at a site, which often show an association or affinity to each other or to a particular set of environmental conditions. A plant community type is a set of plant communities with similar structure and floristic composition.

**Representation** -- The inclusion of an element in a natural area identified according to the guidelines of the Plan. The central goal of the Heritage Program is to assure that each element is adequately represented, but without unnecessary duplication.

**Research Natural Area (RNA)** – Natural areas established by federal agencies under the plan of the Pacific Northwest Research Natural Area Committee. The Oregon Natural Areas Program is, in effect, the state counterpart of the federal program.

**Special Species** -- Animal and plant species considered to be of conservation interest because of their rarity or vulnerability to extirpation or extinction, or because they are under-represented in the statewide system of protected natural areas.

**Terrestrial Ecosystem** -- The name given to an assemblage of land-based species in a given locale, possessing some degree of interrelationship, generally reflected in consistency in dominant species and environment. This term is roughly equivalent to the term "Plant Community Type" as used in the Natural Heritage Act or “Plant Association” as defined in the National Vegetation Classification System. It more accurately reflects the interest in all components of the ecological system rather than merely the dominant plant species.
CHAPTER 2. DESIGNING A NATURAL AREA NETWORK

Vision

A network of natural areas is designed to include the full diversity of ecosystems, species and geologic features in Oregon, which complements other natural areas in the Pacific Northwest, while recognizing that each site is a dynamic ecosystem that will change over time.

Element Approach

Oregon's natural diversity consists of thousands of plants and animals interacting with each other and with their physical environment. To come up with a way to identify and describe this diversity, natural area scientists have identified the elements of diversity (Figure 1).

At the broadest level, an element can be a plant association or an ecosystem, such as a Douglas-fir/swordfern forest, an Idaho fescue dominated prairie, or a sphagnum bog. If a comprehensive list of all species which occur in the complete list Oregon’s plant associations were compiled, the list would contain most of Oregon’s native species.

However, some individual species (such as the Willamette Valley daisy or the pygmy rabbit) are rare or occur only locally. Because these species may not be protected using the ecosystem approach alone, the Natural Areas Program identifies them as special species and classifies them as elements in their own right. An element, therefore, as used in this Plan, is commonly a plant association or an ecological system, but may also be a rare species or a geologic formation. The goal of the natural areas plan is to insure examples of all elements native to Oregon are included in at least one natural area.

Figure 1. Diagram of Element Types Used in the Natural Areas Plan
Ecoregional Approach

Ecoregions are geographic areas with similar features, such as climate, vegetation, geology, geomorphology, soils, and ecosystem processes. Ecoregions generally have characteristic natural communities as well as typical plant and animal species. The State of Oregon has adopted the ecoregional concept as a way to evaluate environmental health, having used them in the State of the Environment Report (2000) and in the Oregon Department of Fish and Wildlife’s Conservation Strategy (2009), and the Oregon Watershed Enhancement Board uses them to identify conservation acquisition priorities. The Natural Areas Plan uses ecoregions to define the different types of natural areas needed for research and education.

Currently, the state and the Natural Areas Program recognize eight terrestrial ecoregions in Oregon, based on the map developed by the Environmental Protection Agency Research Lab in Corvallis (Thorson et al. 2003). The EPA map includes a small part of a ninth ecoregion in Oregon, the Snake River Plains. This has been combined with the Basin and Range Ecoregion for this Plan, since the area found in Oregon is so small. A new Marine – Estuarine region covering the coast and bays has been developed for this plan as well. Figure 2 shows a map of the nine ecoregions used in the plan. A brief description of each ecoregion’s ecology, biology and uses is included at the beginning of each ecoregion chapter.

![Figure 2. Ecoregions of Oregon used in the Natural Areas Plan](image-url)
Ecological Elements and Plant Associations

The ecological units in the Natural Areas Plan are plant associations based on the National Vegetation Classification System (NVCS - Jennings et al. 2008). The Oregon Biodiversity Information Center was one of many programs that helped develop this classification, which is now posted at the NatureServe Explorer website (http://natureserve.org/explorer). This defines a plant association as “a vegetation classification unit defined on the basis of a characteristic range of species composition, diagnostic species occurrence, habitat conditions, and physiognomy.” The Oregon Biodiversity Information Center maintains a comprehensive list of plant associations known from Oregon, available online at http://orbic.pdx.edu/documents/pclist_2004.pdf. Descriptions of most of these associations are also available on NatureServe Explorer.

Unfortunately, only terrestrial, wetland, and riparian vegetation types are included in the NVCS. For aquatic ecosystem types, estuarine types and marine types, no classification has been officially adopted for the United States. As a result, the Natural Areas Plan has selected the classification that is best developed and most widely accepted in Oregon. In 2010, a final draft of marine and estuarine classification was proposed by the National Oceanic and Atmospheric Administration (NOAA) and NatureServe, currently available for review at http://www.csc.noaa.gov/benthic/cmecs/CMECS_S_doc.pdf. State agencies are attempting to implement this in Oregon, and we have used this as the basis for some of the types in our new Marine-Estuarine Ecoregion.

Oregon’s Natural Areas Plan seeks to identify a “discrete and limited system” of natural areas that will represent the full range of Oregon’s natural diversity. The core of the Natural Areas Plan is the list of ecological communities or plant associations that have significant occurrences within each Ecoregion, included in Part 2 of the plan. These are identified to ensure that the full range of biological diversity in each Ecoregion is represented in the network of natural areas. When Oregon’s interagency system of natural areas includes at least one good example of each plant association in a protected area, then the primary goal of the Natural Areas Plan will have been achieved. As this goal is approached, agencies can work to ensure there are places where baselines or controls to study management actions can be established and where all of Oregon’s ecosystems and species can be studied or visited.

Common plant associations often are important in more than one Ecoregion, and they are listed in the Plan in each of these Ecoregions. For example, "Ponderosa pine/snowberry forest" is found in the Blue Mountains, East Cascades, and Northern Basin and Range Ecoregions. This is because some plant associations are wide-ranging, and can vary regionally in ecosystem function, species composition and land management practices. While the dominant species are quite similar, plant associations from different Ecoregions often vary significantly in their complement of associated species.

For simplicity, all ecological elements, including terrestrial, aquatic and marine types, will be referred to as plant associations throughout the remainder of this plan. This does not alter the fact that only wetland, terrestrial and riparian vegetation types have defined plant associations to date.
Identifying Plant Associations for Defining Natural Area Needs

Oregon's plant associations or ecosystem elements are included in the Natural Areas Plan when:

1. They have been defined in the literature or proposed by scientists or managers, and are determined to represent a significant part of Oregon's natural heritage.

2. They represent unique or local ecosystems which make a significant contribution to biodiversity within the Ecoregion.

Because plant associations typically occur in clusters, several can often be found in a mosaic together. As a result, the number of natural areas needed to protect ecological resources is significantly smaller than the number of plant associations in an Ecoregion. As resources become rarer, it becomes more difficult to find such clusters.

Various scientific references were consulted to develop the resource lists in the plan. All major sources are included in the bibliography, which is based on an updated comprehensive collection of scientific literature maintained at the Oregon Biodiversity Information Center. In addition, experts from the region's universities and natural resource agencies as well as knowledgeable individuals were consulted.

Assigning Priorities to Plant Associations in the Plan

Plant Associations are ranked in the Ecoregion ecological element lists in order of priority as high (H), medium (M) or low (L). The primary factor in determining priorities for ecological communities is the risk that plant community may disappear.

The primary characteristics to assess this risk are: 1) rarity of known, high quality occurrences of the element; 2) threat to the occurrences of the type; 3) the ecological fragility or sensitivity to natural or artificial disturbances; and 4) the adequacy and viability of protected occurrences.

The Oregon Biodiversity Information Center uses these same criteria to rank all terrestrial and any defined aquatic plant associations, as well as all native species found in the state. The ranking system is used by Natural Heritage Programs across the U.S. and is maintained by NatureServe. The system ranks elements on both a global and state basis.

The global system uses a scale of G1 to G5, using the four criteria listed above. G1 ranked elements are critically imperiled, while elements ranked G5 are demonstrably secure. Plant associations and native species are also ranked based on their status within Oregon, using the same numbering system. State ranks range from S1 to S5, with S1 including types critically imperiled in Oregon and S5 applied to demonstrably secure Oregon elements.

The priority ranking for plant associations in the Natural Areas Plan is determined by its NatureServe / Natural Heritage rank. The priority values are assigned as follows:

- High Priority = G1, G2 or S1 ranked types
- Moderate = G3, S2 or G4S3 ranked types
- Low = Ranks lower than above

Currently plant associations are only ranked at the state and the global level, which means that the status of an element in an Ecoregion has not been evaluated. Therefore the state and global ranking for a plant association has been applied to all the Ecoregions in which it occurs.
Inventory

To build the desired natural areas network, it is essential to identify the diversity of ecosystems in each ecoregion, and to find examples that are in good enough condition to represent these natural systems. Major partners in Oregon’s Natural Areas Program, the Forest Service, BLM, Oregon Biodiversity Information Center, The Nature Conservancy, Oregon Parks and Recreation Department, continue to work to identify the best potential examples of unrepresented ecosystem types across the state. Recent comprehensive inventories have occurred on the Deschutes and Ochoco National Forests, which allowed for important updates to this plan. However, much inventory work remains to identify the sites needed to create a comprehensive network of natural areas in Oregon.

Determining if a Natural Area Adequately Represents a Plant Association

To achieve the goal of a statewide system of natural areas protecting the full range of Oregon's diversity, areas must be identified with examples of each identified plant association that are of sufficient size and quality to allow for study and education. Three basic criteria are used to decide if a plant association is adequately or only partially conserved at a natural area in which it is found.

1. The Management Intent - Sites are adequately protected if the existing management plan or agency management direction identifies the long-term survival of the plant association at the site as a goal, along with provisions for the site to be protected from human impacts.

2. Quality - A determination should be made that the occurrence of the plant association is large enough and of sufficient quality for research and educational uses.

3. Size or Area – Sometimes, plant associations or species have become so rare that only small occurrences exist at a proposed natural area. In these cases, having partial representation at two or more sites can provide researchers better opportunities for studying these rare elements.

Terrestrial Ecosystem Types

Terrestrial ecosystem types are the most frequently found plant associations. They are organized in the Ecoregion lists by zone, with the zones generally representing the dominant plant species in the canopy. These forest zones were modified from the Yellow Book (Dyrness et al. 1975) which defined the first list of natural area needs for the Pacific Northwest. Adjacent zones containing only a few ecological communities have been combined in certain Ecoregions to simplify the plan.

Aquatic and Wetland Ecosystem Types

There are three types of aquatic or wetland ecosystems that occur in Oregon which are described in this plan:

1. Lacustrine types, which include lakes and ponds;
2. Palustrine types, which include wetlands and bogs; and
3. Riverine types, which include rivers and streams.

The wetland and aquatic ecological communities for these ecosystem types were originally developed at the Aquatic Classification Workshop held in Newport on August 15, 1980. This Workshop used the Yellow Book (Dyrness et al. 1975) as a basis for
the Freshwater classification, and the *Oregon Marine and Estuarine Habitat Classification Systems* (Starr 1979) for the Marine and Estuarine classification. Since then, the lists have been periodically updated or modified.

**Lacustrine** resources are defined as lakes larger than 20 acres (8 hectares) and greater than 6.6 feet (2 meters) at their deepest point. Vegetation growing in aquatic beds such as floating mats and lakeshore marshes are considered lacustrine types. All other wetland vegetation is considered palustrine. The Portland State University Center for Lakes and Reservoirs has the best database of lakes and aquatic weeds and is working to develop an online version of the *Atlas of Oregon Lakes* (Johnson 1985).

**Palustrine** resources are freshwater or alkaline wetlands dominated by emergent trees, shrubs, grasses, sedges, forbs, mosses or liverworts. The Oregon Department of State Lands manages the state wetland program to conserve these resources. They are lakes, ponds and springs smaller than 20 acres (8 hectares) and less than 6.6 feet (2 meters) at their deepest point, as well as intermittent lakes, ponds, springs and playas of these dimensions, but excludes aquatic beds. Riparian areas associated with the immediate margins of rivers and streams are included here. Wetlands have been a major focus of classification and inventory in Oregon. Freshwater wetland ecological communities have been updated from early editions of the plan to conform to the U.S. Fish and Wildlife Service's Classification of Wetlands and Deepwater Habitats of the United States (Cowardin *et al.* 1979), which is now a standard for wetland classification in the United States.

**Riverine** resources represent aquatic types associated with rivers and streams. In the 1981-1993 editions of the plan, riverine resources were identified as a third freshwater aquatic category. However, since there are no standard classifications available to adequately define riverine types, they are no longer included in the Ecoregional lists. While riverine resources are a critical component of Oregon's natural heritage, the inventory and classification information does not exist to identify these elements or to compile a comprehensive list of aquatic ecosystem types. It is hoped that new research by natural resource agencies, non-governmental organizations or universities will lead to a comprehensive classification and map of riverine systems in Oregon.

**Marine and Estuarine Ecosystem Types**

All marine and estuarine ecological elements are compiled in the new Marine and Estuarine Ecoregion. The classification employed is described in detail in this chapter.

**Marine** resources include tidal and subtidal habitats with little or no freshwater dilution. In previous plans, they extended offshore from beaches, headlands and the outer limits of estuaries to the edge of the State of Oregon’s management area, which is three nautical miles seaward of the coastal baseline. In the current plan, the marine area has been extended to the edge of the continental shelf (Figure 2).

Development of policy for management and designation of reserves is overseen by the Ocean Policy Advisory Council (OPAC), and its *State of Oregon Territorial Sea Plan* (1994). The state and OPAC continue to work to establish marine reserves. Previous plans recognized the designations in the Territorial Sea Plan as adequately protecting the elements of biodiversity present in the sites, but this plan includes other designations as well.

**Estuarine** resources are tidal and subtidal waters with occasional to regular freshwater dilution. They extend from the outer limits of open to temporarily enclosed embayments to a point upstream where the effects of ocean-derived salts are negligible. Estuarine resources are well catalogued in the *Oregon Estuary Plan*.
Book, developed cooperatively by the Oregon Department of Fish and Wildlife and the Oregon Department of Land Conservation and Development (ODLCD 1987).

**Ecosystem Process Ecological Elements**

In developing the 1998 Natural Heritage Plan update, the council and natural area scientists identified ecosystem elements to represent major ecological processes, such as fire, wind, floods, insects and pathogens. The council felt that inclusion of landscape or ecosystem process elements within a network of protected areas was of equal importance to protecting a range of vegetation communities based on current vegetation conditions, especially in cases where natural disturbances often maintain or impact ecological conditions. The importance of including landscape level processes is further supported by recent work in landscape ecology.

In both the 1998 and 2003 Natural Heritage Plans, a series of fire ecosystem process elements were described, and included as an important conservation component within the natural areas network. Unfortunately, attempts to establish ecosystem process elements for Research Natural Areas on federal lands were unsuccessful, largely because it became embroiled in a policy debate concerning the role of fire and fire management within natural forests on public lands. It is now apparent that no Ecosystem Process elements will be established in the Pacific Northwest. As a result, these elements and the methodology supporting them have been removed from this plan. The descriptions of ecosystem elements from each Ecoregion in the 2003 Natural Heritage Plan will be published in a separate document, *Ecosystem Process Natural Areas Needs from Oregon* (2011), along with this plan.

**Geologic Formations or Features**

Oregon's geological heritage, which consists of rocks, sediments, and associated features, includes a wonderful geological diversity that illustrates well the richness of Oregon's natural heritage. For example, there are Jurassic shales with finely ornamented ammonites in the Blue Mountain and Klamath Mountain Ecoregions; spectacular Tertiary flood basalts that extend across the 300 mile-width of Oregon from the Columbia Basin Ecoregion to the Marine and Estuarine Ecoregion; explosive, volcanic deposits and features, such as Crater Lake of the Cascades Ecoregion; as well as the Quaternary deposits and features such as the striking, glacial erratics transported from the Rocky Mountains by icebergs during ice-age floods and deposited in the Willamette Valley.

The rocks, sediments, and features of this geological heritage formed in distinct environments or the surface features were sculpted by distinct biological, chemical, and physical processes. These rocks, sediments and features can be defined as geological elements. The geological elements are grouped largely into geological formations and features. Formations represent rocks found in the standard intervals of geologic time that are usually on the order of millions to tens of millions of years. In the Plan these intervals extend from the Devonian (the time interval from about 410 to 355 million years ago) that includes the oldest rocks yet found in Oregon, through the Quaternary, which includes the present time. Features, on the other hand, represent deposits or geomorphic forms whose character has developed over the past two million years (the Holocene time interval) and may be undergoing change today, such as Netarts spit.

These geological elements are similar to the ecological heritage elements in that for the most part, they consist of distinctive assemblages.
They are dissimilar from the ecological heritage elements in that they are organized by time interval, rather than the type of element. Furthermore, even though there are similar time intervals among the different ecoregions, the geological setting and processes that formed the elements (deposits of rock and sediment) of the intervals were usually different. For example, in one ecoregion Tertiary rocks may have formed on land whereas in another ecoregion, the Tertiary rocks may have formed in the sea. As a result, the geological elements are both distinct and characteristic of the different ecoregions.

This 2010 plan is similar to the 2003 plan that represented a major revision developed by the Oregon Department of Geology and Mineral Industries, in cooperation with other university and governmental geologists. However, with the addition of the new Marine and Estuarine Ecoregion a new set of geological elements were defined for the Marine and Estuarine Ecoregion and several geological elements were moved from the 2003 Coast Range Ecoregion to the new Marine and Estuarine Ecoregion.

There are two main principles for including geological features and formations in the following element list of Geologic Types:

1. Certain elements, for instance fragile volcanic features and paleontological sites, are vulnerable to destruction and can be protected by effective natural area management. Paleontological elements will be included in future editions of the plan.

2. Other geological elements are a prominent component of our natural heritage and should be recognized for their educational and interpretive values. This could be accomplished through recognition of the finest features on the State Register of Natural Resources.

"Protection" of a geological element is interpreted more liberally than for biologic communities and species. In many cases a geologic element may not have to be included in a formally designated natural area for it to be considered protected. For instance, in many areas designated for recreation, such as Wild and Scenic Rivers, Wilderness Areas or Parks, geological values are an important factor in their management. However, some geological elements, such as fossil locales or ash flows, can be quite sensitive to disturbance. In these areas, designations designed to protect the element(s) present is desired.

Assigning Priorities to Geological Elements

Geological elements are ranked in the Natural Heritage Resource lists as high (H), medium (M) or low (L) priority. The factors used for assessing geologic elements are somewhat different than the ecological types. The primary factors include the: 1) rarity of known, high quality occurrences of the geologic element; 2) threat to the occurrences of the type; and 3) fragility or sensitivity to natural or artificial disturbances.
**Special Species**

The primary goal of the natural areas program is to ensure that one example of each plant community, geologic formation and species is included in the statewide network of natural areas. The program assumes that all of the common species are likely to be found at least once in the network of natural areas, but that rare or at-risk species may not. Therefore, the program seeks to include examples of rare and at-risk species, or “special species” either on the register or within a natural area if possible.

The Natural Areas Program works with the Oregon Biodiversity Information Center of the Institute for Natural Resources, as well as the Oregon Department of Fish and Wildlife and the Oregon Department of Agriculture, to develop a comprehensive list of special species that need to be included in the Natural Areas Plan. The species included in lists were selected using the most current information available on the distribution and abundance of plant and animal species native to Oregon. The list of taxa in the plan should assist public and private land managers and planners in determining which species are of special concern within their given management jurisdictions. They are also intended for use by amateur and professional botanists and zoologists to help focus their efforts on those taxa most in need of attention.

Species, like ecological and geological elements, are listed within the ecoregions where they occur, and in the protected areas that support them. Only those taxa which are considered to be threatened or endangered in Oregon or throughout their range have been included.

**Special Species List Designations**

**List 1** contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range.

**List 2** contains taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon. These are often peripheral or disjunct species which are of concern when considering species diversity within Oregon's borders. They can be very significant when protecting the genetic diversity of a taxon. Extreme rarity is viewed as a significant threat and as such very rare Oregon taxa are all on this list.

The Oregon Biodiversity Information Center tracks all occurrences in Oregon for any species included on List 1 and List 2, and has a fairly comprehensive database of their locations. The Biodiversity Information Center also maintains two other lists of at-risk species: List 3 and List 4. List 3 is the “Review List”, which includes taxa that could be threatened or endangered, but whose status is currently unclear. List 4 is the “Watch List” of taxa that are rare but apparently stable, or those that are declining but remain too abundant currently to be considered threatened. Taxa on Lists 3 and 4 have not been included in the Natural Areas Plan because they are at lower risk, and because their distributions may not be understood well enough to include them. The comprehensive list of these taxa and the most up-to-date information on their distributions can be found in the most recent edition of *The Rare, Threatened and Endangered Species of Oregon* (ORBIC 2010), available at [http://orbic.pdx.edu/rte-species.html](http://orbic.pdx.edu/rte-species.html).
CHAPTER 3. NATURAL AREA CONSERVATION

Vision

Federal agencies, state agencies, local governments and conservation organizations working together to designate a network of natural areas representing the full diversity of ecosystems in Oregon.

Oregon's natural areas are conserved when landowners or land managers choose to establish a natural area on lands they own or manage. Natural areas can also be permanently protected if a conservation group, state or federal agency buys private land to conserve it. More commonly, it occurs when a state or federal agency designates a site as a natural area in an agency plan. The federal and state agencies rely on different mechanisms, depending on the laws and rules that guide their actions. Descriptions of the agency designations and natural area programs are included in this chapter. In addition this chapter discusses different mechanisms for establishing Natural Areas and outlines various public and private land management designations which together create the statewide system of natural areas.

Natural areas can be conserved voluntarily on private lands, either on a short term basis by an interested landowner, or through a conservation agreement or easement, which has a set time span. Efforts to make it easier for landowners to conserve habitats on their lands and to provide incentives for landowners to restore habitats on private lands have been increasing and are an important focus for the conservation efforts outlined in the Oregon Conservation Strategy. A comprehensive list of incentives for voluntary protection of private lands was produced for the 2003 legislature as part of a legislative workgroup, and is available at: http://www.defenders.org/programs_and_policy/habitat_conservation/private_lands/landowner_incentives/index.php. While these are important for conservation overall, since the first Natural Areas law was passed in Oregon in 1974, voluntary conservation by private landowners has not been an effective method for establishing natural areas.

In Oregon, the majority of natural areas have been established by the Bureau of Land Management and the U.S. Forest Service on federal lands. So, the primary partner in establishing and managing natural areas is the Pacific Northwest Interagency Research Natural Area Committee which works with the federal agencies to establish federal Research Natural Areas (RNAs) on public lands. The Interagency RNA Committee works cooperatively with the Natural Area programs in Oregon and Washington to implement the states’ natural area plans.

The process for establishing natural areas is different for the federal, state and private lands in Oregon, and these are described below. Regardless of the owner, for a site to be designated as a natural area in the state, three steps need to be taken:

1. Search databases and literature at the Oregon Biodiversity Information Center, university libraries, herbaria and other information sources, and contact experts in the scientific and professional community to determine if the site contains species or plant associations needing representation.

2. Visit the site to evaluate the size and quality of the elements present.

3. Make a recommendation to the appropriate oversight group that the area be designated.
Oregon State Agency Natural Area Establishment and Designation

Dedication is the primary mechanism for natural area protection on state lands. The Natural Areas Act states that the Transportation Commission, the Fish and Wildlife Commission, the Board of Forestry, the Board of Higher Education, and the State Land Board “…shall, with the advice and assistance of the Council, establish procedures for the dedication of natural areas on land, the title of which is held by the State of Oregon, and which is under that agency’s management and control.” These established or dedicated sites would be called State Natural Areas.

State agencies can choose to conserve a natural area or dedicate it based on internal staff recommendations, or they can proceed from a recommendation from the Natural Heritage Advisory Council or the Biodiversity Information Center. The Council has adopted model dedication procedures, which are included as Appendix 1 to assist natural resource state agencies in establishing natural areas on their lands. Agencies may wish to further refine these guidelines.

In addition to dedication of state lands, state agencies can either receive gifts of private property or acquire private property to be managed as Natural Areas. The Natural Areas Act clearly states that whenever feasible, areas selected for protection “shall be located on lands which have been allocated primarily to special non-commodity uses.” When the State Parks Commission or another state agency acquires property to protect significant natural heritage values, the Natural Area Program Staff can assist in the development or review of a management plan for the area.

Only properties that have elements included in this natural areas plan and are suitable for dedication would be accepted as state natural areas. The expansion of the state system of Natural Areas to include all of the unrepresented elements that occur primarily on state lands is a long-term goal of the Natural Areas program. The dedication of state lands, the donation of properties, and acquisition of privately owned lands may be necessary to meet this goal.

While natural areas that are dedicated on state lands are assumed to be permanently protected, there are procedures that allow for the Natural Area designation to be removed, or “terminated”. In order to terminate a dedication according to the currently established rules, the agency must first hold a public hearing. There must be adequate public notice and a finding from the hearing that either: (1) there is an "imperative or unavoidable necessity;” or (2) the dedication of the site is no longer needed according to the guidelines of the Natural Areas Plan. Reasons to remove dedication might be that the natural area elements or plant associations that were the basis for designation are no longer present, or another larger or better quality site has been found which better represents the elements and compelling reasons exist to no longer manage the lesser site as a natural area. To date, no state dedicated natural areas have been terminated.

Federal Agency Natural Area Establishment and Designation

Federal agencies have different protocols for establishing natural areas (Research Natural Areas or RNAs) on their lands. Generally federal agencies identify areas which contain unrepresented plant associations or other elements identified in the Oregon Natural Area Plan. These areas are evaluated by staff, boundaries are proposed, alternatives are examined, and a site and site boundaries are selected through the agency’s planning process.

The U.S. Forest Service requires each RNA to be part of formal Forest Management Plans, either through plan revisions or amendments to existing plans. In addition, Establishment Records are created for each RNA. These
records include the justification for establishment, legal boundary descriptions, maps, distinguishing ecological features, environmental analyses, and management issues and guidelines. RNAs become officially established once an Establishment Record is completed and signed by the Region 6 Regional Forester with concurrence by the U.S. Forest Service Pacific Northwest Research Station Director, on behalf of the Chief of the U.S. Forest Service and Secretary of Agriculture.

In Oregon, the Bureau of Land Management (BLM) generally establishes RNAs during updates to their resource management plans (RMPs). The RNA is established when the RMP is approved by the Oregon/Washington BLM State Office. The National Park Service and the U.S. Fish and Wildlife Service follow similar protocols to establish RNAs on their lands.

**Natural Area Protection on Private Lands in Oregon**

Private individuals or organizations may voluntarily designate all or part of their property as a natural area. Until 2009, to do so the property needed to be first included on the Oregon Register of Natural Heritage Resources; this is no longer a requirement. The register is an official list of areas that contain significant natural heritage resources and/or special species. To include a site on the register, the Natural Heritage Advisory Council and the State Land Board must determine that an area is predominantly natural, or has an example of a plant association or species needing conservation.

For the Council to proceed with the site inclusion on the register, the Council needs the written consent of the owner. A private site can be removed from the register if the Council receives a letter from the property owner indicating they no longer wish it registered or if the elements for which it was registered are no longer present at the site. The Council has developed a summary form for all sites nominated for registry (Appendix 1). After the Council reviews the data, it may then recommend the site for inclusion on the register. The State Land Board will then act on this recommendation.

As of June 30, 2010, the Register of Natural Heritage Resources included 93 sites found on both state and private lands. State agencies may choose to register sites, if they would like recognition of the elements presents, and plan to conserve them. The list of all sites on the register is found in Appendix 2. More information on these sites is available from the Biodiversity Information Center.

If a private landowner of a site on the Registry wishes to pursue dedication, the process follows the same outline for state agency dedications. If a private parcel dedication was approved by the Council and executed with the State Land Board, an Instrument of Dedication is provided to the landowner. The Council will assure that this Instrument of Dedication shall be recorded in the office of the clerk of the county in which the property exists. This Instrument may be highly variable in nature.

Private landowners may terminate the dedication at any time in accordance with the procedures outlined in the dedication agreement. Since participation in Natural Areas conservation is entirely voluntary for the private landowner, incentives for the dedication of lands have been established. Landowners who dedicate their property as a Natural Area can apply for and obtain property tax exemptions. If tax exemptions are obtained, back taxes become due if a dedication is terminated. However, aside from conservation organizations which acquire natural areas as part of their mission, no private landowners have yet chosen to dedicate their private property.
Natural Area Designations Included in the Plan

Designations are how most public and some private landowners determine how their lands will be managed. This section outlines the management designations, the level of protection they provide, and the consistency of their management objectives with the goals of Oregon's Natural Areas Program.

There are agencies and organizations not included in the following list that play a role in the identification and protection of natural areas even though they do not themselves manage lands. The Oregon Watershed Enhancement Board provides funding for watershed groups, as well as for easements and acquisitions, both of which can lead to important protections for species and habitats. Federal agencies such as the U.S. Natural Resources Conservation Service, and their local Soil and Water Conservation Districts have an interest in conservation issues and maintain close contact with the agricultural community. Together, these agencies have a very important role to play in conserving nature in Oregon.

In evaluating the level of protection that various agency management designations provide, this plan has adopted criteria from a national effort to develop a protected areas database, called the PAD-US. The project recognizes three main areas which describe how well sites or designations work at protecting diversity. These standard definitions represent the most comprehensive criteria developed to date.

1. Management Intent: The goal or objective of the designation as it relates to the conservation of biodiversity is compatible if not identical with those for managing natural areas. Most sites are designated as 1- conservation focus, 2 conservation compatible, 3 - conservation neutral, and 4 - unknown.

2. Permanence: The length of time the designation is in place. These include permanent, long-term, temporary, and unknown.

3. Effective Management Potential: The ability of the land management entity to implement the intent of the designation. These have to do with agencies having the governance structure, the planning framework, and the resources to manage the property to conserve elements defined in their intent. This was created to address “paper parks” from Central and South America, but can be applied to some private, state and even federal natural areas. This criteria has not been applied in this plan, but will completed in the protected areas database by 2011.

State Agency Designations

State Natural Area (SNA)

*Purpose:* (1) To protect examples of terrestrial and aquatic ecosystems; (2) to serve as gene pool reserves; (3) to serve as benchmarks against which the influences of human activities may be compared; and (4) to provide outdoor laboratories for research and education.

*Administering Agencies:* Department of State Lands, State Parks and Recreation Department, Department of Forestry, Department of Fish and Wildlife, Military Department and Conservation Organizations.

*Management Intent:* Natural Area focused

*Permanence:* Permanent. While state natural areas can be terminated, none have been and they are not likely to be.

*Comments:* Ten sites have been dedicated on state lands to date and several others are currently under consideration.
National Estuarine Research Reserve
(NERR)

*Purpose:* The NERR System is a network of protected areas established for long-term research, education and stewardship. This partnership program between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states protects more than one million acres of estuarine land and water, which provides essential habitat for wildlife, offers educational opportunities for students, teachers and the public, and serves as living laboratories for scientists.

*Administering Agency:* State Land Board via Department of State Lands, supported by NOAA.

*Management Intent:* Natural Area focused

*Permanence:* Permanent

*Comments:* Variable, portions designated as registered or dedicated natural areas are adequately protected, others are not.

**Marine Garden (MG)**

*Purpose:* To provide intertidal areas for enjoyment of or learning about intertidal resources. Marine life in these areas will be protected by prohibiting the taking of shellfish and other marine invertebrates.

*Administrative Structure:* Marine Gardens are a management designation for rocky shores listed in Rocky Shore Management Strategy of the Oregon Territorial Sea Plan. The Oregon Fish and Wildlife Commission designates Marine Garden sites through regulation. The Department of Fish and Wildlife administers regulations for marine invertebrates, shellfish and finfish pursuant to designation. The most current ODFW designations are described in the 2011 Sport Fishing Regulations document (ODFW, 2010). Oregon Parks and Recreation Department (OPRD) could adopt complementary regulations to protect marine algae for rocky intertidal areas within state park boundaries.

*Designation:* Secure for seven sites: Otter Rock, Haystack Rock, Cape Perpetua, Yaquina Head, Cape Kiwanda, Yachats, and Harris Beach.

*Protection:* Fair, not because of regulations but rather from on-site educational and interpretive programs by State Parks or local volunteer organizations that promote stewardship and educate about the regulations. Clear rules are needed to prohibit taking of intertidal marine algae.

**Marine Habitat Refuge (HR)**

*Purpose:* To ensure that various representative areas of marine life in Oregon's rocky shores will be managed to protect natural habitat values and to maintain viable populations of marine plants and animals.

*Administrative Structure:* Marine Habitat Refuges are a management designation for rocky shores listed in Rocky Shore Management Strategy of the Oregon Territorial Sea Plan. The Oregon Fish and Wildlife Commission designates Marine Habitat Refuge sites through regulation of collecting or harvesting marine animal life. The Department of Fish and Wildlife administers regulations pursuant to designation. Oregon Parks and Recreation Department could adopt complementary regulations to protect marine algae for rocky intertidal areas within state park boundaries.

*Designation:* Secure for Whale Cove.

*Protection:* Variable, uncertain, due to lack of access control or on-site monitoring for compliance with regulations by either ODFW or OPRD.
**Marine Priority Rock and Reef (PRR)**

*Purpose:* To designate offshore rocks, islands, or reefs determined to need study or management action.


*Management Intent:* Natural Areas focused

*Permanence:* Permanent

*Comments:* These are inherently protected, there is no management category designated for these sites. However, fishing and collection can occur in these sites under existing laws.

**Marine Research Reserve (RR)**

*Purpose:* To protect and manage areas suitable or being used for scientific study or research including baseline study, monitoring, or applied research.

*Administrative Structure:* Marine Research Reserves are a management designation for rocky shores listed in Rocky Shore Management Strategy of the Oregon Territorial Sea Plan. The Oregon Fish and Wildlife Commission has designated some Marine Research Reserve sites (subtidal and intertidal) through regulation of collecting or harvesting marine animal life. The Department of Fish and Wildlife administers regulations pursuant to designation. Oregon Parks and Recreation Department could adopt complementary regulations to protect intertidal algae within the Ocean Shore State Recreation Area.


*Protection:* Variable, uncertain, due to lack of access control or on-site monitoring for compliance with regulations by either ODFW or OPRD.

**Marine Reserve (MR)**

*Purpose:* To protect areas of Oregon’s seas or adjacent rocky intertidal areas from all extractive activities except as necessary for monitoring and research.

*Administrative Structure:* Marine Reserve sites are recommended by the Ocean Policy Advisory Council, approved by the state legislature, and designated by state agencies, including Oregon Department of Fish and Wildlife.

*Management Intent:* Likely Natural Area compatible; takes an ecosystem approach to conserving marine resources, but still in development.

*Designation:* Pilot reserves have been established for Red Fish Rocks and Otter Rock.

*Permanence:* Objectives are to provide lasting protection, but as this is a new designation these details are yet to be worked out

**Scenic Waterway (SW)**

*Purpose:* To provide examples of wild and scenic rivers.

*Administering Agency:* State Parks and Recreation Department and the Department of Water Resources.

*Management Intent:* Natural Area compatible, but variable, depending on landowner actions, commitment and land management goals.

*Permanence:* Short term only on private lands; the designation is permanent, but no protection implied on state lands.

*Comments:* State, federal, municipal, county or private landowners may register lands upon approval of the Natural Heritage Advisory Council. A few areas have been registered to date.
Federal Agency Designations

Area of Critical Environmental Concern (ACEC)

Purpose: An area within the Bureau of Land Management (BLM) public lands where special management attention is required to protect and to prevent irreparable damage to important historic, cultural or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards.

Administering Agency: USDI Bureau of Land Management

Management Intent: Natural Area focused, in general. A few culturally focused ACECs might be characterized as Natural Area compatible.

Permanence: Variable. Previously, this was thought to be a permanent designation. In 2007 the BLM proposed eliminating all forested ACECs in Western Oregon in the recent Western Oregon Plan Revision (WOPR). Though the WOPR was rejected in 2009, future amendments may also change the protection of these designated areas.

Comments: Not all ecosystems and species contained within ACECs are considered adequately protected in this Plan. However, if an individual site has a management plan which protects natural area values, they can be evaluated separately under this designation. BLM RNA’s represent a subcategory of an ACEC.

National Natural Landmark (NNL)

Purpose: To encourage the preservation of areas that illustrate the ecological and geological character of the United States, to enhance the educational and scientific values of the areas thus preserved, to strengthen cultural appreciation of natural history, and to foster a wider interest and concern in the conservation of the Natural Landmarks Program’s natural heritage.

Administering Structure: USDI National Park Service is responsible for the NNL designation, although the management is dependent on the individual private or public land owner/manager.

Management Intent: Natural Area focused.

Permanence: Temporary. There is no long-term protection for any NNL, although publicly owned sites with this designation are likely to remain protected, given the potential recognition they receive.

Comments: Designation of a National Landmark carries with it no binding restrictions on management or use of the site. It is the equivalent of a national registry program, national recognition of the importance of the site.

National Parks (NP) and National Park Service National Monuments (NM)

Purpose: To preserve the outstanding natural, historical and recreational resources of the United States.

Administering Agency: USDI National Park Service

Management Intent: Natural Area focused.

Permanence: Permanent.

Comments: By and large, all elements within National Parks are considered adequately protected unless they are in an area developed for recreation.

U.S. Forest Service and Bureau of Land Management National Monuments (NM)

Purpose: To preserve the outstanding natural, historical and recreational resources of the US.

Administering Agency: USDI Bureau of Land Management and USDA Forest Service
Management Intent: Variable – either natural area focused or natural area compatible.

Permanence: Permanent.

Comments: Recreation, and occasionally livestock use occur in BLM or USFS National Monuments. As a result, Research Natural Areas will likely be proposed to protect important plant associations present in them.

National Wildlife Refuges (NWR)
Purpose: To provide, preserve, restore, and manage a national network of lands and waters sufficient in size, diversity and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wild lands is enhanced and made available.

Administrating Agency: USDI Fish and Wildlife Service

Management Intent: Variable. Some refuges, and parts of other refuges, are Natural Area focused. Others are Natural Area compatible, and still others are not compatible, with areas farmed or altered to support specific wildlife species.

Permanence: Permanent.

Comments: Establishment of Research Natural Areas with specific management plans within Refuges is considered adequate protection for elements in this plan. There are large areas in wildlife refuges such as Hart Mountain NWR, where the management plan restricts disturbances enough to support long-term research and education. These areas could also support Natural Area conservation.

Outstanding Natural Areas (ONA)
Purpose: An area of unusual natural characteristics where management of recreation activities is necessary to preserve those characteristics.

Management Intent: Natural Area compatible

Permanence: Long-term. These are established in local Resource Management Plans, and can be changed, but they rarely have been.

Comments: These are all designated as ACECs as well as ONAs. The designation in the list of ecosystem elements could read ONA/ACEC for these sites.

Research Natural Areas (RNA)
Purpose: (1) To preserve examples of all significant natural ecosystems for comparison with those influenced by man; (2) to provide educational and research areas for ecological and environmental studies; and (3) to preserve gene pools of typical and endangered plants and animals.


Management Intent: Natural Area focused.

Permanence: Permanent.

Comments: Federal agencies have different protocols for establishing natural areas (research natural areas or RNAs) on their lands. The Forest Service, U.S. Department of Agriculture requires every RNA to be part of formal Forest Management Plans, either through plan revisions or amendments to existing plans. In addition, an Establishment Record is created for each RNA. These records include the justification for establishment, legal boundary descriptions, maps, distinguishing ecological features, environmental analyses, and management issues and guidelines. RNAs become officially established once an Establishment Record is completed and signed by the Region 6 Regional Forester with
concurrence by the Pacific Northwest Research Station Director, on behalf of the Chief of the Forest Service and Secretary of Agriculture.

In Oregon, the BLM generally establishes RNAs during updates to their resource management plans (RMPs). Sites are identified as containing plant associations or other elements identified in the Natural Areas Plan. These areas are evaluated by staff, boundaries are proposed, alternatives are examined, and a recommended alternative is selected. The RNA is established when the RMP is approved by the Oregon / Washington BLM State Office. The National Park Service and the U.S. Fish and Wildlife Service follow similar protocols to establish RNAs on their lands.

Special Interest Areas (SIA)

**Purpose:** To protect, and where appropriate, foster public use and enjoyment of areas with scenic, historical, geological, botanical, zoological, paleontological or other special characteristics. To classify areas that possess unusual recreational and scientific values so that these values are available for public study, use or enjoyment.

**Administering Agency:** USDA Forest Service.

**Management Intent:** Natural Area focused.

**Permanence:** Long-term, to potentially permanent. These are established in a Forest Plan, but can be changed in a forest plan update. The existing plans were to be updated each decade, but have been in place for 25 years.

**Comments:** These areas are managed for recreational use substantially in their natural condition, which may result in variable protection of natural heritage elements. For example, salvage logging may be allowed in SIAs in certain instances. As a result, SIAs are not always considered optimal designations for a natural area.

Wild and Scenic Rivers (WSR)

**Purpose:** To protect the river's aesthetic, scenic, historic, archaeological and scientific features.

**Administering Agencies:** Several agencies, especially the U.S. Department of the Interior

**Management Intent:** Natural Area compatible.

**Permanence:** Permanent

**Comments:** Management plans result in varying degrees of protection of elements, based on the special attributes of the area. Salvage logging and grazing are not necessarily excluded from sites with this designation.

Wilderness Areas (WA)

**Purpose:** Wilderness Areas are devoted to the public purposes of recreational, scenic, scientific, educational, conservation and historical use.

**Administering Agencies:** USDA Forest Service, USDI Bureau of Land Management

**Management Intent:** Natural Area compatible or occasionally focused.

**Permanence:** Permanent

**Comments:** Certain activities which are not compatible with natural area management are permitted in Wilderness Areas, such as heavy recreational use, domestic livestock grazing, or mining. For this reason, the Natural Areas Program and the Research Natural Area Committee continue to try to designate Research Natural Areas within established Wilderness Areas.

Wilderness Study Areas (WSAs) are areas under study for inclusion in the wilderness system. These are usually managed in ways equivalent to Wilderness Areas. In Oregon, grazing and mining rarely occur in Wilderness Areas, so these areas are sometimes used to protect an ecosystem or species element in the plan.
Local Designations

Metro Natural Areas
*Purpose:* To protect and enhance habitat for fish, wildlife and water quality. The natural areas emphasize protection of natural area lands now in urban areas or in areas where development is likely to occur.

*Administering Agency:* Metro Regional Government, City of Portland, other Metro local governments

*Management Intent:* Natural Area focused.

*Permanence:* Permanent

*Comments:* These are generally in urban settings, which while adequately protected, are often influenced by the significant human disturbances surrounding them. As a result, these urban natural areas are rarely used to protect plant associations or species in the plan.

International Designations

Biosphere Reserves
*Purpose:* To conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends.

*Administering Agency:* UNESCO, United Nations

*Management Intent:* Natural Area focused.

*Permanence:* Permanent

Private Organizations

The Nature Conservancy Preserves (TNC)
*Purpose:* (1) To protect examples of high priority terrestrial and aquatic ecosystems, and rare plant and animal species; (2) to serve as gene pool reserves; (3) to serve as benchmarks against which the influences of human activities in similar, disturbed ecosystems may be compared; and (4) to provide outdoor laboratories for scientific research and education.

*Administering Agency:* The Nature Conservancy

*Management Intent:* Natural Area focused.

*Permanence:* Permanent

*Comments:* These areas are privately owned equivalents of Research Natural Areas or State Natural Areas.

The Wetland Conservancy Preserves (TWC)
*Purpose:* (1) To protect examples of high priority wetlands and aquatic ecosystems.

*Administering Agency:* The Wetlands Conservancy

*Management Intent:* Natural Area focused.

*Permanence:* Permanent

*Comments:* These areas are privately owned equivalents of Research Natural Areas or State Natural Areas.
CHAPTER 4. MANAGEMENT AND STEWARDSHIP

Vision

An adaptive, intentional, and science-based approach to management results in a natural areas network that is resilient to threats and environmental changes that will take place over time.

Management Goals and Objectives

The ecosystems represented in the natural areas network today are the result of cumulative effects of both natural and anthropogenic influences over millennia. They are not “pristine” in the sense that they have never been influenced by humans, yet they do represent some of the best examples of ecosystems whose present conditions have been primarily formed by non-human (“natural”) processes. They are also not static, in that these sites will continue to change over time due to both natural and human influences. Scientific knowledge and perceptions of the natural world will also continue to evolve, as will social trends, public needs, and legislative and regulatory direction.

Thus, long-term management strategies will need to be both adaptable and intentional in responding to these ecological and social changes (Carey 2007). This includes forethought as to how these ecosystems should look and function over the long term (e.g., centuries), as well as consideration for the long-term consequences of management actions taken or not taken today. For some sites, this may mean leaving them to develop with little or no human intervention (e.g., old-growth rainforest). For other sites, there is growing recognition that “hands-off” management can have unintended negative consequences (e.g., long-term fire suppression of dry, interior forest) and restoration activities like prescribed fire or thinning may be needed to shift these sites back onto more natural ecological trajectories.

These restoration efforts might best focus on restoring ecological processes, rather than a desired end-state or ecological stage. This is especially important given little precedent for understanding or managing for rapid environmental change (Callicott 2002, Millar 2008).

At times, management will need to react to immediate threats like catastrophic human-induced fire or invasive species. Intentional, proactive planning for how best to respond for each site could help reduce some of the negative consequences and costs associated with making decisions on the spot, or case by case. For example, lack of a well-communicated fire response plan may lead to suppression activities that result in unnecessary damage to soils, vegetation, and aquatic systems. Likewise, lack of an early-detection plan for invasive species may lead to expensive control options that could have otherwise been avoided had the species been detected early.

Management will also need to address a growing number of environmental threats in the region (Gamon 2007). Of these, climate change may be the most pervasive management challenge – even small changes in climate patterns could affect a wide range of ecological interactions and ecosystem processes and result in local extirpations of rare organisms (Joyce et al. 2008, Kappelle et al. 1999, Millar et al. 2007, Noss 2001). There is currently little scientific basis for how best to manage for climate change.
and it will be important to understand and ultimately manage for climate change at a hierarchy of spatial and temporal scales, from individual organisms to global ecosystems (Mustin et al. 2007). A number of different strategies may also be required (Millar 2008). Given its ecological depth and distribution, the natural areas network could serve as an important foundation for studying and developing regional or even global approaches to managing for climate change.

Future management strategies will also need to address appropriate uses of natural areas as human populations continue to increase in the region. This includes better understanding of the impacts of human activities on natural areas. A number of concerns have already arisen over off-road vehicle use, horseback riding, livestock grazing, harvesting wildland products like mushrooms and floral greens, hunting, fishing, and camping. Use is especially of concern for sites that have infrastructures such as trailheads, parking lots, or established camp sites that encourage human use. Misuse of sites may, in part, be the result of lack of knowledge or appreciation for the importance of natural areas. Thus, there is potential to reduce human-use impacts through public outreach, education, and greater on-the-ground presence.
CHAPTER 5. MONITORING AND DATA MANAGEMENT

Vision

Monitoring data are ecologically driven, consistently collected to acceptable scientific standards across the network, stored and maintained properly, and form an integral part of a feedback loop for making and evaluating management decisions.

Monitoring Goals and Objectives

Collecting baseline and monitoring data provides a number of useful benefits for the long-term management of natural areas, including: (1) site-specific data for making management decisions, (2) feedback on the effectiveness of mitigation, restoration, and offsite management activities, (3) inventory of the ecological characteristics of a site, (4) quantified assessment of natural and anthropogenic influences over time, (5) data for refining monitoring and management protocols, and (6) information for long-term scientific study of ecosystems and ecological processes.

A number of monitoring and data management issues will need to be resolved to strengthen the current monitoring program. First, ecological monitoring programs have been inconsistently established across the network (e.g., about 20% of federal sites, 50% of state sites, 75% of The Nature Conservancy sites). For those sites that are not monitored, information about the site is often limited to lists of plant and wildlife species expected to occur on these sites rather than actual inventories.

Second, where monitoring data have been collected, problems can range from different protocols being used across sites, divergence of protocols over time, lack of connection between data being collected and site management objectives, and irregular monitoring schedules once initial data has been collected. A long-term monitoring program with shared monitoring goals, diverse but consistent protocols to meet both site-specific and cross-site objectives, and regular monitoring schedules can increase sampling power, strengthen statistical inferences within and across sites, and ultimately provide empirical support for management actions both within and around natural areas.

Third, current monitoring data are primarily focused on vegetation and related composition. Opportunities exist for expanding monitoring programs to (1) capture a fuller gradient of multi-dimensional structural measures that evaluate broader ecological processes, and (2) include a wider range of indicators that can measure ecological health and function over time due to environmental change, including microclimate, assessments of key wildlife communities, nutrient cycling, soils, and carbon flux. This might also include measures that can evaluate changes in ecological processes rather than simply changes in the spatial distribution or abundance of select species or taxonomic groups (e.g., McIntire and Fajardo 2009). It could also include measuring changes to trophic hierarchies over time as we have little knowledge about where environmental change will have the greatest effects, or where it will have the first effects (e.g., at the top or bottom of a food chain; Wagner and Adrian 2009).

Fourth, many of the strategies outlined here will result in increased use of natural areas. The risk in promoting use is that it could affect the
environmental integrity of some sites, especially those that are sensitive to foot traffic, or sites that have established infrastructures that might already promote heavy use (e.g., parking areas, trails). Therefore, some form of monitoring focused on human-use effects may be needed to help preempt any long-term negative consequences that promoting additional use may have for some sites.

Finally, a cursory inquiry into data management strategies across agencies suggest that data for natural areas are not always handled in ways that ensure their long-term protection and use. Many datasets reside in unsecured boxes, have never been entered into an electronic database, or have no associated metadata to provide the necessary context for the data. Long-term data management requires a program that extends beyond the employment of individual administrators, can resurrect historic data, provides access to data to the broader community, reduces time and effort spent searching for data, and allows for data to be used to address broad scale questions (Michener and Brunt 2000).

Oak savanna sampling in the Willamette Valley (ORBIC staff)
CHAPTER 6. RESEARCH

Vision

The depth of research conducted throughout the natural areas network contributes to the understanding and resolution of important scientific, social and economic issues across a range of spatial and temporal scales.

Research Goals and Objectives

A primary purpose for natural areas is to allow study of ecological processes that can improve our understanding of the natural world. Many of the issues facing conservation, such as climate change and invasive species, will require refinement of ecological theory and better understanding of ecological processes. Research on natural areas may be one of the best ways to gain this knowledge, especially given that they represent some of the most intact ecosystems left on the landscape.

A number of important research findings have been based on data collected from natural areas in the past, including studies of old-growth forest that helped lead to the Northwest Forest Plan, the set of documents that has guided management activities on federal lands since 1994 (USDA and USDI 1994). However, many natural areas have received little research attention (Greene et al. 1986). Reasons for lack of use are varied, including relative remoteness of sites from other research sites or centers of research, lack of site replication, some sites representing ecosystems not under current scientific scrutiny, and recent establishment for a number of sites. The lack of use has also been the result of unfamiliarity of researchers with the benefits of using natural areas and misconceptions over the types of research allowed on natural areas.

Agencies have also differed in the degree to which they have actively encouraged or promoted research on natural areas. These reasons for lack of use suggest there is opportunity to better promote natural areas for research, both internally (within the home agency or organization) and externally to research clients.

There are a number of characteristics unique to the natural areas that make them attractive as study sites, especially for understanding ecological processes and effects of climate change:

1. They are geographically well-distributed throughout the region, representing almost the entire gradient of natural biophysical environments found in the Pacific Northwest. This includes gradients in soils, moisture, temperature, elevations, latitudes, and other biotic and abiotic conditions;

2. They contain sites representing environmental extremes, including rare ecosystems that might be the most sensitive to change over time;

3. The biological diversity contained within natural areas allows for study at all hierarchical levels, from genes to individual organisms to complete communities and systems;

4. As relatively pristine sites, natural areas can be used as controls for nearby field experiments as well as benchmarks for measuring the efficacy of management activities (Julius and West 2008, Joyce et al. 2008); and
5. Most natural areas are permanently protected, allowing for long-term study. A network strategy for climate change research could include everything from collecting climatological data at remote sensing stations to periodic field surveys of climate-sensitive organisms at permanent sampling plots using standardized protocols.

Natural areas can also be promoted as satellite study sites in association with other major ecological networks and programs, including U.S. Forest Service experimental forests and ranges, Department of Interior national parks and US Geological Survey Hydrologic Benchmark Network program, United Nations Biosphere Reserves, the Long-Term Ecological Research (LTER) Network, the National Ecological Observatory Network (NEON), Long-Term Ecosystem Productivity forestry research network, and the National Atmospheric Deposition and National Acid Precipitation Assessment Programs.

As with management and monitoring, research use of natural areas can be enhanced through dedicated funding, either as a regular component of annual agency budgets, or through funding of special projects. For example, seed grants to graduate students could help promote collaborative research with academic institutions. Increased support for research can also be generated by better communication of research studies and their results. This includes better documentation for past and ongoing research projects, encouraging cradle-to-grave research projects to ensure that results are published, and communicating results in different ways to meet the needs of diverse audiences that have an interest in resource management.

Finally, using natural areas to build stronger ties between research and management can help strengthen the importance and relevance of research on natural areas. For example, a number of restoration projects, including woody fuels reduction, prescribed fire, and invasive species control are being proposed for natural areas. However, there is little information available on the site-specific efficacy of these tools, including how they might affect future ecological processes. Close coordination between research and management in designing studies that evaluate these restoration efforts could provide important feedback that results in better management in and around natural areas, and greater appreciation for the importance of research on these sites.
CHAPTER 7. EDUCATION AND COMMUNICATION

Vision

*Education and communication activities connect people with nature, promote understanding of ecology and conservation, increase volunteerism, and strengthen agency and public support for the natural areas network.*

**Education and Communication Goals and Objectives**

Part of a strong interagency network includes effective education, communication and outreach programs. Regional natural areas have been available as outdoor educational laboratories since their inception. Overall use of natural areas as sites for educational activities, however, has been relatively low.

Most natural area educational programs to date have focused on educating college-level and higher students, professional societies, and special-interest groups. There is opportunity to expand the scope of educational activities to include a focus on younger (e.g. K-12) students. Recent social trends in the United States suggest that youth may no longer be getting sufficient exposure to the outdoors and encounters with nature can help reduce aggression, calm anxiety, and develop a healthy sense of self and place (Pilz et al. 2006). A number of agencies have recently added youth education as a top emphasis area (e.g. Kimbell 2009). Engaging youth can also help promote a future adult population that is environmentally literate and appreciates the importance of natural areas and wildlands (USFS 2009b).

Opportunities also exist for expanding the scope of disciplines associated with the use of natural areas beyond traditional science-based fields. For example, individuals from the arts and humanities are increasingly using wildlands as settings for their nature writing, painting, or other forms of artistic expression (Sitka Center for Art and Ecology 2009).

Fostering such use on natural areas can help build a constituency that appreciates and supports natural areas.

Support can also be fostered within local communities near natural areas by developing volunteer and citizen science programs to assist with research, monitoring, site surveillance, restoration projects, and community outreach (Lowman et al. 2009, Yung 2007). Many of the strategic actions presented here can be supported, in part, through the use of volunteers. Volunteers are not free in terms of the amount of staff time needed for recruitment, training and oversight. However, the benefits of incorporating their efforts can often outweigh these costs and offers an alternative to accomplishing tasks, especially when budgets are limited. A number of partners, supporters, and target groups could be considered.

There is also need for increasing the understanding and appreciation of natural areas within the agencies that manage them. There are still a number of misconceptions about natural areas—for example, that natural areas are small, unique pieces of land set aside solely to protect an unusual ecosystem. In part, these misconceptions have arisen because information about natural areas is often site-specific (establishment of a single site, result from a single study). These misperceptions also result when the importance of natural areas is not being effectively translated from the field
(where most natural area information is generated) in ways that resonate with upper-level management. Therefore, strategic actions include those that can frame information in ways that show network-level strength and that can be directly tied to the support of agency missions. These could include:

1. Cost-savings associated with managing natural areas as a network across sites and agencies;

2. Important findings from natural areas that increased knowledge for making sound management decisions;

3. The strength of connections with other agencies, partners and organizations that resulted from participating in the natural areas network;

4. Increased public support of management activities as a result of natural areas management or research;

5. The importance of natural areas for providing high-quality sites for research; and

6. The broad biodiversity and conservation goals met by the natural area network

Green cottonwood riparian woodland at Cottonwood Creek RNA in the Pueblo Mountains by E. Crowe
CHAPTER 8. ECOREGIONAL LISTS AND DEFINITIONS

Introduction

The lists of natural heritage elements found in the nine Oregon ecoregions describe the diversity of the different ecoregions, and show how successful Oregon has been at assuring these elements are represented in natural areas. Figure 2 on page 6 identifies the nine Ecoregions used in this plan as well as the nine ecoregional chapters that follow. More information on the ecology or geology of these regions and more detailed maps are available in the Oregon Ecoregions EPA poster (Thorson et al. 2003). The Marine – Estuarine Ecoregion is new, and represents the only one for which the council developed the boundary, which roughly follows the continental shelf.

Status Summary

The lists of natural heritage elements found in the nine Oregon ecoregions describe the natural areas available for research, the ecosystems and species in each Ecoregion, and the types of places that need to be set aside for natural areas. They describe the diversity of the different ecoregions, and show how successful Oregon has been at assuring these elements are represented in natural areas.

These lists have been significantly updated for this edition of the plan. The Council hopes that agencies and the public will use these lists in making decisions related to conservation. The Council, the Oregon Biodiversity Center Staff, and the Pacific Northwest Research Natural Area Committee also hope to continue getting feedback to improve the accuracy of the information included in these lists.

For each update of the Plan, the council presents a report to the State Land Board outlining changes in the plan, and a comparison of the number of ecosystem and geologic types listed. The differences in protection for ecosystem types between the 1998, 2003 and 2010 plans are illustrated in Table 1. The main difference is that the number of ecosystem types decreased in 2003 with the elimination of the aquatic ecosystem types, and again in 2010 due to the elimination of ecosystem process elements. The reduction of protected ecosystem elements from 2003 to 2010 all occur due to the former Coast Range, Marine and Estuarine types being moved and reclassified into two separate ecoregions. Stream and river ecosystem elements will be added back when a system to classify them is developed.

Table 1. Ecosystem types 1998-2010.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Types</th>
<th>Protected</th>
<th>Unfilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>804</td>
<td>252</td>
<td>617</td>
</tr>
<tr>
<td>2003</td>
<td>750</td>
<td>416</td>
<td>334</td>
</tr>
<tr>
<td>Change 98-03</td>
<td>-54</td>
<td>+164</td>
<td>-283</td>
</tr>
<tr>
<td>2010</td>
<td>722</td>
<td>400</td>
<td>322</td>
</tr>
<tr>
<td>Change 03-10</td>
<td>-28</td>
<td>-16</td>
<td>-12</td>
</tr>
</tbody>
</table>

Figure 3 shows the number of established natural areas included in each of the Natural Heritage Plans and the current Natural Areas Plan. The number of established areas increased rapidly in the 1980s and early 1990s when initial efforts to identify and dedicate sites in the National Forest Plans and BLM Resource Management Plans took effect. The rate of new natural area designations has declined since 2003.
Overall, the percentage of unrepresented (or unfilled) types has remained the same at 44.5%, with the declines due to the loss of some western Oregon Areas of Environmental Concern counteracting the newly designated natural areas. Significant work remains to fill these types. The majority of unfilled ecosystem types are the riparian forests, woodlands and wetlands from eastern Oregon, and low elevation conifer forests in western Oregon. These types are the most difficult to find suitable examples for natural area designation because they have become fairly rare. Figure 4 shows how well ecosystem elements, geologic elements and species are protected within each of the ecoregions in this 2010 edition of the plan.
Using Natural Heritage Resource Lists

The Natural Heritage Act specifies that: "In selecting conservation areas, the inclusion of natural heritage resources, and especially those that are not adequately protected elsewhere, shall be given primary consideration". It is hoped that all state and federal agencies and the Interagency Research Natural Area Committee will continue to use these lists to guide in their selection of potential Research Natural Areas.

The next nine chapters in the plan include brief ecoregional descriptions followed by the lists of ecosystem elements. The descriptions are only included to provide the general ecological and social context of each ecoregion. Chapters include the ecosystem types first, with the terrestrial types organized by vegetation zone, followed by the wetland types. The Oregon Biodiversity Information Center and NatureServe are continuing to work on updating the aquatic and marine classifications and these are likely to continue to be modified in future editions of the plan.

Ecosystem types are then followed by the list of geology formations and features, which were revised in 2003, and are little changed since then. Within each ecoregion, the geology elements are organized by the standard intervals of geological time, from the oldest (Devonian, about 320 million years ago) to the newest (the Quaternary, including the present).

Finally, the ecoregional chapters contain the list of special species elements. The special species are organized by major taxonomic group, with the invertebrates listed first, followed by the vertebrates broken up by class, then the vascular plants, the nonvascular plants, and lastly the lichens and fungi. Species are listed alphabetically by scientific name within each group.

The complete list of established natural areas in Oregon is included with a map in Chapter 11, as are the total list of sites names included in the plan. The Oregon Biodiversity Information Center also maintains a GIS cover showing all the conservation lands in Oregon. This Land Management and Stewardship coverage is available at the Oregon Geospatial Data Clearinghouse, and is also included in the Protected Areas Database of the United States (PAD-US), available from the U.S.G.S. on the National Map.

How the Lists are Organized

Different TEXT COLOR IN GRAY and BLACK are used in all of the lists of ecological, geological and species elements to distinguish elements that are already protected from those needing designations. Those that are unrepresented are highlighted in black. Ecosystem elements in gray are those with designations and management that adequately protects them in the ecoregion. This is not necessarily the case for species elements. Determining if a species is viable at these sites is more difficult. As a result, listing in the plan in black only means the species is currently known to be represented at the natural area(s) listed.

The lists for each of the ecoregions are organized as a series of tables for the different element types (ecological, geological, and species). Each table has four columns. The column headings and definitions are listed below.

Agency – The agency or agencies managing lands most likely to contain examples of this type. These agencies should be working to find and designate an example of this ecosystem or geologic type or
species in this ecoregion. Current agency lists are maintained on file at the Oregon Biodiversity Information Center.

Priority – Priorities for elements listed were determined using principles detailed in Part 1 of the plan. These priorities are subject to continual update as elements become rarer, more threatened, or more secure. Current priorities, determined by the Natural Heritage Advisory Council, are maintained at the Oregon Biodiversity Information Center. Determination of adequacy of representation within a proposed area is made by the Natural Heritage Advisory Council, in cooperation with the Federal Research Natural Area Committee. Due to continual status updates, elements added to the "adequately represented" category will be maintained at the Oregon Biodiversity Information Center.

Ecosystem Type Name – These names are intended to be succinct descriptors for discrete, but often difficult-to-describe, components of the resource spectrum. As such, the name should be considered only a flag. Detailed descriptions of all elements are available at the Oregon Biodiversity Information Center. Most terrestrial and wetland ecosystem elements are plant communities. Detailed descriptions of the terrestrial and wetland plant community elements, called Community Characterization Abstracts, are being prepared, starting with the rarest types. Abstracts include information on the species present, soil, geomorphology, range and distribution of the communities, as well as references in the scientific literature relating to them. These materials are maintained on file at the Oregon Biodiversity Information Center.

Present Representation – This column contains names of established, proposed and recommended natural areas that contain examples of the ecosystem type. Specific formatting and codes are used in this column. These include:

< = The element is present at this protected site, but only in small patches which provide only partial representation of the ecosystem type. If < is not present, the area is assumed to adequately represent the element. In this plan, these have only been used for ecosystem elements, not for geologic elements or species.

ITALICS = Areas listed in italics have been recommended by agency ecologists or Heritage staff as having excellent examples of the type, but have no formal designations.

Elements that have been lost or extirpated in the ecoregions are labeled as such. Those known or suspected to be gone are differentiated as “Probably extirpated”, “Extirpated” or “Extinct”. For those elements considered extirpated or extinct, no agency is designated to seek representation. However, if an example of any of these extirpated types was to be located, it would immediately become a high priority for protection. Sites recommended are those high quality sites currently known. Any site meeting the quality and size criteria for the element would be suitable for designation.

The lists will be updated with each revision of the Oregon Natural Heritage Plan, at five-year intervals. A list of all established natural areas and a map are included in Chapter 11. The current status of all elements and natural areas will be maintained on file at the Oregon Biodiversity Information Center.
<table>
<thead>
<tr>
<th>Priority for Ecological and Geologic Elements</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>H</td>
</tr>
<tr>
<td>Moderate</td>
<td>M</td>
</tr>
<tr>
<td>Low</td>
<td>L</td>
</tr>
<tr>
<td>Unknown</td>
<td>U</td>
</tr>
<tr>
<td>Protected adequately at the listed site or sites</td>
<td>*</td>
</tr>
<tr>
<td>Adequately protected at the listed site or sites once final designation is completed</td>
<td>+</td>
</tr>
<tr>
<td>Only partially protected due to designation, size, or quality at this site</td>
<td>&lt;</td>
</tr>
</tbody>
</table>

**Priority for Species**

- Species threatened or endangered throughout their range (ORBIC List 1) | 1 |
- Species threatened or endangered in Oregon, but more common elsewhere (List 2) | 2 |
- Species presumed extirpated throughout its range | 1-X |
- Species presumed extirpated in Oregon, but persists elsewhere | 2-x |
- Marine special species selected by the Natural Heritage Advisory Council | S |

- Species included because of their federal or state Endangered Species Act status | ESA |
- Species protected under the Marine Mammals Protection Act | MMPA |

**Potential Acting Agency**

- Private Lands | PVT |
- Oregon Department of Forestry | ODF |
- Oregon Department of Transportation | DOT |
- Oregon Department of State Lands | DSL |
- Oregon Department of Fish and Wildlife | OFW |
- Oregon Parks and Recreation Department | PRD |
- Ocean Policy Advisory Council | OPAC |
- Army Corps of Engineers | ACE |
- Bureau of Land Management | BLM |
- Department of Defense | DOD |
- National Park Service | NPS |
- U.S. Fish & Wildlife Service | FWS |
- U.S. Forest Service | FS |

**Present Representation (Terrestrial)**

- Area of Critical Environmental Concern (BLM designation only) | ACEC |
- Federal Research Natural Area (Federal Agencies) | RNA |
- State Natural Area (formerly Natural Heritage Conservation Area) | SNA |
- Proposed designation (for the three agency designations above) | P.... |
- National Monument (Federal Agencies) | NM |
- National Recreation Area | NRA |
- National Wildlife Refuge (U.S. Fish and Wildlife Service) | NWR |
- The Nature Conservancy Preserve | TNC |
- Wilderness Area (Federal Agencies) | WA |
- Wilderness Study Area (Federal Agencies, primarily BLM) | WSA |
- Wild and Scenic River (Federal Agencies) | WSR |
Present Representation (Terrestrial continued)

Wildlife Management Area                      WMA
Special Interest Area                      SIA

Present Representation (Marine and Estuarine)

Marine Garden                      MG
Priority Rock and Reef                       PRR
Research Reserve                      RR
Marine Reserve                       MR
Marine Habitat Refuge                  HR
National Estuarine Research Reserve  NERR

Other

Sites recommended as best example of type (site name in italics)  Italics

---

Tufted puffin by Roy Lowe
The Marine and Estuarine Ecoregion includes all of Oregon’s intertidal, marine and estuarine ecosystem and geologic resources, as well as all the marine and estuarine species. The classification of marine and estuarine types is a first approximation to implement a new national ecological classification created by the National Oceanic and Atmospheric Administration (NOAA) and NatureServe, based on the online Version III draft (FGDC 2010).

Protected examples of these resources are currently not well represented in Oregon’s system of natural areas, and this is the first plan in which this Ecoregion is separated from the Coast Range. The publication of the Territorial Sea Plan (Oregon Ocean Policy Advisory Council, 1994) and current work to establish marine reserves in Oregon has created an excellent opportunity to better protect Oregon's marine and intertidal resources. Designations such as Marine Reserves, Marine Protected Areas, Marine Gardens, Habitat Refuge, Research Reserve, Seabird Protection Areas, Marine Shore, and Priority Rock and Reef have been applied to many of Oregon's most significant biological and ecological marine resources.

In this plan, we have made an effort to match existing natural area needs to these designations. However, more inventories are needed to define the ecological resources of the Oregon Estuarine and Marine ecoregion and to establish the designations necessary to ensure that they will be available for research and education. Because this is the first attempt to define natural area needs for the marine and estuarine areas in Oregon, and because the state is working hard to establish a set of marine reserves, this chapter can only represent a first iteration, which we anticipate changing significantly in the future. The council and the Oregon Biodiversity Information Center would appreciate comments, ideas for updates, and any information that might help improve the lists that follow.

In establishing our Geologic types, we also worked to match existing geologic maps to newly defined geological natural area needs. However, more detailed mapping is needed to comprehensively define the geologic resources of the Marine and Estuarine Ecoregion, particularly the subtidal/offshore area where only the broadest types have been mapped. Progress is being made in this area, and once this is done, there will be a solid basis for identifying and protecting the resources.

Figure 6 shows the numbers of ecosystem and geologic types represented and not represented in the network of established natural areas in this ecoregion. It also shows the special species representation.
The selection of special species also represented a challenge in this Ecoregion, since these species are not tracked or monitored in the same way the terrestrial species are in the other Ecoregions.

Figure 6. Represented and Unrepresented Ecosystem Elements and Species for the Marine and Estuarine Ecoregion.
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Name</th>
<th>Present Representation</th>
</tr>
</thead>
</table>
| DSL    | U        | 1. Subtidal, high-relief rock bottom with *Nereocystis* kelp bed with little or no algal sub-canopy. | **Orford Reef RR**  
Cape Foulweather |
| +      |          | 2. Subtidal, high-relief rock bottom with *Macrocystis* kelp bed with little or no algal sub-canopy. | Cape Arago PMR  
Simpson Reef PRR/HR |
| *      |          | 3. Subtidal, high-relief rock bottom with dense algal sub-canopy under kelp bed. | Redfish Rocks MR |
| DSL, PRD | U       | 4. Subtidal, high-relief, unvegetated rock bottom. | |
| *      |          | 5. Subtidal, low-relief rock bottom with *Nereocystis* kelp bed and possibly *Macrocystis* kelp bed. | Pirate Cove RR |
| DSL, PRD | U       | 6. Subtidal, low-relief rock bottom with dense algal sub-canopy under kelp. | **Nellies Cover HR** |
| *      |          | 7. Subtidal, low-relief, unvegetated rock bottom. | Pirate Cove RR |
| *      |          | 8. Subtidal, high-energy sandy bottom. | Netarts Sand Spit SNA |
| DSL    | U        | 10. Subtidal mud bottom. | |
| *      |          | 11. Subtidal gravel bottom. | Orford Reef PRR |
| *      |          | 12. Subtidal hard bottoms with reef building animals. | Norton Gulch (Gregory Point RR) |
| DSL    | U        | 13. Subtidal, aphotic zone with boulder or bedrock. | |
| DSL    | U        | 14. Subtidal, aphotic zone with shale or shingle. | |
| DSL    | U        | 15. Subtidal, aphotic zone sandy bottom. | |
| *      |          | 16. Intertidal, exposed bedrock, mussel beds. | Yachats MG  
Boiler Bay RR |
| +      |          | 17. Intertidal, exposed bedrock, algal dominated. | North Cove - Cape Arago RR  
Cape Arago PMR |
| *      |          | 18. Intertidal, exposed bedrock, mussel beds. | Yachats MG  
Boiler Bay RR |
| *      |          | 19. Intertidal, exposed bedrock, surfgrass beds. | Otter Crest MG  
Boiler Bay RR |
| DSL, PRD | U       | 20. Intertidal, exposed bedrock, surge channels. | **Ecola Point**  
Seal Rock |
<p>| DSL, PRD | U       | 21. Intertidal, exposed bedrock/boulders subject to sand scour and periodic sand inundation. | <strong>Cape Lookout</strong> |
| DSL, PRD | U       | 22. Intertidal, exposed boulder field, algal dominated. | |</p>
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSL, PRD U</td>
<td>23.</td>
<td>Intertidal, exposed boulder field, not algal dominated.</td>
<td>Redfish Rocks MR</td>
</tr>
<tr>
<td>DSL, PRD U</td>
<td>25.</td>
<td>Intertidal, semi-protected, bedrock, bedrock shelf.</td>
<td><em>Chetco Cove</em></td>
</tr>
<tr>
<td>+</td>
<td>26.</td>
<td>Intertidal, semi-protected, boulder field.</td>
<td>Cape Arago PMR</td>
</tr>
<tr>
<td>DSL, PRD U</td>
<td>27.</td>
<td>Intertidal sandy/gravelly beach.</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>28.</td>
<td>Intertidal, low exposure sandy beach.</td>
<td>Netarts Sand Spit SNA</td>
</tr>
<tr>
<td>DSL, PRD U</td>
<td>29.</td>
<td>Intertidal, high exposure sandy beach.</td>
<td></td>
</tr>
<tr>
<td>DSL, PRD U</td>
<td>30.</td>
<td>Highly erosive seacliffs.</td>
<td>Seal Rock</td>
</tr>
<tr>
<td>*</td>
<td>31.</td>
<td>Erosion resistant seacliffs, with caves if possible.</td>
<td>*Cascade Head PMR Cape Lookout SNA</td>
</tr>
<tr>
<td>DSL, FWS U</td>
<td>32.</td>
<td>Offshore rocks, awash at high tide.</td>
<td><em>Rogue Reef Simpson Reef</em></td>
</tr>
<tr>
<td>DSL, FWS U</td>
<td>33.</td>
<td>Offshore rocks, not awash at high tide, with soil and vegetation.</td>
<td><em>Goat Island Three Arch Rocks NWR</em></td>
</tr>
<tr>
<td>DSL, FWS U</td>
<td>34.</td>
<td>Offshore rocks, not awash, unvegetated.</td>
<td><em>Pillar Rock (Cape Meares)</em></td>
</tr>
<tr>
<td><strong>Estuarine</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSL U</td>
<td>35.</td>
<td>Unvegetated, fine sediment (mud to sand) in subtidal zone.</td>
<td></td>
</tr>
<tr>
<td>DSL U</td>
<td>36.</td>
<td>Eelgrass beds, on fine (mud to sand) unconsolidated substrata in subtidal zone.</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>37.</td>
<td>Unvegetated muds in intertidal zone, including <em>Abarenicola</em> in lower or middle estuary.</td>
<td>South Slough PSNA</td>
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<td>+</td>
<td>38.</td>
<td>Unvegetated muddy sands in intertidal zone, including <em>Mya arenia</em> in upper estuary.</td>
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</tr>
<tr>
<td>DSL U</td>
<td>39.</td>
<td>Unvegetated sands in intertidal zone, including <em>Callinassa californionis</em> in lower or middle estuary.</td>
<td></td>
</tr>
<tr>
<td>DSL U</td>
<td>40.</td>
<td>Intertidal, lower estuary, vegetated and unvegetated rocky surfaces, including macroalgal beds (<em>Enteromorpha, Ulva, Fucus, Polysiphonia, and Sargassum</em>).</td>
<td>South Slough PSNA</td>
</tr>
<tr>
<td>+</td>
<td>41.</td>
<td>Intertidal, lower estuary, vegetated fine, unconsolidated substrata, including eelgrass beds and macroalgal mats (<em>Enteromorpha, Ulva, Vaucheria, and Gracilaria</em>).</td>
<td>South Slough PSNA</td>
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<tr>
<td>*</td>
<td>42.</td>
<td>Low elevation/high salinity intertidal marsh on sand (dominants including Lyngby sedge, saltgrass, glasswort, three-square bulrush, seacoast bulrush and arrow grass).</td>
<td>Netarts Sand Spit SNA</td>
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<td>*</td>
<td>43</td>
<td>Low elevation/high salinity intertidal marsh on silt (dominants including Lyngby sedge, saltgrass, glasswort, three-square bulrush, seacoast bulrush and arrow grass).</td>
<td>Cox Island (TNC) Bull Island SNA Smith Island SNA</td>
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<td>*</td>
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<td>High elevation/low salinity intertidal salt marsh (dominants including Douglas aster, Lyngby sedge, tufted hairgrass and silverweed).</td>
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### Invertebrates

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<td>3 Littorina subrotunda</td>
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### Fish

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<td>6 Acipenser transmontanus</td>
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<td>8 Eopsetta jordani</td>
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<td>9 Hemilepidotus hemilepidotus</td>
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<td>Coho salmon (Lower Columbia River</td>
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<td>TNC,</td>
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<td>Jewell Meadows WMA,</td>
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**Mammals**

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<td>75 <em>Balaenoptera physalus</em></td>
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<td>Baird's beaked whale</td>
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<tr>
<td>77 <em>Callorhinus ursinus</em></td>
<td>Northern fur seal</td>
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<td>81 <em>Eumetopias jubatus</em></td>
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<td>Stejneger's beaked whale</td>
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<td>90 <em>Orcinus orca</em></td>
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<td>91 <em>Phoca vitulina</em></td>
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<td>92 <em>Phocoena phocoena</em></td>
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<td>93 <em>Physeter macrocephalus</em></td>
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<td>94 <em>Pseudorca crassidens</em></td>
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<td>96 <em>Ziphius cavirostris</em></td>
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**Vascular Plants**

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<td>97 <em>Cordylanthus maritimus ssp palustris</em></td>
<td>Salt-marsh bird's-beak</td>
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<td>Oregon Dunes NRA, Cape Lookout State Park</td>
<td>ACE, DSL, PRD</td>
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<table>
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<td>98 <em>Phyllospadix serrulatus</em></td>
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**Algae**

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<td>135 Sparlingia pertusa</td>
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<td>137 Ulvaria obscura var. blytii</td>
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CHAPTER 10. COAST RANGE ECOREGION

The Coast Range Ecoregion includes the entire Oregon coastline and the northern and central Oregon Coast Range Mountains, and extends north through the state of Washington to southwestern British Columbia on Vancouver Island, and south almost to Mendocino, California. Elevations in the Oregon Coast Range Ecoregion range from sea level to 4,000 feet, and the marine climate creates the most moderate and wettest habitats in the state. Average annual rainfall of 60 to 180 inches supports spectacular stands of temperate rainforests. Vegetation is characterized by forests of Sitka spruce, western hemlock, Douglas fir, red alder, redwood and tanoak.

The Oregon coast has other unique ecological features. Sand deposits from coastal streams and rivers (primarily the Umpqua and Columbia Rivers) have created major coastal dune systems, the largest located at the Oregon Dunes National Recreation Area. In the north coast, steep headlands and cliffs are separated by stretches of flat coastal plain and large estuaries. The south coast includes the warmest areas, with rugged headlands and very mild winters, supporting local endemic species such as the coast redwood and Port Orford cedar.

Almost 40% of the region is in public ownership, primarily in National Forest and State Forest lands. Population is dispersed in many small towns, most located within a few miles of the ocean.
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Sitka Spruce</strong></td>
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<tr>
<td>*</td>
<td>1.</td>
<td>Sitka spruce/salal.</td>
<td>Cape Meares RNA/SNA</td>
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<td></td>
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<td>Cape Lookout PSNA</td>
</tr>
<tr>
<td>*</td>
<td>2.</td>
<td>Sitka spruce/swordfern.</td>
<td>Neskowin Crest RNA</td>
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<td></td>
<td>Cape Lookout PSNA</td>
</tr>
<tr>
<td>FS</td>
<td>H</td>
<td>3. Sitka spruce/oxalis, with devils club if possible.</td>
<td><em>Drift Creek WA</em></td>
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<td>4.</td>
<td>Sitka spruce/salmonberry.</td>
<td>Cummins Creek RNA</td>
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<tr>
<td>FS</td>
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<td>5. Sitka spruce/fool's huckleberry-red huckleberry.</td>
<td><em>Neskowin Crest RNA</em></td>
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<td>*</td>
<td>6.</td>
<td>Grand fir-Sitka spruce forest.</td>
<td><em>Nesika Beach (TNC)</em></td>
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<tr>
<td>FS</td>
<td>H</td>
<td>7. Sitka spruce-Port Orford cedar forest on sand.</td>
<td><em>S. Horsefall Campground</em></td>
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<td>FS, BLM, PVT</td>
<td>H</td>
<td>8. Sitka spruce-western hemlock-Port Orford cedar forest on coastal terrace.</td>
<td><em>Coos County Forest</em></td>
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</table>

* **Redwood**

| FS     | H        | 9. Redwood-Douglas fir forest with evergreen shrubs (tanoak, rhododendron, and evergreen huckleberry). | *Wheeler Creek RNA* |

| FS     | H        | 10. Redwood/swordfern and tanoak-Douglas fir/evergreen shrub forests. | *Peavine Ridge* |
|        |          |                        | *Winchuck Slope SNA* |

* **Port Orford Cedar**

| FS, BLM | H | 11. Douglas fir-western hemlock-Port Orford cedar forest with wet shrubs and forbs. | Port Orford Cedar RNA |
|        |   |                                        | Coquille River Falls RNA |
| *      | 12. | Port Orford cedar-Douglas fir-western hemlock forest with dry shrubs and forbs. | Port Orford Cedar RNA |
|        |   |                                        | Coquille River Falls RNA |

| FS, BLM | H | 13. Port Orford cedar forest types on ultramafic soils. | *Hunter Creek Bog RNA* |

* **Western Hemlock**

| FS, BLM | H | 14. Western hemlock/swordfern. | *Cummins Creek RNA* |
|        |   |                                | *High Peak-Moon Creek RNA* |
| *      | 15. | Western hemlock/oxalis. | *Cherry Creek RNA* |

<p>| FS, BLM | H | 16. Western hemlock/rhododendron/swordfern and western hemlock/rhododendron-salal communities. | <em>Cherry Creek RNA</em> |
| *      | 17. | Western hemlock/rhododendron-Oregon grape. | <em>Cherry Creek RNA</em> |
| FS, BLM | M | 18. Western hemlock/devils club with or without grand fir. | <em>Bunker Hill</em> |</p>
<table>
<thead>
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<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tr>
<td>* 19.</td>
<td>Western hemlock/vine maple with salmonberry and swordfern.</td>
<td>Flynn Creek RNA</td>
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<tr>
<td>FS H</td>
<td>Western hemlock/salmonberry, with salal or California hazel if possible.</td>
<td>Cherry Creek RNA</td>
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<tr>
<td>* 21.</td>
<td>Western hemlock/evergreen huckleberry.</td>
<td>High Peak-Moon Creek RNA</td>
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</tr>
<tr>
<td>* 22.</td>
<td>Western hemlock/vine maple-salal.</td>
<td>High Peak-Moon Creek RNA</td>
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<tr>
<td>FS, BLM H</td>
<td>Western hemlock/salal.</td>
<td>Cherry Creek RNA</td>
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</tr>
<tr>
<td>FS, BLM H</td>
<td>Western hemlock/Oregon grape, with salal if possible.</td>
<td>Cherry Creek RNA</td>
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<tr>
<td>FS, BLM M</td>
<td>Douglas fir/oceanspray-salal.</td>
<td>Grass Mountain RNA</td>
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<td>* 27.</td>
<td>Pacific silver fir-western hemlock forest.</td>
<td>Saddleback Mountain RNA</td>
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<tr>
<td>Coastal Dunes</td>
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<td>Onion Peak Conservation Easement</td>
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<tr>
<td>* 28.</td>
<td>Coastal dune mosaic with tree islands and early successional stages.</td>
<td>Tenmile Creek RNA</td>
<td></td>
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<tr>
<td>FS H</td>
<td>Native stabilized dune grassland with red fescue and dune wildrye.</td>
<td>Tenmile Creek RNA</td>
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<tr>
<td>* 30.</td>
<td>Native unstabilized dune grassland with dune bluegrass and seaside lupine.</td>
<td>Sand Lake RNA</td>
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<tr>
<td>ACE H</td>
<td>Unstabilized foredunes with dune bluegrass and American beachgrass.</td>
<td>West Sand Island</td>
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<tr>
<td>PVT, BLM PRD H</td>
<td>Oceanfront herb-dominated dunes with cammisonia, knotweed and silvery phacelia.</td>
<td>Ophir Dunes PSNA</td>
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<tr>
<td>FS, PRD H</td>
<td>Douglas fir/Rhododendron-evergreen huckleberry mature dune forest.</td>
<td>Umpqua Lighthouse SP</td>
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<td>Shore Pine Forests and Woodlands</td>
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<td>FS L</td>
<td>Sitka spruce-shore pine/evergreen huckleberry community.</td>
<td>Tenmile Creek RNA</td>
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<tr>
<td>FS H</td>
<td>Shore pine/manzanita communities.</td>
<td>Eel Creek</td>
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<td>FS, BLM, PRD M</td>
<td>Shorepine/salal-evergreen huckleberry forest.</td>
<td>Blacklock Point PSNA</td>
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<tr>
<td>* 37.</td>
<td>Pygmy shorepine forest on Blacklock soil.</td>
<td>Blacklock Point PSNA</td>
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## COAST RANGE ECOLOGICAL ELEMENTS

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<tr>
<td></td>
<td></td>
<td><strong>Grasslands and Shrublands</strong></td>
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</table>
|        |          | 38. Coastal headland grassland and herbaceous complex with red fescue dominant. | Cascade Head (TNC)  
Neskowin Crest RNA |
| FWS, PVT |        | 39. Coastal headland or oceanfront grassland with California oatgrass, red fescue, and Roemer’s fescue. | Cape Blanco SNA  
Crook Point |
| PRD    |          | 40. Coastal headland shrublands with salal, coastal sage or evergreen huckleberry. | Cape Lookout PSNA  
Cascade Head (TNC) |
|        | H        | 41. Oceanfront shrublands with crowberry and western azalea. | Blacklock Point PSNA  
Cape Blanco SNA |
|        |          | 42. Grass bald on Coast Range mountain. | Grass Mountain RNA  
Saddle Mountain SNA |
|        |          | 43. Rock garden on Coast Range mountain. | Onion Peak Conservation Easement  
Saddle Mountain SNA |
|        |          | **Lacustrine** |                        |
|        | H        | 44. Dune-blocked lake with aquatic beds and marshy shore, surrounded by unconsolidated sands. | New River RNA |
| PRD, PVT, FS, BLM |        | 45. Dune or slump-blocked lake with aquatic beds and marshy shore, surrounded by sedimentary or igneous formations. |                        |
|        |          | **Palustrine** |                        |
| FS    | U        | 46. Pond in active sand dune area. |                        |
| PRD, FS |        | 47. Pond in stabilized sand dune area. |                        |
|        |          | 48. Pond at mid to high elevation, including slump ponds. | Wassen Creek RNA |
|        |          | 49. Sparsely-vegetated deflation plain marsh, with Nevada rush, sickle-leaved rush and springbank clover. | Tenmile Creek RNA |
|        |          | 50. Deflation plain marsh, dominants including slough sedge and silverweed. | Tenmile Creek RNA |
|        |          | 51. Freshwater tidal marsh on lower Columbia River, with streams and mud flats (including Lyngby sedge, hardstem bulrush and narrow-leaved cattail. | Russian Island PRNA |
|        |          | 52. Slough sedge-Sitka sedge fen. | Gearhart Bog (TNC) |
|        |          | 53. Mid to high elevation sedge fen, sphagnum bog and beaver marsh. | Lost Prairie RNA |
|        |          | 54. Labrador tea/sphagnum mire on organic soils, without Darlingtonia, including associations with shore pine and western red cedar. | Gearhart Bog (TNC)  
Woahink Bog Preserve (TWC) |
### COAST RANGE ECOLOGICAL ELEMENTS

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<th>Agency</th>
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<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tbody>
<tr>
<td>FS, PVT BLM</td>
<td>M 55.</td>
<td>Labrador tea/sphagnum mire on organic soils, with Darlingtonia, including associations with shore pine and western red cedar.</td>
<td>Woahink Bog Preserve (TWC)</td>
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<tr>
<td>* 56.</td>
<td>Labrador tea/sphagnum mire on floating lake-fill mat.</td>
<td>Nestucca Bay NWR (FWS), Woahink Bog Preserve (TWC)</td>
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<tr>
<td>PVT</td>
<td>H 57.</td>
<td>Labrador tea-sweet gale heath.</td>
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<tr>
<td>+ 58.</td>
<td>Bog blueberry/tufted hairgrass brush prairie.</td>
<td>Blacklock Point PSNA</td>
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<tr>
<td>PVT, PRD</td>
<td>H 59.</td>
<td>Willow-crabapple/slough sedge swamp with spiraea.</td>
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<tr>
<td>FS, PRD</td>
<td>H 60.</td>
<td>Shore pine/slough sedge seasonal swamp.</td>
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<td>61.</td>
<td>Cottonwood/willow-creek dogwood tidaland swamp.</td>
<td>Tenasillahe RNA</td>
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<td>* 62.</td>
<td>Sitka spruce/creek dogwood and willow/creek dogwood tidaland swamps.</td>
<td>Blind Slough Swamp (TNC)</td>
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<tr>
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<td>Sitka spruce/skunk cabbage swamp (non-tidal).</td>
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<td>* 64.</td>
<td>Western red cedar-western hemlock/skunk cabbage.</td>
<td>Upper Rock Creek RNA</td>
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<tr>
<td>* 65.</td>
<td>Low elevation pond with aquatic beds and marshy shore.</td>
<td>Port Orford Cedar RNA</td>
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<tr>
<td>* 66.</td>
<td>Oregon myrtle/evergreen shrub riparian forest.</td>
<td>N. Fk. Chetco River ACEC</td>
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<tr>
<td>PRD, PVT</td>
<td>H 67.</td>
<td>Shallow lake on ancient deflation plain, with aquatic beds and marshy shore, surrounded by dunes.</td>
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<tr>
<td>* 68.</td>
<td>Pacific reedgrass fen.</td>
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<tr>
<td>* 69.</td>
<td>Oregon ash-red alder swamp.</td>
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## COAST RANGE GEOLOGIC FORMATIONS AND FEATURES

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<td>11. +</td>
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<td>Netarts Bay</td>
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<td>Wave-Cut Terrace</td>
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<td>Bateman Formation</td>
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## COAST RANGE SPECIAL SPECIES

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<td>Newcomb's littorine snail</td>
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<td>2 Anodonta californiensis</td>
<td>California floater (mussel)</td>
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<td>Lewis &amp; Clark NWR</td>
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<td>3 Anodonta nuttalliana</td>
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<td>4 Anodonta wahlmetensis</td>
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<td>7 Capnia kersti</td>
<td>A stonefly</td>
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<td>8 Cicindela hirticollis siuslawensis</td>
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<td>10 Driloleirus macelfreshi</td>
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<td>Steelhead (Upper Willamette River ESU, winter run)</td>
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<td>Oncorhynchus mykiss pop. 35</td>
<td>Steelhead (Southwest Washington ESU, winter run)</td>
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<td>Oncorhynchus tshawytscha pop. 2</td>
<td>Chinook salmon (Snake River ESU, fall run)</td>
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<td>Oncorhynchus tshawytscha pop. 21</td>
<td>Chinook salmon (Lower Columbia River ESU, spring run)</td>
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<td>Oncorhynchus tshawytscha pop. 22</td>
<td>Chinook salmon (Lower Columbia River ESU, fall run)</td>
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<td>Oncorhynchus tshawytscha pop. 23</td>
<td>Chinook salmon (Upper Willamette River ESU, spring run)</td>
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<td>Oncorhynchus tshawytscha pop. 26</td>
<td>Chinook salmon (Southern Oregon/Northern California Coast ESU, fall run)</td>
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<td>Oncorhynchus tshawytscha pop. 8</td>
<td>Chinook salmon (Snake River ESU, spring/summer run)</td>
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<td>Oregonichthys kalawatseti</td>
<td>Umpqua chub</td>
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### COAST RANGE SPECIAL SPECIES

<table>
<thead>
<tr>
<th>Scientific Name</th>
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<th>List</th>
<th>Representation</th>
<th>Agency</th>
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<tbody>
<tr>
<td>58 <em>Rhinichthys cataractae ssp. 1</em></td>
<td>Millicoma dace</td>
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<td>South Fork Coos River, West Fork Millicoma River</td>
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<td><strong>Amphibians</strong></td>
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<td>59 <em>Batrachoseps attenuatus</em></td>
<td>California slender salamander</td>
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<td>Wheeler Creek RNA, Winchick Slope SNA</td>
<td>FWS</td>
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<td>60 <em>Dicamptodon copei</em></td>
<td>Cope's giant salamander</td>
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<td>61 <em>Rana boylii</em></td>
<td>Foothill yellow-legged frog</td>
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<td>Alfred A. Loeb State Park, Coquille River Falls RNA, Grassy Knob WA</td>
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<tr>
<td><strong>Reptiles</strong></td>
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<td><strong>Birds</strong></td>
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<td>63 <em>Brachyramphus marmoratus</em></td>
<td>Marbled murrelet</td>
<td>2</td>
<td>Elk River State Scenic Waterway, Peavine Ridge</td>
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<td>64 <em>Branta canadensis occidentalis</em></td>
<td>Dusky Canada goose</td>
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<td>65 <em>Branta hutchinsii leucopareia</em></td>
<td>Aleutian Canada goose</td>
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<td>66 <em>Bucephala albeola</em></td>
<td>Bufflehead</td>
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<td>67 <em>Cerorhinca monocerata</em></td>
<td>Rhinoceros auklet</td>
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<td>Bandon NA, Cape Blanco State Park, New River RNA, Oregon Dunes National Recreation Area</td>
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<td>68 <em>Charadrius alexandrinus nivosus</em></td>
<td>Western snowy plover</td>
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<td>69 <em>Cygnus buccinator</em></td>
<td>Trumpeter swan</td>
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<td>70 <em>Elanus leucurus</em></td>
<td>White-tailed kite</td>
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<td>71 <em>Eremophila alpestris strigata</em></td>
<td>Streaked horned lark</td>
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<td>72 <em>Falco peregrinus anatum</em></td>
<td>American peregrine falcon</td>
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<td>73 <em>Fratercula cirrhata</em></td>
<td>Tufted puffin</td>
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<td>74 <em>Gymnogyps californianus</em></td>
<td>California condor</td>
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## COAST RANGE SPECIAL SPECIES

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<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>List</th>
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<tbody>
<tr>
<td>75 Haliaeetus leucocephalus</td>
<td>Bald Eagle</td>
<td>ESA</td>
<td>Tenasillahe RNA, Neskowin Crest RNA, Cape Meares SNA/RNA</td>
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<td>76 Histrionicus histrionicus</td>
<td>Harlequin duck</td>
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<td>77 Melanerpes lewis</td>
<td>Lewis's woodpecker</td>
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<td>78 Oceanodroma furcata</td>
<td>Fork-tailed storm-petrel</td>
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<td>79 Pelecanus occidentalis californicus</td>
<td>California brown pelican</td>
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<td>80 Podiceps auritus</td>
<td>Horned grebe</td>
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<td>81 Podiceps grisegena</td>
<td>Red-necked grebe</td>
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<td>82 Pooecetes gramineus affinis</td>
<td>Oregon vesper sparrow</td>
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<td>83 Progne subis</td>
<td>Purple martin</td>
<td>2</td>
<td>East Sand Island, Lewis And Clark NWR, Oregon Dunes National Recreation Area</td>
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<tr>
<td>84 Ptychoramphus aleuticus</td>
<td>Cassin's auklet</td>
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<tr>
<td>85 Strix occidentalis caurina</td>
<td>Northern spotted owl</td>
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<td>Wheeler Creek RNA, Cherry Creek RNA, Little Sink RNA</td>
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### Mammals

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<tr>
<td>86 Antrozous pallidus</td>
<td>Pallid bat</td>
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<tr>
<td>87 Canis lupus</td>
<td>Gray wolf</td>
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<tr>
<td>88 Corynorhinus townsendii</td>
<td>Townsend's big-eared bat</td>
<td>2</td>
<td>Ecola State Park, Samuel H. Boardman State Scenic Corridor</td>
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<tr>
<td>89 Enhydra lutris</td>
<td>Sea otter</td>
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<td>Cape Arago State Park, Cascade Head Preserve, Ecola State Park, Oregon Islands NWR</td>
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<tr>
<td>90 Eumetopias jubatus</td>
<td>Northern sea lion</td>
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<tr>
<td>91 Gulo gulo</td>
<td>Wolverine</td>
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<td>92 Martes pennanti</td>
<td>Fisher</td>
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<td>Grassy Knob WA</td>
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<td>93 Myotis thysanodes</td>
<td>Fringed myotis</td>
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<td>Drift Creek WA, Lewis and Clark NHP</td>
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<td>94 Odocoileus virginianus leucurus</td>
<td>Columbian white-tailed deer</td>
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<td>95 Thomomys bottae detumidus</td>
<td>Pistol River pocket gopher</td>
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<td>96 Thomomys mazama helleri</td>
<td>Gold Beach pocket gopher</td>
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<td>97 Ursus arctos horribilis</td>
<td>Grizzly bear</td>
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### Vascular Plants
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<tr>
<td><em>Abronia umbellata</em> ssp. <em>breviflora</em></td>
<td>Pink sandverbena</td>
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<td><em>Adiantum jordanii</em></td>
<td>California maiden-hair</td>
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<td>Fanno Meadows Tnc Managed Area, Lost Forest/Sand Dunes/Fossil Lake ACEC/RNA</td>
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<td><em>Anemone oregana</em> var. <em>felix</em></td>
<td>Bog anemone</td>
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<td><em>Arctostaphylos hispidula</em></td>
<td>Gasquet manzanita</td>
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<td>Pistol River State Scenic Viewpoint</td>
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<td><em>Artemisia pycnocephala</em></td>
<td>Coastal sagwort</td>
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<td><em>Atriplex gmelinii</em> var. <em>gmelinii</em></td>
<td>Gmelin's saltbush</td>
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<td>Cape Arago State Park, New River RNA, Port Orford Heads State Park</td>
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<td><em>Baccharis douglasii</em></td>
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<td><em>Carex brevicaulis</em></td>
<td>Short-stemmed sedge</td>
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<td><em>Carex gynodyama</em></td>
<td>Hairy sedge</td>
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<td><em>Carex livida</em></td>
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<td><em>Carex macrocephala</em></td>
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<td><em>Carex macrochaeta</em></td>
<td>Alaska long-awned sedge</td>
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<td>Gearhart Bog</td>
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<td>Chambers' paintbrush</td>
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<td><em>Dodecatheon austrofrigidum</em></td>
<td>Frigid shootingstar</td>
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<td><em>Ericameria arborescens</em></td>
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<td>Wandering daisy</td>
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<td><em>Eriophorum chamissonis</em></td>
<td>Russet cotton-grass</td>
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<td>L. Presley &amp; Vera C. Gill State Natural Site, New River RNA</td>
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<td><em>Erythronium elegans</em></td>
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<td><em>Filipendula occidentalis</em></td>
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<td><em>Gilia millefoliata</em></td>
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<td>Whorled marsh pennywort</td>
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<td><em>Iliamna latibracteata</em></td>
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<td><em>Lasthenia ornduffii</em></td>
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<td><em>Lewisia columbiana var. rupicola</em></td>
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<td><em>Lilium kelloggii</em></td>
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<td><em>Limonium californicum</em></td>
<td>Western marsh-rosemary</td>
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<td><em>Lycopodiella inundata</em></td>
<td>Northern bog clubmoss</td>
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<td>Microseris bigelovii</td>
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<td><em>Monardella purpurea</em></td>
<td>Siskiyou monardella</td>
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## COAST RANGE SPECIAL SPECIES

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CHAPTER 11. WILLAMETTE VALLEY ECOREGION

The Willamette Valley Ecoregion is located between the Coast Range and the Western Cascades in northwestern Oregon and includes Oregon’s largest river valley. From Oregon it extends north to include the Vancouver, Washington bottomlands. The valley is characterized by broad, alluvial flats and low basalt hills. Soils include deep alluvial silts from river deposits and dense heavy clays from pluvial deposits in the valley bottom’s numerous oxbow lakes and ponds.

The abundant rainfall and fertile soils make the valley Oregon’s most important agricultural region. This has been the case since the first settlers began arriving via the Oregon trail. As a result, the Willamette Valley is Oregon’s most developed area. The Willamette Valley is home to most Oregonians, with more than 70% of the state's population, the majority of its industry, and almost half of its farmland.

When the first European settlers came to Oregon, the valley was a mosaic of gallery riparian forests and wetlands, open white oak savannas and prairie, with valley margins of oak, ponderosa pine and Douglas fir woodlands. Native Americans maintained the prairies, oak savannas and woodlands by regularly burning most of the valley. With settlement, the prairies have been largely farmed and the open oak savannas and oak-conifer woodlands have been logged or become closed canopy forests due to fire suppression.

The Willamette Valley’s location on the Pacific Flyway makes it an important area for migrating and wintering waterfowl. Geese and shorebirds benefit from flooded agricultural lands, and the Willamette River and its many tributaries support salmon and steelhead runs, mostly of hatchery origin due to the large number of dams in the system. The valley’s few remaining fragments of native prairie support many special plant species and endemic invertebrates, while the remaining wetlands provide habitat to the Oregon chub, the western pond turtle and many other sensitive animal species.

Figure 9. Willamette Valley Map.

Figure 10. Willamette Valley Represented and Unrepresented Types.
### Conifer Forests

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<td>* 3.</td>
<td></td>
<td>Douglas fir-western hemlock/Oregon grape and salal forests, with grand fir if possible.</td>
<td>Mohawk RNA Wilhoit Springs RNA</td>
</tr>
<tr>
<td>BLM</td>
<td>H</td>
<td>4. Ponderosa pine-Douglas fir/California fescue woodland.</td>
<td>* Fox Hollow RNA Ponderosa Pine PACEC</td>
</tr>
<tr>
<td>* 5.</td>
<td></td>
<td>Douglas fir-grand fir/vine maple-salal.</td>
<td>Little Sink RNA</td>
</tr>
<tr>
<td>BLM, FS</td>
<td>M</td>
<td>6. Western red cedar-western hemlock/hazel forest on alluvial terrace and slopes.</td>
<td>* Sandy River (TNC) &amp; ACEC</td>
</tr>
</tbody>
</table>

### Mixed Hardwood-Conifer Forests

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 7.</td>
<td></td>
<td>Douglas fir-bigleaf maple forest with some grand fir if possible.</td>
<td>Forest Peak RNA The Butte RNA</td>
</tr>
</tbody>
</table>

### Hardwood Forests

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>11. Oregon white oak/grass savanna.</td>
<td>The Butte RNA Wren Prairie (TNC)</td>
</tr>
<tr>
<td>FWS</td>
<td></td>
<td></td>
<td>Basket Slough NWR</td>
</tr>
<tr>
<td>* 12.</td>
<td></td>
<td>Oregon white oak/poison oak-snowberry/blue wildrye woodland.</td>
<td>Pigeon Butte RNA Maple Knoll RNA</td>
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<td>County</td>
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### Prairies

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<tr>
<th>Agency</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Basket Slough NWR Dorena Prairie</td>
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<tr>
<td>Agency</td>
<td>Priority</td>
<td>Ecosystem Element Name</td>
<td>Present Representation</td>
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<td>---------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>*</td>
<td>15.</td>
<td>Lemmon's needlegrass-moss bald.</td>
<td>Forest Peak RNA Rattlesnake Butte (TNC)</td>
</tr>
<tr>
<td>Riparian Woodlands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVT, PRD</td>
<td>M</td>
<td>17. White alder bottomland riparian forest.</td>
<td></td>
</tr>
<tr>
<td>Lacustrine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRD, PVT, FWS</td>
<td>H</td>
<td>18. Oxbow lake on Willamette River, with aquatic beds and marshy shore.</td>
<td>Mission Bottom</td>
</tr>
<tr>
<td>PRD, DSL, PVT, OFW</td>
<td>H</td>
<td>19. Shallow backwater lake on major river floodplain, with associated marsh and mudflats.</td>
<td>Burlington Bottoms Sauvie Island</td>
</tr>
<tr>
<td>Palustrine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>20.</td>
<td>Slump pond at margin of valley, with aquatic beds and marshy shore.</td>
<td>Little Sink RNA</td>
</tr>
<tr>
<td>PVT</td>
<td>U</td>
<td>21. Low elevation vernal pool.</td>
<td>Possibly Extirpated</td>
</tr>
<tr>
<td>PRD, FWS</td>
<td>U</td>
<td>22. Cold spring.</td>
<td></td>
</tr>
<tr>
<td>OFW, PVT</td>
<td>M</td>
<td>23. Tidal marsh on major river, with associated mud flats (including spikerush, bulrush, burreed and wapato).</td>
<td>Rooster Rock Scappose Bay</td>
</tr>
<tr>
<td>PRD, PVT</td>
<td>M</td>
<td>24. Wapato marsh (including cutgrass, knotgrass and nodding beggars tick).</td>
<td>Beggars Tick Marsh Sauvie Island</td>
</tr>
<tr>
<td>*</td>
<td>25.</td>
<td>Slough sedge-one sided sedge marsh.</td>
<td>Fern Ridge RNA Willamette Floodplain RNA</td>
</tr>
<tr>
<td>*</td>
<td>26.</td>
<td>Tufted hairgrass valley bottomland prairie, with vernal pools and brush prairie (including Nootka rose, Douglas spiraea and dwarf blueberry).</td>
<td>Willamette Floodplain RNA Willow Creek (TNC) Fern Ridge RNA</td>
</tr>
<tr>
<td>*</td>
<td>27.</td>
<td>Tufted hairgrass-California oatgrass bottomland prairie.</td>
<td>Fern Ridge RNA Willow Creek (TNC)</td>
</tr>
<tr>
<td>*</td>
<td>30.</td>
<td>Hooker willow-Sitka willow shrub swamp.</td>
<td>Camassia (TNC) Beggars Tick Marsh</td>
</tr>
<tr>
<td>PVT, OFW</td>
<td>M</td>
<td>31. Pacific willow shrub swamp.</td>
<td>Luckiamute-Little Luckiamute Scappose Bay, Sauvie Island WMA</td>
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<tr>
<td>*</td>
<td>32.</td>
<td>Oregon ash/slough sedge woodland with snowberry.</td>
<td>Willamette Floodplain RNA</td>
</tr>
<tr>
<td>FWS, OFW</td>
<td>M</td>
<td>33. Oregon ash/Pacific willow woodland.</td>
<td>Luckiamute River</td>
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<tr>
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</tr>
<tr>
<td>PRD</td>
<td>M</td>
<td>34. Riparian area dominated by river and Pacific willow.</td>
<td>Gary, Flagg and Chatham Islands, PSNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 35. Riparian area dominated by Oregon ash, black cottonwood and creek dogwood.</td>
<td></td>
</tr>
<tr>
<td>PVT, PRD</td>
<td>H</td>
<td>36. Riparian area dominated by Oregon ash, black cottonwood and snowberry.</td>
<td>Multnomah Channel (Sauvie Island), Mission Bottom, Santiam Bar</td>
</tr>
<tr>
<td>PVT</td>
<td>H</td>
<td>37. Western red cedar-western hemlock/skunk cabbage swamp.</td>
<td>Possibly extirpated</td>
</tr>
<tr>
<td>OFW, PVT, Metro</td>
<td>H</td>
<td>38. Columbia sedge marsh.</td>
<td>Smith and Bybee Lakes (Metro)&lt;</td>
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</table>
### WILLAMETTE VALLEY GEOLOGIC FORMATIONS AND FEATURES

<table>
<thead>
<tr>
<th>Agency</th>
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<th>Formation or Feature Name</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Holocene</strong></td>
<td></td>
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<tr>
<td>M</td>
<td>1.</td>
<td>Meandering Stream</td>
<td>Tualatin River</td>
</tr>
<tr>
<td>*</td>
<td>2.</td>
<td>River Terraces</td>
<td>Sandy River (TNC)/ACEC</td>
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<td></td>
<td></td>
<td></td>
<td>Oxbow Park (Metro)</td>
</tr>
<tr>
<td>H</td>
<td>3.</td>
<td>Talus Caves In Boring Lava Rock Fall</td>
<td>Carver Caves</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Pleistocene</strong></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>4.</td>
<td>Glacial Erratic</td>
<td>Erratic Rock State Wayside</td>
</tr>
<tr>
<td>PVT</td>
<td>L 5.</td>
<td>Portland Hills Silt</td>
<td>Forest Park</td>
</tr>
<tr>
<td>PVT</td>
<td>L 6.</td>
<td>Willamette Silt</td>
<td>River Bend</td>
</tr>
<tr>
<td>PVT</td>
<td>L 7.</td>
<td>Cataclysmic Flood Bedforms</td>
<td>Irvington Bar</td>
</tr>
<tr>
<td>*</td>
<td>L 8.</td>
<td>Cataclysmic Flood Scours</td>
<td>Rock Island State Greenway Site</td>
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<tr>
<td></td>
<td></td>
<td><strong>Pleistocene and Pliocene</strong></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>9.</td>
<td>Boring Lava</td>
<td>Rocky Butte State Park</td>
</tr>
<tr>
<td>*</td>
<td>10.</td>
<td>Boring Volcano</td>
<td>Mt. Scott Park</td>
</tr>
<tr>
<td>*</td>
<td>11.</td>
<td>Springwater Terrace Gravel</td>
<td>Milo McIver State Park</td>
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<td>Eagle Creek Park</td>
</tr>
<tr>
<td>PVT</td>
<td>L 12.</td>
<td>Troutdale Formation</td>
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</tr>
<tr>
<td></td>
<td></td>
<td><strong>Pliocene and Miocene</strong></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>13.</td>
<td>Sandy River Mudstone</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td><strong>Miocene</strong></td>
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<td>PVT</td>
<td>L 14.</td>
<td>Molalla Formation</td>
<td>Molalla</td>
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<tr>
<td>PVT</td>
<td>L 15.</td>
<td>Wanapum Basalt</td>
<td>Oregon City</td>
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<tr>
<td>PVT</td>
<td>L 16.</td>
<td>Grand Ronde Basalt</td>
<td>Oregon City</td>
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<tr>
<td></td>
<td></td>
<td><strong>Oligocene</strong></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>17.</td>
<td>Scotts Mills Formation</td>
<td>Drake Crossing</td>
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<tr>
<td></td>
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<td><strong>Eocene</strong></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>18.</td>
<td>Little Butte Volcanics</td>
<td>Molalla</td>
</tr>
<tr>
<td>L</td>
<td>19.</td>
<td>Eugene Formation</td>
<td>Spores Point</td>
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</table>
### WILLAMETTE VALLEY GEOLOGIC FORMATIONS AND FEATURES

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Formation or Feature Name</th>
<th>Present Representation</th>
</tr>
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<tbody>
<tr>
<td>L</td>
<td>20.</td>
<td>Fisher Formation</td>
<td>Eugene</td>
</tr>
<tr>
<td>L</td>
<td>21.</td>
<td>Spencer Formation</td>
<td>Eugene</td>
</tr>
<tr>
<td>L</td>
<td>22.</td>
<td>Yamhill Formation</td>
<td>McMinnville</td>
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## WILLAMETTE VALLEY SPECIAL SPECIES

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>List</th>
<th>Present Representation</th>
<th>Agency</th>
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<tbody>
<tr>
<td><strong>Invertebrates</strong></td>
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<tr>
<td>1 Acetropis americana</td>
<td>American grass bug</td>
<td>1</td>
<td>William Finley NWR</td>
<td>FWS</td>
</tr>
<tr>
<td>2 Anodonta californiensis</td>
<td>California floater (mussel)</td>
<td>2</td>
<td>Sauvie Island WMA</td>
<td>FWS</td>
</tr>
<tr>
<td>3 Anodonta nuttalliana</td>
<td>Winged floater</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Anodonta wahlanetensis</td>
<td>Willamette floater (mussel)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Callophrys johnsoni</td>
<td>Johnson's hairstreak (butterfly)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Chloea latis aspasma</td>
<td>Siskiyou short-horned grasshopper</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Colligyra sp. 4</td>
<td>Columbia duskysnail</td>
<td>1</td>
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<tr>
<td>8 Cryptomastix devia</td>
<td>Puget oregonian (snail)</td>
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<tr>
<td>9 Deroceras hesperium</td>
<td>Evening fieldslug</td>
<td>1</td>
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<tr>
<td>10 Driloleirus macelfreshi</td>
<td>Oregon giant earthworm</td>
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<tr>
<td>11 Euphydryas editha taylori</td>
<td>Taylor's checkerspot (butterfly)</td>
<td>1</td>
<td>Wren Prairie Preserve</td>
<td>TNC</td>
</tr>
<tr>
<td>12 Fisherola nuttallii</td>
<td>Shortface lanx (=Giant Columbia River limpet)</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>13 Fluminicola fuscus</td>
<td>Columbia pebblesnail or spire snail</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>14 Gonidea angulata</td>
<td>Western ridged mussel</td>
<td>2</td>
<td>Little Rock Island TNC Managed Area, Sauvie Island WMA</td>
<td>FWS, TNC</td>
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<tr>
<td>15 Juga hemphilli hemphilli</td>
<td>Barren juga (snail)</td>
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<tr>
<td>16 Juga sp. 3</td>
<td>Brown juga (snail)</td>
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<td>17 Physella columbiana</td>
<td>Rotund physa (snail)</td>
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<tr>
<td>18 Plebejus icarioides fenderi</td>
<td>Fender's blue (butterfly)</td>
<td>1</td>
<td>Wren Prairie Preserve, Willow Creek Preserve, Backett Slough NWR</td>
<td>TNC, FWS</td>
</tr>
<tr>
<td>19 Pristiloma pilsbryi</td>
<td>Crowned tightcoil (snail)</td>
<td>1</td>
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<tr>
<td>20 Speyeria callippe ssp. 1</td>
<td>Willamette callippe fritillary (butterfly)</td>
<td>1-x</td>
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<tr>
<td>21 Speyeria zerene bremnerii</td>
<td>Valley silverspot (butterfly)</td>
<td>2-x</td>
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<tr>
<td>22 Vesperocila sp. 2</td>
<td>Bald hesperian (snail)</td>
<td>1</td>
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<tr>
<td>23 Vorticifex neritoides</td>
<td>Nerite ramshorn (snail)</td>
<td>1</td>
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<tr>
<td><strong>Fish</strong></td>
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<tr>
<td>24 Oncorhynchus clarkii pop. 2</td>
<td>Coastal cutthroat trout (Southwestern Washington/Columbia River ESU)</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>25 Oncorhynchus keta pop. 3</td>
<td>Chum salmon (Columbia River ESU)</td>
<td>1</td>
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</tr>
<tr>
<td>26 Oncorhynchus kisutch pop. 1</td>
<td>Coho salmon (Lower Columbia River ESU)</td>
<td>1</td>
<td></td>
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<tr>
<td>27 Oncorhynchus kisutch pop. 3</td>
<td>Coho salmon (Oregon Coast ESU)</td>
<td>1</td>
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<tr>
<td>28 Oncorhynchus mykiss pop. 13</td>
<td>Steelhead (Snake River Basin ESU)</td>
<td>1</td>
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</tr>
<tr>
<td>29 Oncorhynchus mykiss pop. 26</td>
<td>Steelhead (Lower Columbia River ESU, summer run)</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>30 Oncorhynchus mykiss pop. 27</td>
<td>Steelhead (Lower Columbia River ESU, winter run)</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>List</td>
<td>Present Representation</td>
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<tr>
<td>31 Oncorhynchus mykiss pop. 28</td>
<td>Steelhead (Middle Columbia River ESU, summer run)</td>
<td>1</td>
<td></td>
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<tr>
<td>32 Oncorhynchus mykiss pop. 29</td>
<td>Steelhead (Middle Columbia River ESU, winter run)</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>33 Oncorhynchus mykiss pop. 30</td>
<td>Steelhead (Oregon Coast ESU, summer run)</td>
<td>1</td>
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<tr>
<td>34 Oncorhynchus mykiss pop. 31</td>
<td>Steelhead (Oregon Coast ESU, winter run)</td>
<td>1</td>
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<tr>
<td>35 Oncorhynchus mykiss pop. 33</td>
<td>Steelhead (Upper Willamette River ESU, winter run)</td>
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<tr>
<td>36 Oncorhynchus mykiss pop. 35</td>
<td>Steelhead (Southwest Washington ESU, winter run)</td>
<td>2</td>
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<tr>
<td>37 Oncorhynchus tshawytscha pop. 2</td>
<td>Chinook salmon (Snake River ESU, fall run)</td>
<td>1</td>
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<tr>
<td>38 Oncorhynchus tshawytscha pop. 21</td>
<td>Chinook salmon (Lower Columbia River ESU, spring run)</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>39 Oncorhynchus tshawytscha pop. 22</td>
<td>Chinook salmon (Lower Columbia River ESU, fall run)</td>
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<tr>
<td>40 Oncorhynchus tshawytscha pop. 23</td>
<td>Chinook salmon (Upper Willamette River ESU, spring run)</td>
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<tr>
<td>41 Oncorhynchus tshawytscha pop. 8</td>
<td>Chinook salmon (Snake River ESU, spring/summer run)</td>
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</tr>
<tr>
<td>42 Oregonichthys crameri</td>
<td>Oregon chub</td>
<td>1</td>
<td>William Finley NWR, Elijah Bristow State Park</td>
<td>FWS, PRD</td>
</tr>
<tr>
<td>43 Salvelinus confluentus pop. 2</td>
<td>Bull trout (Columbia River population)</td>
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**Amphibians**

<table>
<thead>
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<th>Common Name</th>
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<tbody>
<tr>
<td>44 Rana boylii</td>
<td>Foothill yellow-legged frog</td>
<td>2</td>
<td>William Finley NWR</td>
</tr>
<tr>
<td>45 Rana pretiosa</td>
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<td>William Finley NWR</td>
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</table>

**Reptiles**

<table>
<thead>
<tr>
<th>Scientific Name</th>
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<tr>
<td>46 Actinemys marmorata marmorata</td>
<td>Northern Pacific pond turtle</td>
<td>2</td>
<td>Ankeny NWR, Elijah Bristow State Park, William Finley NWR, Willow Creek Preserve</td>
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<tr>
<td>47 Chrysemys picta</td>
<td>Painted turtle</td>
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<td>Ankeny NWR, Champoeg State Heritage Area, Fern Ridge WMA, Sauvie Island WMA, William Finley NWR</td>
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**Birds**

<table>
<thead>
<tr>
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<th>Common Name</th>
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<th>Agency</th>
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<tbody>
<tr>
<td>48 Agelaius tricolor</td>
<td>Tricolored blackbird</td>
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<td>49 Ammodramus savannarum</td>
<td>Grasshopper sparrow</td>
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<tr>
<td>50 Branta canadensis occidentalis</td>
<td>Dusky Canada goose</td>
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<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>List</td>
<td>Present Representation</td>
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<td>Aleutian Canada goose</td>
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<td>Bufflehead</td>
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<td><strong>53</strong> <em>Coccyzus americanus</em></td>
<td>Yellow-billed cuckoo</td>
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<tr>
<td><strong>54</strong> <em>Cygnus buccinator</em></td>
<td>Trumpeter swan</td>
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<td><strong>55</strong> <em>Elanus leucurus</em></td>
<td>White-tailed kite</td>
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<td><strong>56</strong> <em>Eremophila alpestris strigata</em></td>
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<td>American peregrine falcon</td>
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<td><strong>58</strong> <em>Gymnogyps californianus</em></td>
<td>California condor</td>
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<td><strong>59</strong> <em>Haliaeetus leucocephalus</em></td>
<td>Bald eagle</td>
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<td><strong>60</strong> <em>Melanerpes lewis</em></td>
<td>Lewis's woodpecker</td>
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<td><strong>61</strong> <em>Podiceps auritus</em></td>
<td>Horned grebe</td>
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<td><strong>62</strong> <em>Pooecetes gramineus affinis</em></td>
<td>Oregon vesper sparrow</td>
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<tr>
<td><strong>63</strong> <em>Progne subis</em></td>
<td>Purple martin</td>
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<tr>
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<td>Northern spotted owl</td>
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<td><strong>Mammals</strong></td>
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<tr>
<td><strong>65</strong> <em>Antrozous pallidus</em></td>
<td>Pallid bat</td>
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<tr>
<td><strong>66</strong> <em>Canis lupus</em></td>
<td>Gray wolf</td>
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<tr>
<td><strong>67</strong> <em>Corynorhinus townsendii</em></td>
<td>Townsend's big-eared bat</td>
<td>2</td>
<td>Milo McIver State Park</td>
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<tr>
<td><strong>68</strong> <em>Lynx canadensis</em></td>
<td>Canada lynx</td>
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<tr>
<td><strong>69</strong> <em>Myotis thysanodes</em></td>
<td>Fringed myotis</td>
<td>2</td>
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<tr>
<td><strong>70</strong> <em>Odocoileus virginianus leucurus</em></td>
<td>Columbian white-tailed deer</td>
<td>1</td>
<td>Burlington Bottoms</td>
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<tr>
<td><strong>71</strong> <em>Ursus arctos horribilis</em></td>
<td>Grizzly bear</td>
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<tr>
<td><strong>Vascular Plants</strong></td>
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<tr>
<td><strong>72</strong> <em>Agrostis howellii</em></td>
<td>Howell's bentgrass</td>
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<td><strong>73</strong> <em>Carex comosa</em></td>
<td>Bristly sedge</td>
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<tr>
<td><strong>74</strong> <em>Carex gynodynama</em></td>
<td>Hairy sedge</td>
<td>2</td>
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<tr>
<td><strong>75</strong> <em>Carex retrorsa</em></td>
<td>Retrorse sedge</td>
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<td><strong>76</strong> <em>Castilleja levisecta</em></td>
<td>Golden paintbrush</td>
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<tr>
<td><strong>77</strong> <em>Cicendia quadrangularis</em></td>
<td>Timwort</td>
<td>2</td>
<td>Willow Creek Preserve, Long Tom ACEC</td>
</tr>
<tr>
<td><strong>78</strong> <em>Cimicifuga elata var. elata</em></td>
<td>Tall bugbane</td>
<td>1</td>
<td>The Butte RNA</td>
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<tr>
<td><strong>79</strong> <em>Cyperus acuminatus</em></td>
<td>Short-pointed cyperus</td>
<td>2</td>
<td>Fern Ridge Wildlife</td>
</tr>
<tr>
<td><strong>80</strong> <em>Cyperus lupulinus ssp. lupinus</em></td>
<td>A cyperus</td>
<td>2</td>
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</table>
## WILLAMETTE VALLEY SPECIAL SPECIES

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>List</th>
<th>Present Representation</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>81 Delphinium leucophaeum</td>
<td>White rock larkspur</td>
<td>1</td>
<td>Camassia Natural Area, Little Rock Island, Champoeg State Heritage Park</td>
<td>TNC, PRD</td>
</tr>
<tr>
<td>82 Delphinium nuttallii</td>
<td>Nuttall's larkspur</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83 Delphinium oreganum</td>
<td>Willamette Valley larkspur</td>
<td>1</td>
<td>North Santiam State Recreation Area</td>
<td>PRD</td>
</tr>
<tr>
<td>84 Delphinium pavonaceum</td>
<td>Peacock larkspur</td>
<td>1</td>
<td>Willamette Floodplain RNA, William Finley NWR</td>
<td>BLM, FWS</td>
</tr>
<tr>
<td>85 Erigeron decumbens</td>
<td>Willamette Valley daisy</td>
<td>1</td>
<td>Fern Ridge RNA, William Finley NWR, Baskett Slough NWR</td>
<td>BLM, FWS</td>
</tr>
<tr>
<td>86 Eucephalus vialis</td>
<td>Wayside aster</td>
<td>1</td>
<td>Camas Swale RNA, Camas Swale ACEC, Willow Creek Preserve</td>
<td>TNC, BLM</td>
</tr>
<tr>
<td>87 Heliotropium curassavicum</td>
<td>Salt heliotrope</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>88 Horkelia congesta ssp. congesta</td>
<td>Shaggy horkelia</td>
<td>1</td>
<td>Fern Ridge RNA, Long Tom ACEC, Willow Creek Preserve</td>
<td>BLM, TNC</td>
</tr>
<tr>
<td>89 Howellia aquatilis</td>
<td>Howellia</td>
<td>1</td>
<td>William Finley NWR</td>
<td>FWS</td>
</tr>
<tr>
<td>90 Hydrocotyle verticillata</td>
<td>Whorled marsh pennywort</td>
<td>2</td>
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<td></td>
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<tr>
<td>91 Iris tenax var. gormanii</td>
<td>Gorman's iris</td>
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<td></td>
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<tr>
<td>92 Lathyrus holochlorus</td>
<td>Thin-leaved peavine</td>
<td>1</td>
<td>William Finley NWR, Ankeny NWR</td>
<td>FWS, TNC</td>
</tr>
<tr>
<td>93 Lipocarpha micrantha</td>
<td>Small-flowered lipocarpha</td>
<td>2-x</td>
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<td></td>
</tr>
<tr>
<td>94 Lomatium bradshawii</td>
<td>Bradshaw's lomatium</td>
<td>1</td>
<td>Fern Ridge RNA, Long Tom ACEC, Willamette Floodplain RNA</td>
<td>BLM</td>
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<tr>
<td>95 Lupinus sulphureus ssp. kincaidii</td>
<td>Kincaid's lupine</td>
<td>1</td>
<td>Cogswell-Foster (TNC), Baskett Slough NWR, William Finley NWR</td>
<td>TNC, FWS</td>
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<tr>
<td>96 Mimulus tricolor</td>
<td>Three-colored monkeyflower</td>
<td>2</td>
<td>Ankeny NWR, Cogswell-Foster Preserve, Willamette River Greenway, William Finley NWR</td>
<td>TNC</td>
</tr>
<tr>
<td>97 Navarretia willamettensis</td>
<td>Willamette navarretia</td>
<td>1</td>
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<td></td>
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<tr>
<td>98 Pellaea andromedifolia</td>
<td>Coffee fern</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>99 Polystichum californicum</td>
<td>California sword-fern</td>
<td>2</td>
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<td></td>
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<tr>
<td>100 Pyrocoma racemosa var. racemosa</td>
<td>Racemose pyrocoma</td>
<td>2</td>
<td>Fern Ridge RNA</td>
<td>ACE</td>
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<tr>
<td>101 Romanzoffia thompsonii</td>
<td>Thompson mistmaiden</td>
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<td></td>
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<tr>
<td>102 Rorippa columbae</td>
<td>Columbia cress</td>
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<td></td>
<td></td>
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<tr>
<td>103 Rotala ramosior</td>
<td>Toothcup</td>
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<td></td>
<td></td>
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<tr>
<td>104 Scirpus pendulus</td>
<td>Drooping bulrush</td>
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<td></td>
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<tr>
<td>105 Sedella pumila</td>
<td>Sierra mock-stoncrops</td>
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## Willamette Valley Special Species

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>List</th>
<th>Present Representation</th>
<th>Agency</th>
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<tbody>
<tr>
<td><strong>Sericocarpus rigidus</strong></td>
<td>White-topped aster</td>
<td>1</td>
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<tr>
<td><strong>Sidalcea nelsoniana</strong></td>
<td>Nelson's sidalcea</td>
<td>1</td>
<td>Willamette Prairie RNA, Wren Prairie (TNC), William Finley NWR</td>
<td>BLM, TNC, FWS</td>
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<tr>
<td><strong>Sisyrinchium hitchcockii</strong></td>
<td>Hitchcock's blue-eyed grass</td>
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<td>Willow Creek Preserve</td>
<td>TNC</td>
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<tr>
<td><strong>Sullivantia oregana</strong></td>
<td>Oregon sullivantia</td>
<td>1</td>
<td>Crown Point, Rooster Rock State Park</td>
<td>PRD</td>
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<tr>
<td><strong>Utricularia gibba</strong></td>
<td>Humped bladderwort</td>
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<tr>
<td><strong>Wolffia borealis</strong></td>
<td>Dotted water-meal</td>
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<td>Little Sink RNA</td>
<td>BLM</td>
</tr>
<tr>
<td><strong>Wolffia columbiana</strong></td>
<td>Columbia water-meal</td>
<td>2</td>
<td>Smith and Bybee Lakes, Willamette Park Corvallis</td>
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### Nonvascular Plants

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<tbody>
<tr>
<td><strong>Bruchia flexuosa</strong></td>
<td>Moss</td>
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<td>Willow Creek Preserve</td>
<td>TNC</td>
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<tr>
<td><strong>Ephemерum crassinervium</strong></td>
<td>Moss</td>
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<td></td>
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<tr>
<td><strong>Ephemерum serratum</strong></td>
<td>Moss</td>
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<td></td>
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<tr>
<td><strong>Fissидens fontanus</strong></td>
<td>Moss</td>
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<td><strong>Micromitrium synoicum</strong></td>
<td>Moss</td>
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<tr>
<td><strong>Physcomitrella patens</strong></td>
<td>Moss</td>
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<td>Sauvie Island WMA, William Finley NWR</td>
<td>OFW, FWS</td>
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<tr>
<td><strong>Porella bolanderi</strong></td>
<td>Liverwort</td>
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<td></td>
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<td><strong>Preissia quadrata</strong></td>
<td>Liverwort</td>
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<tr>
<td><strong>Sphaerocarpos hians</strong></td>
<td>Liverwort</td>
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<td>Avery Park</td>
<td>City</td>
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<td><strong>Tayloria serrata</strong></td>
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### Fungi

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<tr>
<td><strong>Boletus pulcherrimus</strong></td>
<td>Fungus</td>
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<td><strong>Calicium adspersum</strong></td>
<td>Lichen</td>
<td>2</td>
<td>Little Sink RNA</td>
<td>BLM</td>
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<tr>
<td><strong>Leptonia occidentalis var. occidentalis</strong></td>
<td>Fungus</td>
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<tr>
<td><strong>Phaeocorylia gregaria</strong></td>
<td>Fungus</td>
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<tr>
<td><strong>Pseudorhizina californica</strong></td>
<td>Fungus</td>
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<tr>
<td><strong>Rhizopogon subradicatus</strong></td>
<td>Fungus</td>
<td>2-x</td>
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<tr>
<td><strong>Urnula craterium</strong></td>
<td>Fungus</td>
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CHAPTER 12. Klamath Mountains Ecoregion

The Klamath Mountains Ecoregion covers most of southwestern Oregon and northwestern California and includes the Siskiyou Mountains, California’s Marble Mountains and Trinity Alps and the interior valleys and foothills between these mountain ranges. Oregon elevations are from 100 to over 7,500 feet. The ecoregion also has major climatic extremes. Far western portions receive more than 100 inches of rain per year, with relatively mild temperatures year-round. The southern interior valleys are much drier, with locations receiving less than 20 inches of rain per year and summer high temperatures averaging more than 90° F.

The ecoregion has the oldest landscapes in Oregon, representing the only large area of the state not shaped primarily by volcanism. It also is by far the most geologically diverse region, having large areas of metamorphic and sedimentary rocks such as serpentine, limestone and gabbro, as well as granite and basalt. Topography ranges from steep, dissected mountains and canyons to gentle foothills and flat valley bottoms.

The combination of exceptional climatic, geologic, and topographic diversity supports the most diverse habitats in Oregon. In addition, the Klamath Mountain Ecoregion is a floristic crossroads, including elements of the Sierra Nevada Mountains, Sacramento Valley and Coast Range Mountains of California; the Cascade Mountains of Oregon and Washington; and the Great Basin to the east. Its geologic age, stable climate, and unusual geology result in the ecoregion being a major center of species endemism for vascular plants. Of the 4,000 native plant species or subspecies occurring in Oregon, about half are found in this ecoregion, with about a quarter of these known only here. The region is also known for its diversity of conifers, with 30 different species. In Oregon, the West Cascades has the second largest number of conifer species, with 18 species.

Prior to European settlement, the landscape was dominated by Douglas fir forests, oak woodlands and ponderosa pine woodlands. There were native grasslands and chaparral on the valley bottoms, and diverse conifer and mixed hardwood forests. All of the natural habitats have changed since fire suppression became effective in the early twentieth century. The region has a high frequency of dry, summer lightning storms, leading to natural fire frequency of less than 40 years for most of the region, and closer to 20 years in the valleys and eastern portions of the region. Over 50 years of fire suppression have dramatically altered the ecology of the forests, savannas and shrublands in this region.

Figure 11. Klamath Mountains Ecoregion map.
Figure 12. Represented and Unrepresented Ecosystem Elements and Species for the Klamath Mountains Ecoregion.
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Oregon White Oak</strong></td>
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<tr>
<td>*</td>
<td>1</td>
<td>Oregon white oak savanna or open woodland with forbs or grasses.</td>
<td>Round Top Butte (TNC)/RNA Fawn Butte PRNA Bushnell-Irwin Rockes ACEC Whetstone Savanna (TNC)</td>
</tr>
<tr>
<td>PVT, ACE, M</td>
<td>2</td>
<td>Oregon white oak-Douglas fir-madrone/poison oak woodland.</td>
<td>Bushnell-Irwin Rocks ACEC Fawn Butte PRNA</td>
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<tr>
<td>FS, BLM</td>
<td>H</td>
<td>3. Port Orford cedar/huckleberry oak/beargrass on ultramafic soils.</td>
<td>Pipe Fork RNA</td>
</tr>
<tr>
<td>*</td>
<td>4</td>
<td>Port Orford cedar-white fir/Oregon grape and Port Orford cedar-tanoak/salal communities.</td>
<td>Pipe Fork RNA</td>
</tr>
<tr>
<td>*</td>
<td>5</td>
<td>Port Orford cedar-western hemlock with leucothe and swordfern.</td>
<td>North Fork Silver Creek RNA</td>
</tr>
<tr>
<td>*</td>
<td>6</td>
<td>Port Orford cedar/hairy honeysuckle/fescue on ultramafic soils.</td>
<td>Lemmingsworth Gulch RNA Cedar Log Flat RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td>H</td>
<td>7. Port Orford cedar maritime types with evergreen huckleberry/swordfern or rhododendron-salal.</td>
<td>Ashland RNA Roundtop Butte RNA-(TNC) French Flat RNA Fawn Butte PRNA</td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>10. Ponderosa pine-black oak woodland.</td>
<td>Lower Table Rock (TNC)</td>
</tr>
<tr>
<td>BLM</td>
<td>H</td>
<td>11. Western juniper-Oregon white oak-Ponderosa pine/buckbrush/bunchgrass savanna.</td>
<td>Siskiyou Pass PACEC</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Douglas Fir</strong></td>
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</tr>
<tr>
<td>+</td>
<td>12</td>
<td>Douglas fir serpentine woodland.</td>
<td>Eight Dollar Mtn ACEC/PSNA Lemmingsworth Gulch RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td>*</td>
<td>15. Douglas fir forest with salal and/or swordfern.</td>
<td>Bear Gulch RNA Hoover Gulch RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td>H</td>
<td>16. Douglas fir/canyon live oak woodland with poison oak and dwarf Oregon grape if possible.</td>
<td>French Flat RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td>H</td>
<td>17. Douglas fir-California black oak/poison oak.</td>
<td>French Flat RNA</td>
</tr>
</tbody>
</table>
## KLAMATH MOUNTAINS ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>18. Douglas fir-Ponderosa pine forest with poison oak, hairy</td>
<td>North Myrtle Creek RNA</td>
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<tr>
<td></td>
<td></td>
<td>snowberry or Piper’s Oregon grape understory.</td>
<td>Oregon Gulch RNA</td>
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<tr>
<td>FS, BLM</td>
<td>L</td>
<td>19. Douglas fir-white fir forest at high elevation.</td>
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<td>FS, BLM</td>
<td>H</td>
<td>20. Douglas fir/oceanspray or dry shrub community.</td>
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<td></td>
<td><strong>Western Hemlock</strong></td>
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<td>FS</td>
<td>M</td>
<td>21. Western hemlock-white fir forest with dwarf Oregon</td>
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<td></td>
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<td>grape and vine maple.</td>
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<td>H</td>
<td>22. Western hemlock/salal/swordfern and western hemlock/vine</td>
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<td></td>
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<td>maple-salal with western red cedar.</td>
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<td>M</td>
<td>23. Western hemlock-tanoak/Pacific rhododendron, western</td>
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<td></td>
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<td>hemlock-incense cedar/salal and western hemlock/salaldorf</td>
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<td>Oregon grape associations.</td>
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<td>M</td>
<td>24. Western hemlock/Pacific rhododendron associations.</td>
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<td>FS, BLM</td>
<td>M</td>
<td>25. Western hemlock coastal communities with California</td>
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<td></td>
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<td>laurel, evergreen huckleberry, swordfern, and salmonberry</td>
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<td></td>
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<td>if possible.</td>
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<td><strong>Tan Oak</strong></td>
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<td>M</td>
<td>26. Tanoak on ultramafics with shrub understory.</td>
<td>Lemmingsworth Gulch RNA</td>
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<td>27. Tanoak - Douglas fir dry site forest with canyon live</td>
<td>Hoover Gluch RNA</td>
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<td></td>
<td></td>
<td>oak, dwarf Oregon grape and poison oak if possible.</td>
<td>Lemmingsworth Gulch RNA</td>
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<td>28. Moist tanoak forests (tanoak-bigleaf maple-canyon live</td>
<td>Bobby Creek RNA</td>
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<td>oak/swordfern, tanoak-Port Orford cedar/ salal, and tanoak/</td>
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<td></td>
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<td>evergreen huckleberry-rhododendron-salal).</td>
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<tr>
<td>FS, BLM</td>
<td>H</td>
<td>29. Tanoak-western hemlock/evergreen huckleberry forest</td>
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<td></td>
<td></td>
<td>with swordfern if possible.</td>
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<td>30. Tanoak-Douglas fir moist forest with evergreen</td>
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<td></td>
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<td>huckleberry, salal and dwarf Oregon grape.</td>
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<td>31. Tanoak on ultramafics with sugar pine and golden</td>
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<td>chinkapin.</td>
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<td>32. Tanoak with white fir and Sadler’s oak at a cool site.</td>
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<td><strong>White Fir</strong></td>
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<td>FS, BLM</td>
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<td>33. White fir/pinemat manzanita on shallow soil.</td>
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<td>34. White fir-tanoak/prince’s pine forest.</td>
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<td>35. White fir at high elevations (white fir-red fir/Sadler</td>
<td>Grayback Glades RNA</td>
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<tr>
<td></td>
<td></td>
<td>oak or vanilla leaf or prince’s-pine-threeleaf anemone and</td>
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<td></td>
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<td>whitefir/beargrass associations).</td>
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<td>Ecosystem Element Name</td>
<td>Present Representation</td>
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<td></td>
<td>36.</td>
<td>White fir/dwarf Oregon grape moderately dry site forest with twinflower and vanilla leaf if possible.</td>
<td>North Fork Silver Creek RNA&lt;br&gt;North Myrtle Creek RNA</td>
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<td>FS, BLM</td>
<td>M</td>
<td>37. White fir, moderately dry site forest with baldhip rose, hairy snowberry and starflower if possible.</td>
<td><em>Oregon Gulch RNA</em></td>
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<tr>
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<td>*</td>
<td>38. White fir moist site forest with rhododendron, Dwarf Oregon grape, Sadler oak, salal, and twinflower, often with western hemlock.</td>
<td>Holton Creek RNA</td>
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<td>FS, BLM</td>
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<td>39. White fir/huckleberry oak on ultramafics.</td>
<td>Brewer Spruce RNA&lt;br&gt;Oliver Mathews PRNA</td>
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<tr>
<td></td>
<td>*</td>
<td>40. White fir with Brewer spruce and Alaska yellow cedar if possible.</td>
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<tr>
<td><strong>Red Fir</strong></td>
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<tr>
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<td>+</td>
<td>41. Red fir-mountain hemlock/pinemat manzanita/prince’s pine forest.</td>
<td>Oliver Mathews PRNA</td>
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<tr>
<td></td>
<td>+</td>
<td>42. Red fir-white fir/baldhip rose/one-sided pyrola.</td>
<td>Oliver Mathews PRNA</td>
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<td>FS</td>
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<td>43. Red fir-white fir/Sadler oak/one-sided pyrola.</td>
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<td>44. Red fir-white fir/Sadler oak/prince’s pine.</td>
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<td>45. Red fir/mountain sweetroot.</td>
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<td><strong>Mountain Hemlock</strong></td>
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<td>46. Mountain hemlock/herb association.</td>
<td>Oliver Mathews PRNA</td>
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<td>L</td>
<td>47. Mountain hemlock-red fir/dwarf bramble/one-sided pyrola.</td>
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<td><strong>Serpentine Pine</strong></td>
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<td></td>
<td>*</td>
<td>48. Knobcone pine forest.</td>
<td>Lemmingsworth Gulch RNA&lt;br&gt;Hunter Creek Bog RNA</td>
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<tr>
<td></td>
<td>*</td>
<td>49. Jeffrey pine grassland savanna.</td>
<td>Beatty Creek RNA&lt;br&gt;Cedar Log Flat RNA</td>
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<tr>
<td>PVT, BLM</td>
<td>M</td>
<td>50. Jeffrey pine with incense cedar and dry shrubs.</td>
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</tr>
<tr>
<td>FS, BLM</td>
<td>M</td>
<td>51. Jeffrey pine/huckleberry oak-pinemat manzanita forest with box-leaved silk-tassel if possible.</td>
<td><em>Eight Dollar Mtn PSNA/ACEC</em></td>
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<tr>
<td>DSL</td>
<td>M</td>
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<tr>
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<td>+</td>
<td>52. Western white pine/beargrass.</td>
<td>Lemmingsworth Gulch RNA&lt;br&gt;Red Mountain PRNA</td>
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<tr>
<td></td>
<td>+</td>
<td>53. Western white pine/huckleberry oak/beargrass with tanoak and Jeffrey pine if possible.</td>
<td>Lemmingsworth Gulch RNA&lt;br&gt;Red Mountain PRNA</td>
</tr>
<tr>
<td>Agency</td>
<td>Priority</td>
<td>Ecosystem Element Name</td>
<td>Present Representation</td>
</tr>
<tr>
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<tr>
<td>PVT, BLM H</td>
<td>54.</td>
<td>Manzanita-wedgeleaf ceanothus/bunchgrass chaparral.</td>
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<tr>
<td></td>
<td></td>
<td>* 55. Sticky manzanita-gray manzanita serpentine chaparral.</td>
<td>Rough &amp; Ready Creek ACEC/(TNC)</td>
</tr>
<tr>
<td>PVT, BLM M</td>
<td>56.</td>
<td>Live oak/Fremont silk-tassel-birchleaf mountain mahogany/bunchgrass.</td>
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<tr>
<td>FS H</td>
<td></td>
<td>* 57. Birchleaf mountain mahogany-ceanothus-rosaceous mixed chaparral.</td>
<td>Scotch Creek RNA</td>
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<tr>
<td>Grasslands</td>
<td></td>
<td>+ 58. Baker cypress woodland.</td>
<td>Oliver Mathews PRNA</td>
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<tr>
<td></td>
<td></td>
<td>* 59. Bluebunch wheatgrass-California oatgrass-Lemmon's needlegrass slopes.</td>
<td>Round Top Butte (TNC)/RNA</td>
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<tr>
<td>PVT, BLM H</td>
<td>60.</td>
<td>Idaho fescue-junegrass-Lemmon's needlegrass non-serpentine grassland.</td>
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<td></td>
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<td>* 61. Coastal oak-conifer woodland and meadow mosaic.</td>
<td>North Fork Hunter Creek ACEC</td>
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<tr>
<td>Lacustrine</td>
<td></td>
<td>62. Dune or slump-blocked lake with aquatic beds and marshy shore.</td>
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<tr>
<td>FS, BLM U</td>
<td></td>
<td>* 63. Valley floor vernal pools on hardpan.</td>
<td>Table Rocks RNA</td>
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<tr>
<td></td>
<td></td>
<td>* 64. Vernal pools on basaltic andesite.</td>
<td>Table Rocks RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 65. Lower to upper montane lake with aquatic beds and marshy shore, on serpentine or</td>
<td>Red Mountain PRNA</td>
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<tr>
<td>Palustrine</td>
<td></td>
<td>66. Douglas fir-bigleaf maple forest.</td>
<td>North Myrtle Creek RNA</td>
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<tr>
<td>FS, BLM M</td>
<td>67.</td>
<td>Riparian hardwoods with ash and black cottonwood.</td>
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</tr>
<tr>
<td>PVT, BLM H</td>
<td>68.</td>
<td>Alluvial terrace with ash, Oregon white oak and Ponderosa pine.</td>
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<td></td>
<td></td>
<td>* 69. High elevation alder glade.</td>
<td>Grayback Glades RNA</td>
</tr>
<tr>
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<td></td>
<td>* 70. Riparian hardwood forest along a major river (with alder, bigleaf maple and myrtle)</td>
<td>North Fork Chetco River RNA</td>
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<tr>
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<td>* 71. Mid to high elevation pond with aquatic beds and marshy shore.</td>
<td>Myrtle Island RNA</td>
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<td>Brewer Spruce RNA</td>
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# KLAMATH MOUNTAINS ECOLOGICAL ELEMENTS

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<th>Present Representation</th>
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<tbody>
<tr>
<td>+ 72.</td>
<td>Mid to high elevation vernal ponds and large cold springs.</td>
<td>Oliver Mathews PRNA</td>
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<tr>
<td>FS</td>
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<td>73. Tufted hairgrass-sedge wetland.</td>
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<td>* 74.</td>
<td>Tufted hairgrass-California oatgrass bottomland seasonally flooded prairie.</td>
<td>Round Top Butte RNA/(TNC) French Flat RNA</td>
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<tr>
<td>* 75.</td>
<td>Mire on floating lake-fill mat.</td>
<td>Sharon Lake Fen (TNC)</td>
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<td>FS, NPS</td>
<td>U</td>
<td>76. Hillslope wetland with willow and saussurea.</td>
<td>Oregon Caves NM</td>
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<tr>
<td>FS</td>
<td>U</td>
<td>77. Montane fen and wet mountain meadow complex.</td>
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<tr>
<td>* 78.</td>
<td>Darlingtonia fen on serpentine-peridotite, with western azalea and camas along margins.</td>
<td>Lemmingsworth Gulch RNA Woodcock Bog RNA</td>
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<tr>
<td>* 79.</td>
<td>Darlingtonia fen on serpentine-peridotite, with Port Orford cedar.</td>
<td>Hunter Creek Bog RNA</td>
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<tr>
<td>FS</td>
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<td>80. Riparian on serpentine-peridotite, with Port Orford cedar, western azalea and darlingtonia.</td>
<td>Kalmiopsis WA</td>
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<td>* 81.</td>
<td>California laurel riparian forest.</td>
<td>North Fork Chetco River RNA</td>
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<td>Agency</td>
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<td>Formation or Feature Name</td>
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<td><strong>Quaternary</strong></td>
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<td>* 1. Limestone Caves</td>
<td>Oregon Caves NM</td>
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<td>* 2. River Gorge</td>
<td>Mule Creek Canyon Rogue WSR</td>
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<td><strong>Eocene</strong></td>
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<td>3. Tyee Formation</td>
<td>Reston</td>
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<tr>
<td>PVT</td>
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<td>4. Camas Valley Formation</td>
<td>Reston</td>
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<td>PVT</td>
<td>L</td>
<td>5. White Tail Ridge Formation</td>
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<td>6. Tenmile Formation</td>
<td>Reston</td>
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<td>7. Bushnell Rock Formation</td>
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<td><strong>Eocene and Paleocene</strong></td>
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<td>PVT</td>
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<td>8. Siletz River Volcanics</td>
<td>Reston</td>
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<td><strong>Cretaceous</strong></td>
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<td>* 9. Days Creek Formation</td>
<td>Eight Dollar Mountain SIA/ACEC</td>
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<td><strong>Cretaceous and Jurassic</strong></td>
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<td>BLM, FS</td>
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<td>10. Riddle Formation</td>
<td>Days Creek</td>
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<td>PVT</td>
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<td>11. Dothan Formation</td>
<td>Winston</td>
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<td><strong>Jurassic</strong></td>
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<td>12. Colebrooke Schist</td>
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<td>13. Coast Range Ophiolite</td>
<td>Riddle</td>
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<td>14. Galice Formation</td>
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<td>* 15. Rogue Formation</td>
<td>Rogue River WSR (by Glendale)</td>
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<td>M</td>
<td>16. Josephine Ophiolite</td>
<td>Cave Junction</td>
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<td>17. May Creek Schist</td>
<td>Evans Creek</td>
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<td><strong>Invertebrates</strong></td>
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<td>1 Bombus franklini</td>
<td>Franklin's bumblebee</td>
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<td>Lower Table Rock</td>
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<tr>
<td>2 Branchinecta lynchi</td>
<td>Vernal pool fairy shrimp</td>
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<td>ACEC, Table Rocks</td>
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<td>RNA, Whetstone</td>
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<td>3 Callophrys johnsoni</td>
<td>Johnson's hairstreak (butterfly)</td>
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<td>4 Chloealtis aspasma</td>
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<td>5 Fluminicola sp. 19</td>
<td>Keene Creek pebblesnail</td>
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<td>6 Helminthoglypta hertleini</td>
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<td>7 Juga sp. 2</td>
<td>Blue Mountains juga (snail)</td>
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<td>8 Juga sp. 3</td>
<td>Brown juga (snail)</td>
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<td>9 Lanx alta</td>
<td>Highcap lanx (snail)</td>
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<td>10 Lanx subrotunda</td>
<td>Rotund lanx (snail)</td>
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<td>12 Monadenia fidelis beryllica</td>
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<td>Jenny Creek sucker</td>
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<td>26 Oncorhynchus mykiss pop. 24</td>
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<td>Umpqua chub</td>
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# Klamath Mountains Special Species

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<td>55 Canis lupus</td>
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**Nonvascular Plants**

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CHAPTER 13. WEST CASCADES ECOREGION

The West Cascades Ecoregion extends from southern British Columbia south almost to the California border. This mountainous, heavily forested ecoregion is bounded on the west by the farms and woodlands of the Willamette Valley or the drier forests and valleys of the Klamath Mountains. To the east, it spills over the crest of the Cascade Mountains to the drier pine forests of the East Cascades.

The crest of the Cascade Range is dominated by a series of volcanic peaks. In Oregon, Mount Hood is the highest at 11,240 feet, but a dozen others top 8,000 feet. The western slopes of the range feature long ridges with steep sides and wide, glaciated valleys. Most of the rivers draining the northern two-thirds of the ecoregion flow into the Willamette Valley and then to the Columbia River system; the southern third drains to the Pacific Ocean through the Umpqua and Rogue River systems. The climate varies with elevation and, to a lesser extent, latitude. Higher elevations receive heavy winter snows. The drier southern half has a fire regime similar to the Klamath Mountains, with frequent lightning-caused fires. In the north, the natural fire regime historically has had less frequent but more severe fires.

The ecoregion is almost entirely forested. Douglas fir-western hemlock forests dominate large areas up to elevations of about 3,300 feet. However, most of the previously-harvested forests of the lowlands and lower slopes now support mixed conifer-deciduous forests, with young Douglas fir and western hemlock forests found in a mosaic with hardwood species such as bigleaf maple and red alder. Silver fir-mountain hemlock forests occur at mid-elevations. Silver fir is common between 2,600 and 4,200 feet. Mountain hemlock is most common between 3,200 and 6,000 feet. In the higher areas, mountain hemlock or occasionally Alaska yellow cedar, subalpine fir, or whitebark pine woodlands open into alpine parklands with patches of forest interspersed with shrub and meadow communities. Alpine areas feature a variety of habitats ranging from dwarf shrubs, grasses and forbs to wetlands and barren expanses of rocks and ice.
Figure 14. Represented and Unrepresented Ecosystem Elements and Species for the West Cascades Ecoregion.
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<td>5.</td>
<td>Western hemlock/rhododendron-Alaska huckleberry.</td>
<td>Middle Santiam RNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>6. Western hemlock/Alaska huckleberry-salal.</td>
<td>Menagerie WA</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>*</td>
<td>7.</td>
<td>Western hemlock/rhododendron/twinflower with beargrass if possible.</td>
<td>Bull Run RNA</td>
</tr>
<tr>
<td>*</td>
<td>8.</td>
<td>Western hemlock/dwarf Oregon grape/swordfern.</td>
<td>Middle Santiam RNA</td>
</tr>
<tr>
<td>*</td>
<td>9.</td>
<td>Western hemlock/dwarf Oregon grape/oxalis.</td>
<td>Middle Santiam RNA</td>
</tr>
<tr>
<td>FS</td>
<td>H</td>
<td>10. Western hemlock/dwarf Oregon grape/vanilla leaf.</td>
<td>Menagerie WA</td>
</tr>
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<td>*</td>
<td>11.</td>
<td>Western hemlock/dwarf Oregon grape/twinflower.</td>
<td>Hagan RNA</td>
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<td>M</td>
<td>12. Western hemlock/salal.</td>
<td>Columbia WA</td>
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<td>H</td>
<td>13. Western hemlock/vanilla leaf.</td>
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<td>*</td>
<td>14.</td>
<td>Western hemlock/oxalis.</td>
<td>Middle Santiam RNA</td>
</tr>
<tr>
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<td>15.</td>
<td>Western hemlock/devil's club.</td>
<td>Carolyn's Crown - Shafer Creek RNA Columbia WA</td>
</tr>
<tr>
<td>FS, BLM PRD</td>
<td>H</td>
<td>16. River terrace forest with Douglas fir, western red cedar, western hemlock and associated hardwoods.</td>
<td>Middle Santiam R. Terrace ACEC</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>*</td>
<td>17.</td>
<td>Old growth western red cedar types.</td>
<td>Carolyn's Crown – Shafer Creek RNA</td>
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<tr>
<td></td>
<td></td>
<td><strong>Pacific Silver Fir</strong></td>
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<tr>
<td>FS</td>
<td>L</td>
<td>18. Silver fir/dwarf Oregon grape.</td>
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</tr>
<tr>
<td>+</td>
<td>19.</td>
<td>Silver fir/rhododendron/beargrass.</td>
<td>Big Bend Mountain WMA Carolyn's Crown – Shafer Creek RNA</td>
</tr>
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<td>*</td>
<td>20.</td>
<td>Silver fir/rhododendron-dwarf Oregon grape.</td>
<td>Big Bend Mountain WMA Bull Run RNA</td>
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<tr>
<td>FS</td>
<td>M</td>
<td>21. Silver fir forest with big huckleberry and dwarf bramble.</td>
<td></td>
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</tr>
<tr>
<td>+</td>
<td>22.</td>
<td>Silver fir/big huckleberry/beadlily.</td>
<td>Salmon-Huckleberry WA Big Bend Mountain WMA</td>
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<tr>
<td></td>
<td></td>
<td>* 23. Silver fir/big huckleberry/beargrass.</td>
<td>Big Bend Mountain WMA Bull Run RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 25. Silver fir/Alaska huckleberry/bunchberry with rhododendron if possible.</td>
<td>Big Bend Mountain WMA Wildcat Mountain RNA Carolyn's Crown – Shafer Creek RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 27. Silver fir/coolwort foamflower and silver fir/vine maple/coolwort foamflower communities.</td>
<td>Wildcat Mountain RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 28. Silver fir/Cascades azalea with fool’s huckleberry if possible.</td>
<td>Mount Hood WA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 29. Silver fir/Devil's club.</td>
<td>Big Bend Mountain WMA Bull Run RNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>30. Silver fir-white fir/starry Solomon seal with dwarf Oregon grape if possible.</td>
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<tr>
<td></td>
<td></td>
<td><strong>Douglas Fir</strong></td>
<td></td>
</tr>
<tr>
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<td></td>
<td>* 32. Douglas fir-Oregon white oak/poison oak woodland with associated meadows.</td>
<td>Squaw Flat RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td>M</td>
<td>33. Douglas fir/poison oak woodland.</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>* 34. Douglas fir/salal/swordfern forest.</td>
<td>Red Ponds RNA</td>
</tr>
<tr>
<td></td>
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<td>* 35. Douglas fir/oceanspray-dwarf Oregon grape.</td>
<td>Rigdon Point RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 36. Douglas fir/oceanspray/whipplevine with incense cedar if possible.</td>
<td>Limpy Rock RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 38. Douglas fir-ponderosa pine-sugar pine/evergreen shrub forest.</td>
<td>Abbott Creek RNA</td>
</tr>
<tr>
<td><strong>White Fir and Red Fir</strong></td>
<td></td>
<td></td>
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<tr>
<td>FS, BLM</td>
<td>M</td>
<td>39. White fir-Douglas fir/Piper's Oregon grape.</td>
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<tr>
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<td>* 40. White fir-incense cedar/dwarf Oregon grape forest.</td>
<td>Abbott Creek RNA</td>
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<tr>
<td>FS, BLM</td>
<td>M</td>
<td>41. White fir/big huckleberry with twinflower and vanilla leaf if possible.</td>
<td></td>
</tr>
<tr>
<td>FS, BLM</td>
<td>M</td>
<td>42. White fir/vine maple/vanilla leaf with snow bramble if possible.</td>
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### WEST CASCADES ECOLOGICAL ELEMENTS

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<thead>
<tr>
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<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
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<tbody>
<tr>
<td>FS, BLM M</td>
<td>43. White fir/dwarf Oregon grape-salal.</td>
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<tr>
<td>L</td>
<td>44. White fir-red fir/prince's pine.</td>
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<tr>
<td>FS     M</td>
<td>45. White fir-Douglas fir forest with dwarf Oregon grape and threeleaf anemone and with western serviceberry and Douglas maple if possible.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>46. Ponderosa pine/greenleaf manzanita-bitterbrush.</td>
<td>Desert Creek RNA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>47. Shasta red fir/big huckleberry.</td>
<td>Wickiup Springs PRNA, Cougar Butte RNA</td>
<td></td>
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<tr>
<td>FS     H</td>
<td>48. Red fir-Alaska yellow cedar forest.</td>
<td>Sky Lakes WA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>49. Mountain meadow-white fir forest mosaic with blue wildrye and Umpqua swertia.</td>
<td>Cougar Butte RNA</td>
<td></td>
</tr>
</tbody>
</table>

#### Mountain Hemlock

| S      | 50. Mountain hemlock/big huckleberry.                                                                  | Gold Lake Bog RNA, Waldo WA                                                            |
|        | * 51. Mountain hemlock/rhododendron.                                                                  | Three Sisters WA, Waldo Lake WA                                                       |
|        | + 52. Mountain hemlock/grouse huckleberry and mountain hemlock/woodrush forests.                      | Torrey-Charlton RNA, Three Sisters WA                                                  |

#### Subalpine and Alpine Communities

<p>| * 53. Subalpine bitterbrush steppe with long stolon sedge and needlegrass.                            | Desert Creek RNA                                                                        |
| * 54. Engelmann spruce-subalpine fir forest.                                                       | Gold Lake Bog RNA                                                                        |
| * 55. Alaska yellow cedar forest mosaic.                                                            | Three Creeks RNA                                                                        |
| * 56. Lodgepole pine/Brewer's sedge forest.                                                         | Pumice Desert RNA                                                                        |
| * 57. Whitebark pine in the high Cascades.                                                         | Llao Rock RNA                                                                            |
| * 58. Subalpine meadow mosaic in the high Cascades.                                                 | Three Sisters WA, Mt. Jefferson WA, Rogue-Umpqua Divide WA                               |
| * 59. Subalpine pumice and ash fields.                                                              | Pumice Desert RNA                                                                        |
| * 60. Alpine needlegrass in the high Cascades.                                                      | Sky Lakes WA, Mountain Lakes WA                                                          |
| * 61. Alpine mosaic (above treeline with a variety of meadows, rocky areas, and aspects).           | Three Sisters WA, Mount Jefferson WA, Mount Thielsen WA                                   |</p>
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
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<tbody>
<tr>
<td>FS U</td>
<td>62.</td>
<td>Lava flow with representative vegetation (range from mid to high elevations).</td>
<td>McKenzie Pass RNA</td>
</tr>
<tr>
<td>FS L</td>
<td>63.</td>
<td>Recent lahar (mudflow) with successional forest communities including lodgepole pine/pinemat manzanita.</td>
<td>Horse Rock Ridge RNA, Grassy Mountain PACEC</td>
</tr>
<tr>
<td></td>
<td>64.</td>
<td>Lodgepole pine/sedge communities on glacial outwash.</td>
<td>Horse Rock Ridge RNA, Grassymountain PACEC</td>
</tr>
<tr>
<td></td>
<td>65.</td>
<td>Blue wildrye or red fescue grass bald communities.</td>
<td>Horse Rock Ridge RNA, Grassymountain PACEC</td>
</tr>
<tr>
<td></td>
<td>66.</td>
<td>Chaparral communities dominated by chinquapin and manzanita.</td>
<td>Old Baldy RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Lacustrine</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>67.</td>
<td>Mid-montane lake with aquatic beds and marshy shore, surrounded by mixed conifer forest.</td>
<td>Lost Lake RNA</td>
</tr>
<tr>
<td></td>
<td>68.</td>
<td>Mid to upper montane lake with aquatic beds and marshy shore.</td>
<td>Waldo Lake WA, Mt. Jefferson WA, Mount Washington WA, Diamond Lake WA</td>
</tr>
<tr>
<td></td>
<td>69.</td>
<td>Subalpine lake.</td>
<td>Big Bend Mtn. RNA, Crabtree Lake ONA/ACEC</td>
</tr>
<tr>
<td></td>
<td>70.</td>
<td>Alpine lake.</td>
<td>Three Sisters WA</td>
</tr>
<tr>
<td></td>
<td>71.</td>
<td>Ultraoligotrophic montane lake.</td>
<td>Waldo Lake WA, Crater Lake National Park</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Palustrine</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>72.</td>
<td>Low elevation pond, with aquatic beds and marshy shore.</td>
<td>Red Ponds RNA</td>
</tr>
<tr>
<td></td>
<td>73.</td>
<td>Upper montane to subalpine pond, with aquatic beds and marshy shore.</td>
<td>Gold Lake Bog RNA, Torrey-Charlton RNA, Many Lakes RNA</td>
</tr>
<tr>
<td></td>
<td>74.</td>
<td>Alpine pond.</td>
<td>Three Sisters WA</td>
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<tr>
<td></td>
<td>75.</td>
<td>Montane vernal pond.</td>
<td>Big Bend Mtn. PRNA, Torrey-Charlton RNA</td>
</tr>
<tr>
<td>PVT, FS</td>
<td>76.</td>
<td>Flowing and pooled hot springs.</td>
<td>Big Bend Mtn. PRNA, Bull Run RNA</td>
</tr>
<tr>
<td></td>
<td>77.</td>
<td>Flowing and pooled cold springs.</td>
<td>Big Bend Mtn. PRNA, Bull Run RNA</td>
</tr>
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## WEST CASCADES ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS</td>
<td>H</td>
<td>78. Vernal seepage slopes on low to mid elevation rocky bald communities, with monkeyflower, saxifrage and moss.</td>
<td>*Horse Rock Ridge RNA Grassy Mountain ACEC</td>
</tr>
<tr>
<td>+</td>
<td>80.</td>
<td>Sitka sedge fen.</td>
<td>Big Bend Mtn. PRNA</td>
</tr>
<tr>
<td>*</td>
<td>81.</td>
<td>Subalpine sedge fen, dominated by black and Holm sedge.</td>
<td>Three Sisters WA Mount Jefferson WA</td>
</tr>
<tr>
<td>*</td>
<td>82.</td>
<td>Few flowered spikerush/brown moss fen, with lodgepole pine.</td>
<td>Gold Lake Bog RNA Many Lakes RNA</td>
</tr>
<tr>
<td>*</td>
<td>83.</td>
<td>Bog laurel shrub swamp.</td>
<td>Torrey-Charlton RNA Sphagnum Bog RNA</td>
</tr>
<tr>
<td>*</td>
<td>84.</td>
<td>Forb flush on seepage slope (including marsh marigold, shooting-star, bistort, arrowleaf groundsel and false hellebore).</td>
<td>Upper Elk Meadows RNA Three Sisters WA Mt. Jefferson WA</td>
</tr>
<tr>
<td>*</td>
<td>85.</td>
<td>Geyer willow shrub swamp.</td>
<td>Gold Lake Bog RNA</td>
</tr>
<tr>
<td>*</td>
<td>86.</td>
<td>Sitka alder/devils club swamp on seepy talus slopes or avalanche tracks.</td>
<td>Three Sisters WA Mt. Jefferson WA</td>
</tr>
<tr>
<td>*</td>
<td>87.</td>
<td>Sitka alder/lady fern swamp.</td>
<td>Upper Elk Meadows RNA Olallie Ridge RNA</td>
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<tr>
<td>+</td>
<td>89.</td>
<td>Mountain alder/sedge on organic soils.</td>
<td>Sphagnum Bog RNA Many Lakes RNA</td>
</tr>
<tr>
<td>*</td>
<td>90.</td>
<td>Bog blueberry shrubswamp, with Engelmann spruce, lodgepole pine, and tufted hairgrass.</td>
<td>Gold Lake Bog RNA Many Lakes RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td>H</td>
<td>91. Western red cedar-western hemlock/skunk cabbage swamp.</td>
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</tr>
<tr>
<td>FS</td>
<td>L</td>
<td>92. Alaska yellow cedar/devils club swamp.</td>
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<tr>
<td>Agency</td>
<td>Priority</td>
<td>Formation or Feature Name</td>
<td>Present Representation</td>
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<tr>
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<td><strong>Holocene</strong></td>
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<td>1.</td>
<td>Columbia River Gorge</td>
<td>Columbia River Gorge National Scenic Area</td>
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<tr>
<td></td>
<td>2.</td>
<td>Multnomah Falls</td>
<td>Columbia River Gorge National Scenic Area</td>
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<tr>
<td>PRD</td>
<td>H</td>
<td>3. Sand dunes in western Columbia River Gorge</td>
<td>Rooster Rock State Park</td>
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<td>*</td>
<td>4.</td>
<td>Bridge of the Gods Landslide</td>
<td>Columbia River Gorge National Scenic Area</td>
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<td>Bagby Hot Springs</td>
<td>Bagby RNA</td>
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<td><strong>Pleistocene and Holocene</strong></td>
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<td>*</td>
<td>6.</td>
<td>Eliot Glacier</td>
<td>Mt. Hood WA</td>
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<tr>
<td>FS</td>
<td>M</td>
<td>7. Old Maid Lahar</td>
<td>Sandy River</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>8. Cascades Stratovolcanoes Cone: Mt. McLoughlin</td>
<td>Mt. McLoughlin</td>
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<td>Cascades Stratovolcanoes Caldera: Crater Lake</td>
<td>Crater Lake National Park</td>
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<td><strong>Pliocene and Miocene</strong></td>
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</tr>
<tr>
<td>FS</td>
<td>L</td>
<td>11. Outerson volcanics</td>
<td>Outerson Mountain</td>
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<td>FS</td>
<td>L</td>
<td>12. Rhododendron Formation</td>
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<td></td>
<td><strong>Miocene</strong></td>
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<td>Eagle Creek Formation</td>
<td>Eagle Creek</td>
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<td>FS</td>
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<td>14. Sardine Formation</td>
<td>Sardine Mountain</td>
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<td></td>
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<td><strong>Miocene and Oligocene</strong></td>
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<td>FS, PVT</td>
<td>L</td>
<td>15. Breitenbush Formation</td>
<td>Cleator Bend Breitenbush River</td>
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<td><strong>Oligocene and Eocene</strong></td>
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<td>FS</td>
<td>L</td>
<td>16. Heppsie Andesite</td>
<td>Heppsie Mountain</td>
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<td>L</td>
<td>17. Wasson Formation</td>
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<td>L</td>
<td>18. Roxy Formation</td>
<td>Ashland</td>
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<td>L</td>
<td>19. Tuff of Bond Creek</td>
<td>Diamond Rock</td>
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<td>FS</td>
<td>L</td>
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<td></td>
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<td>FS</td>
<td>L</td>
<td>21. Hornbrook Formation</td>
<td>Jacksonville</td>
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## WEST CASCADES SPECIAL SPECIES

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<th>Scientific Name</th>
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<td>1 Agonum belleri</td>
<td>Beller's ground beetle</td>
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<td>2 Allomyia scotti</td>
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<tr>
<td>3 Anodonta californiensis</td>
<td>California floater (mussel)</td>
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<td>4 Anodonta nutalliana</td>
<td>Winged floater</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>5 Anodonta wahlametensis</td>
<td>Willamette floater (mussel)</td>
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<td>6 Calliphrys johnsoni</td>
<td>Johnson's hairstreak (butterfly)</td>
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<td>7 Chloaaltis aspasma</td>
<td>Siskiyou short-horned grasshopper</td>
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<td></td>
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<td>8 Colligyrus sp. 4</td>
<td>Columbia dusksnail</td>
<td>1</td>
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<td>9 Cryptomastix devia</td>
<td>Puget oregonian (snail)</td>
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<td></td>
</tr>
<tr>
<td>10 Cryptomastix hendersoni</td>
<td>Columbia Gorge oregonian (snail)</td>
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<td></td>
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<td>11 Deroceras hesperium</td>
<td>Evening fieldslug</td>
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<td>12 Farula constricta</td>
<td>A caddisfly</td>
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<tr>
<td>13 Fluminicola sp. 15</td>
<td>Tiger lily pebblesnail</td>
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<tr>
<td>14 Fluminicola sp. 19</td>
<td>Keene Creek pebblesnail</td>
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<td>15 Fluminicola sp. 21</td>
<td>Pinhead pebblesnail</td>
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<td>16 Fluminicola sp. 4</td>
<td>Fall Creek pebblesnail</td>
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<td>17 Fluminicola sp. 7</td>
<td>Lake of the Woods pebblesnail</td>
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<td>18 Gliabates oregonius</td>
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<td>19 Gonidea angulata</td>
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<td>20 Helminthogypta hertleini</td>
<td>Oregon shoulderband (snail)</td>
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<td>21 Juga hemphilli dallesensis</td>
<td>Dalles juga (snail)</td>
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<td>22 Juga hemphilli hemphilli</td>
<td>Barren juga (snail)</td>
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<td>23 Juga sp. 1</td>
<td>Basalt juga (snail)</td>
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<td>24 Juga sp. 3</td>
<td>Brown juga (snail)</td>
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<tr>
<td>25 Juga sp. 7</td>
<td>Three-band juga (snail)</td>
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<tr>
<td>26 Lanx subrotunda</td>
<td>Rotund lanx (snail)</td>
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<td>27 Monadenia chaceana</td>
<td>Chace sideband (snail)</td>
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<td>28 Monadenia fidelis celeuthia</td>
<td>Traveling sideband (snail)</td>
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<td>29 Monadenia fidelis columbiana</td>
<td>Columbia sideband (snail)</td>
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<td>30 Monadenia fidelis minor</td>
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<td>31 Namamyia platonis</td>
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<td>32 Neothremma andersoni</td>
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<td>33 Physella colombiana</td>
<td>Rotund physa (snail)</td>
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<td>34 Plebejus podarce</td>
<td>Gray blue (butterfly)</td>
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<td>35 Polites mardon</td>
<td>Mardon skipper (butterfly)</td>
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<td>36 Pristiloma arcticum crateris</td>
<td>Crater Lake tightcoil (snail)</td>
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<td>37 Pristiloma johnsoni</td>
<td>Broadwhorl tightcoil (snail)</td>
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<td>38 Prophysaon sp. 1</td>
<td>Klamath tail-dropper (slug)</td>
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<td>39 Prophysaon vanattae pop. 1</td>
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<td>40 Rhyacophila Chandleri</td>
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<td>41 Rhyacophila leechi</td>
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<td>42 Sixeonotus sp. 1</td>
<td>A plant bug</td>
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<td>43 Speyeria coronis coronis</td>
<td>Coronis fritillary (butterfly)</td>
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<td>44 Vanduzeina borealis californica</td>
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<td>45 Vespericola sierranus</td>
<td>Siskiyou hesperian (snail)</td>
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<td>46 Vorticifex neritoides</td>
<td>Nerite ramshorn (snail)</td>
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<td>47 Zapada wahkeena</td>
<td>Wahkeena Falls flightless stonefly</td>
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<td><strong>Fish</strong></td>
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<td>48 Catostomus rimiculus pop. 1</td>
<td>Jenny Creek sucker</td>
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<td>49 Lampetra minima</td>
<td>Miller Lake lamprey</td>
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<td>50 Oncorhynchus clarkii pop. 2</td>
<td>Coastal cutthroat trout (Southwestern Washington/Columbia River ESU)</td>
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<td>51 Oncorhynchus keta pop. 3</td>
<td>Chum salmon (Columbia River ESU)</td>
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<tr>
<td>52 Oncorhynchus kisutch pop. 1</td>
<td>Coho salmon (Lower Columbia River ESU)</td>
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<td>Salmon-Huckleberry Wilderness Area FS</td>
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<td>53 Oncorhynchus kisutch pop. 2</td>
<td>Coho salmon (Southern Oregon/Northern California Coasts ESU)</td>
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<td>54 Oncorhynchus kisutch pop. 3</td>
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<td>55 Oncorhynchus mykiss pop. 13</td>
<td>Steelhead (Snake River Basin ESU)</td>
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<td>56 Oncorhynchus mykiss pop. 24</td>
<td>Steelhead (Klamath Mountains Province ESU, summer run)</td>
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<td>57 Oncorhynchus mykiss pop. 25</td>
<td>Steelhead (Klamath Mountains Province ESU, winter run)</td>
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<td>58 Oncorhynchus mykiss pop. 26</td>
<td>Steelhead (Lower Columbia River ESU, summer run)</td>
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<td>59 Oncorhynchus mykiss pop. 27</td>
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<td>60 Oncorhynchus mykiss pop. 28</td>
<td>Steelhead (Middle Columbia River ESU, summer run)</td>
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<td>61 Oncorhynchus mykiss pop. 29</td>
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<td>62 Oncorhynchus mykiss pop. 30</td>
<td>Steelhead (Oregon Coast ESU, summer run)</td>
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<td>Steelhead (Oregon Coast ESU, winter run)</td>
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<td>64 Oncorhynchus mykiss pop. 33</td>
<td>Steelhead (Upper Willamette River ESU, winter run)</td>
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<td>65 Oncorhynchus tshawytscha pop. 2</td>
<td>Chinook salmon (Snake River ESU, fall run)</td>
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<td>66 Oncorhynchus tshawytscha pop. 21</td>
<td>Chinook salmon (Lower Columbia River ESU, spring run)</td>
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<td>67 Oncorhynchus tshawytscha pop. 22</td>
<td>Chinook salmon (Lower Columbia River ESU, fall run)</td>
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<td>68 Oncorhynchus tshawytscha pop. 23</td>
<td>Chinook salmon (Upper Willamette River ESU, spring run)</td>
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<td>69 <em>Oncorhynchus tshawytscha</em> pop. 26</td>
<td>Chinook salmon (Southern Oregon/Northern California Coast ESU, fall run)</td>
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<tr>
<td>70 <em>Oncorhynchus tshawytscha</em> pop. 8</td>
<td>Chinook salmon (Snake River ESU, spring/summer run)</td>
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<tr>
<td>71 <em>Oregonichthys crameri</em></td>
<td>Oregon chub</td>
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<tr>
<td>72 <em>Oregonichthys kalawatseti</em></td>
<td>Umpqua chub</td>
<td>1</td>
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<tr>
<td>73 <em>Salvelinus confluentus</em> pop. 1</td>
<td>Bull trout (Klamath River population)</td>
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<tr>
<td>74 <em>Salvelinus confluentus</em> pop. 2</td>
<td>Bull trout (Columbia River population)</td>
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<tr>
<td><strong>Amphibians</strong></td>
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<td>75 <em>Dicamptodon copei</em></td>
<td>Cope's giant salamander</td>
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<td>76 <em>Plethodon larselli</em></td>
<td>Larch Mountain salamander</td>
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<tr>
<td>77 <em>Rana boylii</em></td>
<td>Foothill yellow-legged frog</td>
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<td>FS North Umpqua Wild &amp; Scenic River</td>
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<td>78 <em>Rana pretiosa</em></td>
<td>Oregon spotted frog</td>
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<td>BLM, FS Gold Lake Bog RNA, Many Lakes RNA, Sky Lakes WA</td>
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<td><strong>Reptiles</strong></td>
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<tr>
<td>79 <em>Actinemys marmorata marmorata</em></td>
<td>Northern Pacific pond turtle</td>
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<td>80 <em>Chrysemys picta</em></td>
<td>Painted turtle</td>
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<td><strong>Birds</strong></td>
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<td>81 <em>Bucephala albeola</em></td>
<td>Bufflehead</td>
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<td>82 <em>Coccyzus americanus</em></td>
<td>Yellow-billed cuckoo</td>
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<td>PRD, FS Starvation Creek State Park, Three Sisters WA</td>
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<td>83 <em>Cypseloides niger</em></td>
<td>Black swift</td>
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<td>PRD, FS Starvation Creek State Park, Three Sisters WA</td>
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<td>American peregrine falcon</td>
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<td>85 <em>Haliaeetus leucocephalus</em></td>
<td>Bald eagle</td>
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<td>86 <em>Gymnogyps californianus</em></td>
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<td>Lewis's woodpecker</td>
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<td>89 <em>Picoides albolarvatus</em></td>
<td>White-headed woodpecker</td>
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<td>90 Podiceps auritus</td>
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<td>91 Podiceps grisegena</td>
<td>Red-necked grebe</td>
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<td>92 Progne subis</td>
<td>Purple martin</td>
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<td>93 Seiurus noveboracensis</td>
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<td>96 Canis lupus</td>
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<td>97 Corynorhinus townsendii</td>
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<td>PRD FS</td>
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<td>98 Gulo gulo</td>
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<td>100 Martes pennanti</td>
<td>Fisher</td>
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<td>101 Myotis thysanodes</td>
<td>Fringed myotis</td>
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<td>102 Ursus arctos horribilis</td>
<td>Grizzly bear</td>
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<td>103 Agoseris elata</td>
<td>Tall agoseris</td>
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<td>104 Agrostis howellii</td>
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<td>105 Anemone oregana var. felix</td>
<td>Bog anemone</td>
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<td>Wildcat Mountain RNA</td>
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<td>106 Arabis hastatula</td>
<td>Hells Canyon rockcress</td>
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<td>Wildcat Mountain RNA</td>
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<td>107 Arabis sparsiflora var. atrorubens</td>
<td>Sickle-pod rockcress</td>
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<td>Columbia Gorge National Scenic Area</td>
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<tr>
<td>108 Arabis suffrutescens var. horizontalis</td>
<td>Crater Lake rockcress</td>
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<td>Sky Lakes WA, Crater Lake National Park</td>
<td>NPS</td>
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<td>109</td>
<td>Arnica viscosa</td>
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<td>Artemisia campestris var. wormskioldii</td>
<td>Northern wormwood</td>
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<td>Asplenium septentrionale</td>
<td>Grass-fern</td>
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<td>Botrychium crenulatum</td>
<td>Crenulate grape-fern</td>
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<td>113</td>
<td>Botrychium montanum</td>
<td>Mountain grape-fern</td>
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<tr>
<td>114</td>
<td>Botrychium pumicola</td>
<td>Pumice grape-fern</td>
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<td>Crater Lake National Park, Three Sisters</td>
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<td>Calamagrostis breweri</td>
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**Nonvascular Plants**

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CHAPTER 14. EAST CASCADES ECOREGION

The East Cascades Ecoregion is a transition zone that extends from below the crest of the Cascade Range east to where the ponderosa pine zone meets the sagebrush-juniper steppe. The ecoregion also extends north into Washington and south into California. In Oregon, the ecoregion is variable, including extensive lodgepole forests on deep Mazama ash, the montane and foothill Ponderosa pine forests, Klamath Basin lakes and wetlands, and diverse montane forests.

The eastern slopes of the Cascades are drier than the Western Slopes, with annual rainfall ranging from 14-26 inches per year. It is less steep and cut by fewer streams than the west. The northern two-thirds of the East Cascades are drained by the Deschutes River system, which includes a series of large lakes and reservoirs near its headwaters. The southern third is drained by the Klamath River, which flows south and west into California. The Klamath Basin, which extends into the Modoc Plateau in California, is a broad, relatively flat mid-elevation valley that historically supported a vast expanse of lakes and marshes. Oregon’s largest lake, Upper Klamath Lake, is the biggest remnant of this wetland system. Most of the basin’s wetlands have been drained and converted to agriculture.

The mountains on the northern and eastern edges of the Klamath Basin lack a generally accepted name, but include a series of peaks and ridges extending from Paulina Peak near Bend southward through the headwaters of the Williamson, Sprague and Chewaucan rivers to the Warner Mountains east of Lakeview. These mountains are generally forested, but the valleys and flats between them include large marshes, irrigated meadows and pastures, and arid juniper and sagebrush steppes. These habitats are a critical part of the Pacific flyway, supporting vast number of shorebirds and waterfowl, the densest wintering concentration of bald eagles in the world, and many other wildlife species.

Also of ecological significance is the ecological zone found at the northern end of this region in Oregon, where the Columbia River Gorge contains a wealth of diversity. This Columbia Gorge transition zone, the extensive Ponderosa pine forests and woodlands, and the vast wetlands of the Klamath and upper Deschutes basin characterize this region.
Figure 16. East Cascades Represented and Unrepresented Elements and Species.
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<td>* 1. Western juniper/big sagebrush/Idaho fescue.</td>
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<td>* 3. Western juniper/big sagebrush-bitterbrush/Idaho fescue-western needlegrass.</td>
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<td>* 5. Western juniper/low sagebrush/Idaho fescue and bluebunch wheatgrass communities.</td>
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<td><strong>Ponderosa Pine</strong></td>
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<td>* 6. Ponderosa pine-western juniper/bitterbrush/Idaho fescue.</td>
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<td>* 7. Ponderosa pine/bitterbrush/western needlegrass and long-stolon sedge communities.</td>
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<td>Bluejay RNA</td>
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<td>* 8. Ponderosa pine/bitterbrush/Idaho fescue.</td>
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<td>11. Ponderosa pine/big sagebrush-bitterbrush.</td>
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<td>Pringle Falls RNA</td>
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<td>* 15. Lodgepole pine/bitterbrush/long-stolon sedge</td>
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<td>Bluejay RNA</td>
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<td>* 16. Lodgepole pine/bitterbrush/Idaho fescue.</td>
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<td>17. Lodgepole pine/bitterbrush-squawcurrent.</td>
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<td>* 18. Lodgepole pine/grouse huckleberry.</td>
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<td>23. Lodgepole pine/kinnikinnik.</td>
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<td>Bluejay RNA</td>
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<td>25. Whitebark pine-lodgepole pine forest.</td>
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<td><strong>Grand Fir</strong></td>
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<td>+ 26. Englemann spruce bottomland with ponderosa and lodgepole pine.</td>
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<td>* 27. Grand fir-Englemann spruce/starry solomon seal.</td>
<td>Gumjuwac-Tolo RNA</td>
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<td>* 28. Grand fir/skunkleaf polemonium.</td>
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<td>FS</td>
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<td>29. Grand fir/vanilla leaf.</td>
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<td>31. Grand fir/snowberry, if possible with ridgetops containing oceanspray and other dry shrubs.</td>
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<td><strong>Mixed Conifer</strong></td>
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<td>+ 32. Ponderosa pine-white fir/snowberry.</td>
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<td>* 33. Ponderosa pine-white fir/green manzanita/western needlegrass.</td>
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<td>Pringle Falls RNA</td>
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<td>+ 34. Ponderosa pine-white fir/snowbrush.</td>
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<td>35. Ponderosa pine-white fir/snowbrush-greenleaf manzanita.</td>
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<td>36. Ponderosa pine-white fir/chinkquapin forest, with snowbrush and boxwood if possible.</td>
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<td>37. White fir/snowbrush-squawcarpet ceanothis with kinnikinnik if possible.</td>
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<td>* 38. White fir-Douglas fir/snowbrush.</td>
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<td>40. Douglas fir-Pacific silver fir forest.</td>
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<td>* 41. White fir-Pacific silver fir/snowberry.</td>
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<td>* 42. White fir-red fir/long-stolon sedge forest with chinkapin if possible.</td>
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<td>43. Red fir-mountain hemlock/pinemat manzanita with mountain hemlock/grouseberry if possible.</td>
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**Grasslands and Shrubland Steppe**

| *        | 44. Bluebunch wheatgrass-Sandberg bluegrass. | Mill Creek RNA |
| *        | 45. Idaho fescue-hawkweed.                  | McCall Preserve at Rowena (TNC) |
| *        | 46. Big sagebrush-bitterbrush/Idaho fescue-western needlegrass. | Peck’s Milkvetch ACEC |

FS, BLM L 47. Mountain big sagebrush/bunchgrass.

* 48. Low sagebrush vegetation complex, with Idaho fescue, bluegrass, and bluebunch wheatgrass. Vee Pasture RNA

PVT H 49. Bitterbrush steppe with bluebunch wheatgrass and Idaho fescue.

PVT, BLM H 50. Big sagebrush, greasewood or meadow (Nevada bluegrass or basin wildrye).

**Special Types**

* 51. Oregon white oak/bitterbrush/bluebunch wheatgrass. Mill Creek RNA

FS H 52. Ponderosa pine-Oregon white oak woodland.

PVT, BLM M 53. Oak-Pine woodland, with California black oak.

FS M 54. Douglas fir-grand fir/Oregon grape.

FS L 55. Dry site Douglas fir with vine maple, Douglas maple, and oceanspray.

PVT, BLM M 56. Oregon white oak canyon riparian with bittercherry, serviceberry or red-osier dogwood.

+ 57. Entire undisturbed cinder cone at mid-elevations with ponderosa pine-lodgepole pine climax. Wechee Butte PRNA

* 58. Entire undisturbed forested cinder cone, in white fir zone; pre-Mazama. Moskt Butte RNA

+ 59. Entire forested cinder cone, in white fir zone; post-Mazama. Katsuk Butte PRNA

* 60. Entire undisturbed cinder cone in mountain hemlock zone. Moskt Butte RNA

**Lacustrine and Riverine**

* 61. Mid-montane lake, with aquatic beds and marshy shore. Cache Mountain RNA
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>*</td>
<td>62. Upper montane lake, with aquatic beds and marshy shore.</td>
<td>Cherry Basin RNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>63. Flowing and pooled cold springs.</td>
<td>Cultus River PRNA</td>
</tr>
<tr>
<td>PVT, FS</td>
<td>U</td>
<td>64. Flowing and pooled hot springs.</td>
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<tr>
<td>PVT, FS</td>
<td>U</td>
<td>65. Mare's egg springs.</td>
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**Palustrine**

<table>
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<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>*</td>
<td>66. Vernal pond at mid to high elevation</td>
<td>Sycan Marsh (TNC)</td>
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<tr>
<td></td>
<td>*</td>
<td>67. Subalpine pond.</td>
<td>Cherry Basin RNA</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>68. Bulrush-pondlily marsh with aquatic beds.</td>
<td>Sycan Marsh (TNC)</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>69. Few flowered spikerush/brown moss fen, with lodgepole pine.</td>
<td>Sycan Marsh (TNC)</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>70. Forb flush on seepage slope (including shooting-star, bistort, arrowleaf groundsel and false hellebore).</td>
<td>Sycan Marsh (TNC)</td>
</tr>
<tr>
<td>FWS, FS BLM</td>
<td>M</td>
<td>71. Beaked sedge marsh.</td>
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</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>72. Wooly sedge marsh.</td>
<td>Big Marsh</td>
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<td></td>
<td>*</td>
<td>73. Creeping spikerush meadow.</td>
<td>Sycan Marsh (TNC)</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>74. Cusick or Nevada bluegrass meadow.</td>
<td>Sycan Marsh (TNC) Bluejay RNA</td>
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<tr>
<td></td>
<td>*</td>
<td>75. Tufted hairgrass meadow, with lodgepole pine and sedge at margin.</td>
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<tr>
<td>FS</td>
<td>M</td>
<td>76. Undergreen willow-mountain willow shrub swamp.</td>
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<tr>
<td>FS</td>
<td>M</td>
<td>77. Booth willow-Geyer willow shrub swamp.</td>
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<td>*</td>
<td>78. Bog blueberry shrub-swamp, with lodgepole pine and tufted hairgrass.</td>
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<tr>
<td>PVT, BLM</td>
<td>M</td>
<td>79. Silver sagebrush/Nebraska sedge-Cusick bluegrass playa.</td>
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<tr>
<td>FS, BLM</td>
<td>H</td>
<td>80. Riparian dominated by white alder.</td>
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<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>81. Mountain alder-creek dogwood riparian.</td>
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<tr>
<td>FS</td>
<td>H</td>
<td>82. Black cottonwood/mountain alder riparian.</td>
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<tr>
<td>FS</td>
<td>H</td>
<td>83. Mountain alder-Douglas spiraea riparian.</td>
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<td>84. Mountain alder-snowberry riparian.</td>
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<td>86. Booth willow-mountain willow riparian.</td>
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<td>PVT, BLM</td>
<td>M</td>
<td>88. Pacific willow-coyote willow riparian.</td>
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<td>FS</td>
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<td>89. Geyer willow and Lemmon willow riparian.</td>
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<td>FS</td>
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<td>90. Black cottonwood/widefruit sedge riparian.</td>
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<td>91. Engelmann spruce/widefruit sedge swamp.</td>
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<td>Formation or Feature Name</td>
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<td>1. Active Fault Plane</td>
<td>Modoc Point</td>
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<td>2. Ash-Dammed Marsh</td>
<td>Klamath Marsh NWR</td>
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<td>3. Metolius Springs</td>
<td>Metolius Headwater Springs</td>
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<td>4. Mazama Ash</td>
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<td>Mayer State Park McCall Preserve at Rowena (TNC)</td>
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<td>FS, PVT</td>
<td>M</td>
<td>6. Shevlin Park Tuff</td>
<td>Bend</td>
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<td>BLM, FS</td>
<td>M</td>
<td>7. Tumalo Ash-Flow Tuff</td>
<td>Bull Flat ACEC</td>
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<td>8. Bend Air-Fall Pumice</td>
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<td>9. Desert Spring Tuff</td>
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<td>Pleistocene and Pliocene</td>
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<td>10. Lava Butte Cinder Cone</td>
<td>Lave Butte SIA</td>
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<td>11. Newberry Shield Volcano</td>
<td>Newberry Crater NM</td>
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<td>12. Newberry Crater</td>
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<td>13. Newberry Lava Caves And Tubes</td>
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<td>15. Hole-In-The-Ground Maar</td>
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<td>Merrill</td>
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<td>17. Deschutes Formation</td>
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<td>Miocene</td>
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<td>18. Simtustus Formation</td>
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<td>L</td>
<td>19. Palagonitic Tuff</td>
<td>Devil’s Garden</td>
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### EAST CASCADES SPECIAL SPECIES:

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<td>2 Anodonta nuttalliana</td>
<td>Winged floater (mussel)</td>
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<td>5 Cicindela columbica</td>
<td>Columbia River tiger beetle</td>
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<td>6 Colligyrus sp. 4</td>
<td>Columbia duskysnail</td>
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<td>Williamson River</td>
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<td>7 Colligyrus sp. 5</td>
<td>Klamath duskysnail</td>
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<td>Ouxy Spring</td>
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<td>8 Colligyrus sp. 7</td>
<td>Mare's egg duskysnail</td>
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<td>9 Colligyrus sp. 8</td>
<td>Nodose duskysnail</td>
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<td>10 Cryptomastix devia</td>
<td>Puget oregonian (snail)</td>
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<td>Columbia Gorge oregonian (snail)</td>
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<td>Evening fieldslug</td>
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<td>13 Fluminicola modoci</td>
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<td>14 Fluminicola sp. 10</td>
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<td>Nerite pebblesnail</td>
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<td>16 Fluminicola sp. 12</td>
<td>Odessa pebblesnail</td>
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<td>17 Fluminicola sp. 13</td>
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<td>18 Fluminicola sp. 14</td>
<td>Tall pebblesnail</td>
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<td>Harriman Spring</td>
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<td>19 Fluminicola sp. 15</td>
<td>Tiger lily pebblesnail</td>
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<td>20 Fluminicola sp. 16</td>
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<td>21 Fluminicola sp. 18</td>
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<td>Kimball State Park, PRD, Klamath State Fish Hatchery</td>
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<td>Keene Creek pebblesnail</td>
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<td>Blue Jay Spring Run</td>
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<td>23 Fluminicola sp. 2</td>
<td>Casebeer pebblesnail</td>
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<td>24 Fluminicola sp. 20</td>
<td>Crooked Creek pebblesnail</td>
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<td>Kimball State Park, PRD</td>
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<td>32 Gliabates oregonius</td>
<td>Salamander slug</td>
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<td>35 Juga acutifilosa</td>
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<td>67 Gila bicolor thalassina</td>
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<td>68 Lampetra minima</td>
<td>Miller Lake lamprey</td>
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<td>69 Lampetra tridentata ssp. 1</td>
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<td>70 Lavinia symmetricus mitrulus</td>
<td>Pit roach</td>
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<tr>
<td>71 Oncorhynchus clarkii pop. 2</td>
<td>Coastal cutthroat trout (Southwestern Washington/Columbia River ESU)</td>
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<tr>
<td>72 Oncorhynchus kisutch pop. 1</td>
<td>Coho salmon (Lower Columbia River ESU)</td>
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<tr>
<td>73 Oncorhynchus mykiss pop. 13</td>
<td>Steelhead (Snake River Basin ESU)</td>
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<tr>
<td>74 Oncorhynchus mykiss pop. 2</td>
<td>Jenny Creek redband trout</td>
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<tr>
<td>75 Oncorhynchus mykiss pop. 26</td>
<td>Steelhead (Lower Columbia River ESU, summer run)</td>
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### EAST CASCADES SPECIAL SPECIES

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<tr>
<td>76 Oncorhynchus mykiss pop. 27</td>
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<td>77 Oncorhynchus mykiss pop. 28</td>
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<td>79 Oncorhynchus mykiss pop. 4</td>
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<td>81 Oncorhynchus tshawytscha pop. 2</td>
<td>Chinook salmon (Snake River ESU, fall run)</td>
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<td>82 Oncorhynchus tshawytscha pop. 21</td>
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<td>85 Salvelinus confluentus pop. 1</td>
<td>Bull trout (Klamath River population)</td>
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<td>Sycan Marsh Preserve, Gearhart Mountain WA, Crater Lake National Park</td>
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<td>86 Salvelinus confluentus pop. 2</td>
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#### Amphibians

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<tr>
<td>87 Rana pipiens</td>
<td>Northern leopard frog</td>
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<td>88 Rana pretiosa</td>
<td>Oregon spotted frog</td>
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<td>89 Taricha granulosa mazamae</td>
<td>Crater Lake newt</td>
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#### Reptiles

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<tr>
<td>90 Actinemys marmorata marmorata</td>
<td>Northern Pacific pond turtle</td>
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#### Birds

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<tbody>
<tr>
<td>91 Agelaius tricolor</td>
<td>Tricolored blackbird</td>
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<td>92 Anser albidus elastis</td>
<td>Tule goose</td>
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<td>93 Bartramia longicauda</td>
<td>Upland sandpiper</td>
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<td>94 Bucephala albeola</td>
<td>Bufflehead</td>
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<td>95 Centrocercus urophasianus</td>
<td>Greater sage-grouse</td>
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<td>96 Charadrius alexandrinus nivosus</td>
<td>Western snowy plover</td>
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<td>97 Coccyzus americanus</td>
<td>Yellow-billed cuckoo</td>
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<td>Klamath Marsh NWR, Sycamour Marsh Preserve</td>
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<td>98 Coturnicops noveboracensis</td>
<td>Yellow rail</td>
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<td>99 Cygnus buccinator</td>
<td>Trumpeter swan</td>
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<td>100 Egretta thula</td>
<td>Snowy egret</td>
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<td>Merlin</td>
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<td>102 <em>Falco peregrinus anatum</em></td>
<td>American peregrine falcon</td>
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<td>103 <em>Haliaeetus leucocephalus</em></td>
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<td>Mountain Lakes WA, Bear Valley NWR, Upper Klamath NWR</td>
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<td>104 <em>Histrionicus histrionicus</em></td>
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<td>110 <em>Tympanuchus phasianellus columbianus</em></td>
<td>Columbian sharp-tailed grouse</td>
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<td>114 <em>Brachylagus idahoensis</em></td>
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<td>115 <em>Canis lupus</em></td>
<td>Gray wolf</td>
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<td>116 <em>Corynorhinus townsendii</em></td>
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<td>117 <em>Gulo gulo</em></td>
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<td>118 <em>Lynx canadensis</em></td>
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<td>123 <em>Vulpes macrotis</em></td>
<td>Kit fox</td>
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<td>125 <em>Arabis sparsiflora var. atrorubens</em></td>
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<td>126 <em>Artemisia arbuscula ssp. longicaulis</em></td>
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<td>127 <em>Astragalus applegatei</em></td>
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<td>One-leaved calochortus</td>
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<td>Slender sedge</td>
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<td>142 <em>Carex vernacula</em></td>
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<td>143 <em>Castilleja chlorotica</em></td>
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<td>144 <em>Castilleja thompsonii</em></td>
<td>Thompson's paintbrush</td>
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<td>145 <em>Cicuta bulbifera</em></td>
<td>Bulb-bearing water-hemlock</td>
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<td>146 <em>Delphinium nuttallii</em></td>
<td>Nutall's larkspur</td>
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<td>Bolander's spikerush</td>
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<td>Warner Mountain bedstraw</td>
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<td>152 <em>Gentiana newberryi</em></td>
<td>Newberry's gentian</td>
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<td><em>Heliotropium curassavicum</em></td>
<td>Salt heliotrope</td>
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<tr>
<td><em>Ivesia shockleyi</em></td>
<td>Shockley's ivesia</td>
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<tr>
<td><em>Limnanthes floccosa ssp. bellingeriana</em></td>
<td>Bellinger's meadow-foam</td>
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<td><em>Lipocarpha aristulata</em></td>
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<td><em>Lobelia dortmanni</em></td>
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<td><em>Lomatium watsonii</em></td>
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<td><em>Lycopodiella inundata</em></td>
<td>Northern bog clubmoss</td>
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<td><em>Meconella oregana</em></td>
<td>White meconella</td>
<td>1</td>
<td>Tom McCall Preserve, Koberg Beach State Park, Mayer State Park</td>
<td>TNC, PRD</td>
</tr>
<tr>
<td><em>Melica stricta</em></td>
<td>Nodding melic</td>
<td>2</td>
<td></td>
<td>Drews Reservoir</td>
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<tr>
<td><em>Mimulus evanescens</em></td>
<td>Disappearing monkeyflower</td>
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<tr>
<td><em>Mimulus tricolor</em></td>
<td>Three-colored monkeyflower</td>
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<td>Sycan Marsh</td>
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<tr>
<td><em>Penstemon barrettiae</em></td>
<td>Barrett's penstemon</td>
<td>1</td>
<td>Koberg Beach State Park</td>
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<tr>
<td><em>Penstemon glaucinus</em></td>
<td>Blue-leaved penstemon</td>
<td>1</td>
<td>Yainax Butte ACEC, Deadhorse Rim-Whitebark Pine RNA, Slide Mountain SIA</td>
<td>BLM, FS</td>
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<tr>
<td><em>Penstemon peckii</em></td>
<td>Peck's penstemon</td>
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<td>Metolius River (TNC)</td>
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<tr>
<td><em>Perideridia erythrorhiza</em></td>
<td>Red-root yampah</td>
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<td><em>Phacelia inundata</em></td>
<td>Playa phacelia</td>
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<td><em>Pilularia americana</em></td>
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<td><em>Plagiobothrys salus</em></td>
<td>Desert allocarya</td>
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<td><em>Pleurapagon oregonus</em></td>
<td>Oregon semaphore grass</td>
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<td>Mud Creek Managed Area (TNC)</td>
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<td><em>Potamogeton fibrillosus</em></td>
<td>Fibrous pondweed</td>
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<td><em>Ramunculus triternatus</em></td>
<td>Dalles Mt. buttercup</td>
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<tr>
<td><em>Rorippa columbiana</em></td>
<td>Columbia cress</td>
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<td></td>
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<tr>
<td><em>Rotala ramosior</em></td>
<td>Toothcup</td>
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<tr>
<td><em>Salix laevigata</em></td>
<td>Polished willow</td>
<td>2-x</td>
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<tr>
<td><em>Scheuchzeria palustris ssp. americana</em></td>
<td>Scheuchzeria</td>
<td>2</td>
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<tr>
<td><em>Suksdorfia violacea</em></td>
<td>Violet suksdorfia</td>
<td>2</td>
<td>Columbia Gorge National Scenic Area, Mayer State Park, Memaloose State Park</td>
<td>PRD</td>
</tr>
<tr>
<td><em>Thelypodium brachycarpum</em></td>
<td>Short-podded thelypody</td>
<td>2</td>
<td>Klamath WMA, Lower Klamath NWR</td>
<td></td>
</tr>
<tr>
<td><em>Thelypodium howellii ssp. howellii</em></td>
<td>Howell's thelypody</td>
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## EAST CASCADES SPECIAL SPECIES

<table>
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<th>Common Name</th>
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<th>Present Representation</th>
<th>Agency</th>
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<tbody>
<tr>
<td><strong>Nonvascular Plants</strong></td>
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<tr>
<td>182 Cephaloziella spinigera</td>
<td>Liverwort</td>
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<tr>
<td>183 Pseudocalliergon trifarium</td>
<td>Moss</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>184 Schistidium cinclidodonteum</td>
<td>Moss</td>
<td>2</td>
<td></td>
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<tr>
<td>185 Splachnum ampullaceum</td>
<td>Moss</td>
<td>2</td>
<td></td>
<td>Buck Lake Fen</td>
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<tr>
<td>186 Tomentypnum nitens</td>
<td>Moss</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fungi</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>187 Boletus pulcherrimus</td>
<td>Fungus</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>188 Lyophyllum piceum</td>
<td>Fungus</td>
<td>1-X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>189 Pseudorhizina californica</td>
<td>Fungus</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>190 Rhizopogon oswalldii</td>
<td>Fungus</td>
<td>2-x</td>
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<td></td>
</tr>
</tbody>
</table>
CHAPTER 15. COLUMBIA BASIN ECOREGION

The Oregon portion of the Columbia Basin Ecoregion is sometimes referred to as the Umatilla Plateau. It extends from the eastern slopes of the Cascades Mountains south and east from the Columbia River to the Blue Mountains. The region continues northward throughout most of eastern Washington, including a small portion of west central Idaho. The region includes the Columbia Basin proper, and the Palouse, which is recognized by many geographers as a separate region.

The Columbia River, with its historic floods and large deposits of loess (wind-borne silt and sand) from the end of the last ice age, has greatly influenced the region. Most of the Oregon portion of the ecoregion is a lava plateau broken by basalt canyons carved out by the Deschutes, John Day, and Umatilla Rivers and other streams that flow into the Columbia. The climate is arid, with cold winters and hot summers. Most of the ecoregion receives less than 15 inches of precipitation per year (some areas as little as eight inches), much of that in the form of snow.

The majority of the ecoregion’s natural vegetation is native bunchgrass prairie, often called Palouse prairie because of the deep, loess soils and plentiful grass. The majority of the ecoregion in Washington was originally sagebrush steppe. Sandy deposits along the Columbia River support open dunes, bitterbrush and steppe and western juniper. A few species of ground-squirrel and plants (milkvetch species among others) adapted to these habitats. The rivers are characterized by riparian vegetation, with black cottonwood, willows, chokecherry and aspen dominating riverbanks. Less common are riparian areas dominated by black hawthorn and white alder.
Early travelers along the Oregon trail found vast natural grasslands broken by brushy draws and tree- and rimrock-bordered streams with numerous springs. Because of the deep productive soils, mild climate (due to low elevations) and the presence of adequate water (either from wells or from the Columbia, Snake and Umatilla rivers), much of this region provided model farmland. The Columbia Basin Ecoregion is second only to the Willamette Valley in the percentage of landscape converted to non-native habitats and human uses. Protected areas and public lands are very limited in this region, with the only vegetation types that have not declined dramatically being found on lands that cannot be farmed: the steep canyon grasslands and scablands.

Figure 18. Columbia Basin Represented and Unrepresented Elements and Species.
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS, BLM H</td>
<td>1.</td>
<td>Ponderosa pine/hawthorn grassland mosaic.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 2.</td>
<td>Western juniper/big sagebrush/bunchgrass.</td>
<td>Boardman PRNA addition</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Boardman Grasslands (TNC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Shrub Steppe</strong></td>
<td></td>
</tr>
<tr>
<td>PVT, BLM H</td>
<td>3.</td>
<td>Big sagebrush/Idaho fescue.</td>
<td>Possibly extirpated</td>
</tr>
<tr>
<td>PVT, BLM H</td>
<td>4.</td>
<td>Big sagebrush/needle-and-thread.</td>
<td>* Lindsay Prairie (TNC)</td>
</tr>
<tr>
<td></td>
<td>* 5.</td>
<td>Big sagebrush/bluebunch wheatgrass-Sandberg bluegrass.</td>
<td>Boardman RNA</td>
</tr>
<tr>
<td></td>
<td>* 6.</td>
<td>Rigid sagebrush/Sandberg bluegrass.</td>
<td>Lawrence Grassland (TNC)</td>
</tr>
<tr>
<td>PVT, FWS H</td>
<td>8.</td>
<td>Big sagebrush-bitterbrush/bunchgrass.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Grasslands</strong></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Boardman Grasslands (TNC)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Lindsay Prairie (TNC)</td>
</tr>
<tr>
<td>PVT, BLM H</td>
<td>12.</td>
<td>Idaho fescue-bluebunch wheatgrass.</td>
<td></td>
</tr>
<tr>
<td>PVT H</td>
<td>13.</td>
<td>Idaho fescue-junegrass.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM L</td>
<td>15.</td>
<td>Buckwheat-Sandberg bluegrass scabland.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM H</td>
<td>16.</td>
<td>Bunchgrass mounds/grassland scabland complex.</td>
<td>Lawrence Grassland (TNC)</td>
</tr>
<tr>
<td></td>
<td>* 17.</td>
<td>Bunchgrass mounds/rigid sagebrush scabland complex.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM M</td>
<td>18.</td>
<td>Great Basin wildrye.</td>
<td>Possibly extirpated</td>
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<td></td>
<td></td>
<td><strong>Special Types</strong></td>
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<tr>
<td>PVT, FWS U</td>
<td>19.</td>
<td>Unstabilized sand dune communities along the Columbia River.</td>
<td>Umatilla National Wildlife Refuge</td>
</tr>
<tr>
<td>ACE</td>
<td></td>
<td>* 20. Unstabilized, inland sand dune series, from active unvegetated dunes through partially stabilized dunes (with bitterbrush, big sagebrush, rabbitbrush, and Indian ricegrass).</td>
<td>Boardman RNA</td>
</tr>
<tr>
<td>Agency</td>
<td>Priority</td>
<td>Ecosystem Element Name</td>
<td>Present Representation</td>
</tr>
<tr>
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<td>-------------------------------------------------------------</td>
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<tr>
<td></td>
<td></td>
<td><strong>Lacustrine</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Palustrine</strong></td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>22. Bare playas with annual forbs and grasses including mousetail and annual foxtail.</td>
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</tr>
<tr>
<td>PVT, OFW, BLM</td>
<td>H</td>
<td>24. Riparian dominated by peachleaf willow, coyote willow, or Pacific willow.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>25. Riparian dominated by white alder.</td>
<td></td>
</tr>
<tr>
<td>BLM</td>
<td>H</td>
<td>26. Riparian dominated by black hawthorn.</td>
<td></td>
</tr>
<tr>
<td>BLM</td>
<td>H</td>
<td>27. Riparian dominated by western birch, with quaking aspen if possible.</td>
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</tr>
<tr>
<td>BLM, PVT</td>
<td>M</td>
<td>28. Black cottonwood/creek dogwood or rose riparian.</td>
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</tr>
<tr>
<td>BLM, PVT</td>
<td>M</td>
<td>29. Black cottonwood/snowberry riparian.</td>
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</tr>
<tr>
<td>PVT</td>
<td>M</td>
<td>30. Black cottonwood/black hawthorn riparian.</td>
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# COLUMBIA BASIN GEOLOGIC FORMATIONS AND FEATURES

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<td><strong>Holocene</strong></td>
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<td>ACE, BLM</td>
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<td>1.  Eolian Dunes</td>
<td>Boardman Grasslands (TNC)</td>
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<tr>
<td></td>
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<td></td>
<td>Boardman Naval Training Center</td>
</tr>
<tr>
<td>PVT</td>
<td>H</td>
<td>2.  Mima Mounds</td>
<td>Eight Mile Mounds</td>
</tr>
<tr>
<td><strong>Pleistocene</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td></td>
<td>3.  Flood Bar</td>
<td>Umatilla Weapons Depot</td>
</tr>
<tr>
<td>*</td>
<td></td>
<td>4.  Flood Scour</td>
<td>Hat Rock State Park</td>
</tr>
<tr>
<td>ACE, BLM</td>
<td>H</td>
<td>5.  Bar and Crescentric Dunes</td>
<td>Petersburg</td>
</tr>
<tr>
<td>PVT</td>
<td>M</td>
<td>6.  Scabland Topography</td>
<td>Blalock</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>7.  Rhythmites (Missoula floods)</td>
<td>Arlington</td>
</tr>
<tr>
<td>BLM, PVT</td>
<td>M</td>
<td>8.  Mt. St. Helens Tephra</td>
<td>Arlington</td>
</tr>
<tr>
<td><strong>Pliocene and Miocene</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVT</td>
<td>L</td>
<td>9.  Chenoweth Formation</td>
<td>Chenoweth Creek</td>
</tr>
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<td>BLM, FS</td>
<td>L</td>
<td>10. Tygh Valley Formation</td>
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<tr>
<td>PVT</td>
<td>M</td>
<td>11. Alkali Canyon Formation</td>
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<td>PVT</td>
<td>L</td>
<td>12. McKay Formation</td>
<td>McKay Reservoir</td>
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<tr>
<td><strong>Miocene</strong></td>
<td></td>
<td></td>
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<tr>
<td>*</td>
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<td>13. Saddle Mountains Basalt</td>
<td>Hat Rock State Park</td>
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<tr>
<td>PVT</td>
<td>L</td>
<td>14. Wanapum Basalt Formation</td>
<td>Umatilla River/Pendleton</td>
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<tr>
<td>BLM, FS</td>
<td>L</td>
<td>15. Grande Ronde Basalt Formation</td>
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### COLUMBIA BASIN SPECIAL SPECIES

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<th>Common Name</th>
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<td>Invertebrates</td>
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<td><strong>1</strong> Anodonta californiensis</td>
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<td>BLM</td>
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<tr>
<td><strong>2</strong> Cicindela columbica</td>
<td>Columbia River tiger beetle</td>
<td>1-x</td>
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<td><strong>3</strong> Colligyrus sp. 4</td>
<td>Columbia duskysnail</td>
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<td><strong>4</strong> Cryptomastix hendersoni</td>
<td>Columbia Gorge oregonian (snail)</td>
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<tr>
<td><strong>5</strong> Fisherola nuttalli</td>
<td>Shortface lanx (=Giant Columbia River limpet)</td>
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<td>Columbia River</td>
<td></td>
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<tr>
<td><strong>6</strong> Fluminicola fuscus</td>
<td>Columbia pebblesnail or spire snail</td>
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<td><strong>7</strong> Fluminicola sp. 17</td>
<td>Tuscan pebblesnail</td>
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<td><strong>8</strong> Gonidea angulata</td>
<td>Western ridged mussel</td>
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<td><strong>9</strong> Juga bulbosa</td>
<td>Bulb juga (snail)</td>
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<td>Columbia River, Deschutes Wild and Scenic River</td>
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<tr>
<td><strong>10</strong> Juga hemphilli dallesensis</td>
<td>Dalles juga (snail)</td>
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<tr>
<td><strong>11</strong> Juga hemphilli maupinensis</td>
<td>Purple-lipped juga (snail)</td>
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<td><strong>12</strong> Juga newberryi</td>
<td>A Freshwater Snail</td>
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<td><strong>13</strong> Juga sp. 1</td>
<td>Basalt juga (snail)</td>
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<tr>
<td><strong>15</strong> Juga sp. 6</td>
<td>Purple juga (snail)</td>
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<td><strong>16</strong> Juga sp. 7</td>
<td>Three-band juga (snail)</td>
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<td><strong>17</strong> Monadenia fidelis minor</td>
<td>Oregon snail (Dalles sideband)</td>
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<tr>
<td><strong>18</strong> Monadenia fidelis ssp. 1</td>
<td>Deschutes sideband (snail)</td>
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<td><strong>19</strong> Oreohelix variabilis</td>
<td>Dalles mountainsnail</td>
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<td>Columbia River</td>
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<tr>
<td><strong>20</strong> Oreohelix variabilis ssp. 1</td>
<td>Deschutes mountainsnail</td>
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<td><strong>21</strong> Pyrgulopsis robusta</td>
<td>Jackson Lake springsnail</td>
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<td><strong>22</strong> Vespericola depressa</td>
<td>Columbia Gorge hesperian (snail)</td>
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<tr>
<td><strong>23</strong> Vespericola sp. 1</td>
<td>Oak Springs hesperian (snail)</td>
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<tr>
<td><strong>Fish</strong></td>
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<tr>
<td><strong>24</strong> Oncorhynchus clarkii pop. 2</td>
<td>Coastal cutthroat trout (Southwestern Washington/Columbia River ESU)</td>
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<td><strong>25</strong> Oncorhynchus kisutch pop. 1</td>
<td>Coho salmon (Lower Columbia River ESU)</td>
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<tr>
<td><strong>26</strong> Oncorhynchus mykiss pop. 13</td>
<td>Steelhead (Snake River Basin ESU)</td>
<td>1</td>
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<tr>
<td><strong>27</strong> Oncorhynchus mykiss pop. 28</td>
<td>Steelhead (Middle Columbia River ESU, summer run)</td>
<td>1</td>
<td>Deschutes Wild and Scenic River, John Day Wild and Scenic River</td>
<td></td>
</tr>
<tr>
<td><strong>28</strong> Oncorhynchus mykiss pop. 29</td>
<td>Steelhead (Middle Columbia River ESU, winter run)</td>
<td>1</td>
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</tr>
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</table>
## COLUMBIA BASIN SPECIAL SPECIES

<table>
<thead>
<tr>
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<th>Common Name</th>
<th>List</th>
<th>Present Representation</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>29 Oncorhynchus tshawytscha</strong></td>
<td><strong>Chinook salmon (Deschutes River ESU, summer/fall run)</strong></td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>pop. 18</td>
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<tr>
<td><strong>30 Oncorhynchus tshawytscha</strong></td>
<td><strong>Chinook salmon (Snake River ESU, fall run)</strong></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pop. 2</td>
<td></td>
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</tr>
<tr>
<td><strong>31 Oncorhynchus tshawytscha</strong></td>
<td><strong>Chinook salmon (Snake River ESU, spring/summer run)</strong></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pop. 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>32 Salvelinus confluentus</strong></td>
<td><strong>Bull trout (Columbia River population)</strong></td>
<td>1</td>
<td></td>
<td>Deschutes Wild and Scenic River</td>
</tr>
<tr>
<td>pop. 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Amphibians</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>33 Bufo woodhousii</strong></td>
<td><strong>Woodhouse's toad</strong></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>34 Rana luteiventris</strong></td>
<td><strong>Columbia spotted frog</strong></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>35 Rana pipiens</strong></td>
<td><strong>Northern leopard frog</strong></td>
<td>2</td>
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</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>36 Chrysemys picta</strong></td>
<td><strong>Painted turtle</strong></td>
<td>2</td>
<td></td>
<td>Columbia Gorge National Scenic Area, Irrigon WMA, Umatilla NWR</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>37 Agelaius tricolor</strong></td>
<td><strong>Tricolored blackbird</strong></td>
<td>2</td>
<td></td>
<td>Umatilla NWR</td>
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<tr>
<td><strong>38 Ammodramus savannarum</strong></td>
<td><strong>Grasshopper sparrow</strong></td>
<td>2</td>
<td></td>
<td>Boardman RNA/TNC Preserve</td>
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<tr>
<td><strong>39 Buphala albeola</strong></td>
<td><strong>Bufflehead</strong></td>
<td>2</td>
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<tr>
<td><strong>40 Centrocercus urophasianus</strong></td>
<td><strong>Greater sage-grouse</strong></td>
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<tr>
<td><strong>41 Falco columbarius</strong></td>
<td><strong>Merlin</strong></td>
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<tr>
<td><strong>42 Falco peregrinus anatum</strong></td>
<td><strong>American peregrine falcon</strong></td>
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<tr>
<td><strong>43 Melanerpes lewis</strong></td>
<td><strong>Lewis's woodpecker</strong></td>
<td>2</td>
<td></td>
<td>Tygh Valley State Wayside, White River WMA</td>
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<td><strong>44 Podiceps auritus</strong></td>
<td><strong>Horned grebe</strong></td>
<td>2</td>
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<tr>
<td><strong>45 Tymanuchus phasianellus</strong></td>
<td><strong>Columbian sharp-tailed grouse</strong></td>
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<td></td>
<td></td>
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<tr>
<td><strong>columbianus</strong></td>
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<tr>
<td><strong>Mammals</strong></td>
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<tr>
<td><strong>46 Antrozous pallidus</strong></td>
<td><strong>Pallid bat</strong></td>
<td>2</td>
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<tr>
<td><strong>47 Brachylagus idahoensis</strong></td>
<td><strong>Pygmy rabbit</strong></td>
<td>2</td>
<td></td>
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<tr>
<td><strong>48 Canis lupus</strong></td>
<td><strong>Gray wolf</strong></td>
<td>2</td>
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<tr>
<td><strong>49 Corynorhinus townsendii</strong></td>
<td><strong>Townsend's big-eared bat</strong></td>
<td>2</td>
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<tr>
<td><strong>50 Euderma maculatum</strong></td>
<td><strong>Spotted bat</strong></td>
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<td><strong>51 Gulo gulo</strong></td>
<td><strong>Wolverine</strong></td>
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<tr>
<td><strong>52 Lynx canadensis</strong></td>
<td><strong>Canada lynx</strong></td>
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<td><strong>53 Ovis canadensis nelsoni</strong></td>
<td><strong>Desert bighorn sheep</strong></td>
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<td><strong>54 Spermophilus washingtoni</strong></td>
<td><strong>Washington ground squirrel</strong></td>
<td>1</td>
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<td>Boardman RNA, Boardman Grasslands (TNC)</td>
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<td><strong>55 Ursus arctos horribilis</strong></td>
<td><strong>Grizzly bear</strong></td>
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134
<table>
<thead>
<tr>
<th>Scientific Name</th>
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<tr>
<td><strong>Vascular Plants</strong></td>
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<td>56 <em>Achnatherum hendersonii</em></td>
<td>Henderson ricegrass</td>
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<td>Lawrence Grasslands (TNC)</td>
<td>TNC</td>
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<td>57 <em>Allium robinsonii</em></td>
<td>Robinson's onion</td>
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<tr>
<td>58 <em>Artemisia campestris var. wormskiioldii</em></td>
<td>Northern wormwood</td>
<td>1-x</td>
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<tr>
<td>59 <em>Astragalus collinus var. laurentii</em></td>
<td>Geyer's milk-vetch</td>
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<tr>
<td>60 <em>Astragalus geyeri var. geyeri</em></td>
<td>Hood River milk-vetch</td>
<td>2</td>
<td>Columbia Gorge National Scenic Area</td>
<td>PVT</td>
</tr>
<tr>
<td>61 <em>Astragalus hoodianus</em></td>
<td></td>
<td>2</td>
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<tr>
<td>62 <em>Astragalus tyghensis</em></td>
<td>Tygh Valley milk-vetch</td>
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<td>63 <em>Balsamorhiza rosea</em></td>
<td>Rosy balsamroot</td>
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<td>64 <em>Callitriche fassettii</em></td>
<td>The Dalles water-starwort</td>
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<tr>
<td>65 <em>Callitriche marginata</em></td>
<td>Winged water-starwort</td>
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<td>66 <em>Camissonia pygmaea</em></td>
<td>Dwarf evening-primrose</td>
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<td>67 <em>Carex retroversa</em></td>
<td>Retrorse sedge</td>
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<td>68 <em>Coryphantha vivipara var. vivipara</em></td>
<td>Cushion coryphantha</td>
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<td>69 <em>Cryptantha leucophaea</em></td>
<td>Gray cryptantha</td>
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<td>70 <em>Heliotropium curassavicum</em></td>
<td>Salt heliotrope</td>
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<td>71 <em>Lipocarpha aristulata</em></td>
<td>Aristulate lipocarpha</td>
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<td>72 <em>Lomatium watsonii</em></td>
<td>Watson's desert-parsley</td>
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<td>73 <em>Mimulus evanescens</em></td>
<td>Disappearing monkeyflower</td>
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<td>74 <em>Myosurus sessilis</em></td>
<td>Sessile mousetail</td>
<td>1</td>
<td><em>Shutler Playas</em></td>
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<tr>
<td>75 <em>Phemeranthus spinescens</em></td>
<td>Spiny flame-flower</td>
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</table>
CHAPTER 16. BLUE MOUNTAINS ECOREGION

The Blue Mountains Ecoregion occupies nearly all of northeastern Oregon and extends into small portions of southern Washington and western Idaho. It encompasses three major mountain ranges: the Ochoco, Blue and Wallowa mountains. It also includes the High Lava Plains, an ecoregion recognized in past versions of this plan, which occupies most of the non-forested lands at the western edge of the region.

Landscapes include deep, rocky-walled canyons, glacially cut gorges, dissected plateaus, broad alluvial river valleys, and numerous mountain lakes, forests and meadows. Due to sharp elevational differences, the climate varies over broad temperature and precipitation ranges. Overall, the ecoregion is characterized by short, dry summers and long, cold winters.

The flora is intermediate between the east Cascades and the western Rocky Mountains of Idaho and Montana. Species composition changes with elevation and longitude. Western juniper dominates the western portion of the region, sagebrush and grassland steppes dominate the entire eastern length of the region, ponderosa pine woodlands are characteristic at mid-elevations and mixed coniferous forests
dominate at higher altitudes. Extensive grasslands occur in and north of the Wallowa Mountains, while sagebrush steppe is prevalent in the southeastern and southwestern parts of the region.

Before European settlement, Ponderosa pine savannas, basin big sagebrush steppe, native grasslands and riparian woodlands were widespread in this region. Today, many bottomland habitats have been replaced by irrigated alfalfa, juniper has expanded into many former shrub-steppe vegetation types, and ponderosa pine savannas have been cut or are being invaded by Douglas fir and grand fir.

The diversity in elevation, soils and climate yields diverse habitats and many endemic plant species. The Wallowa Mountains alone have more than 10 plants species found nowhere else. Bighorn sheep, elk and large mammal populations here are among the largest in the state. The variety in habitats, including low, mid and high elevation grasslands, shrublands and forests results in this ecoregion having more habitat diversity than all but the Klamath Mountains Ecoregion. As a result, there are a correspondingly high number of ecosystem Elements which follow.

Figure 20. Blue Mountains Ecoregion Represented and Unrepresented Elements and Species.
## BLUE MOUNTAINS ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS, BLM</td>
<td>L</td>
<td>Western juniper/low sagebrush/bunchgrass.</td>
<td>Shaketable PRNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td>M</td>
<td>Western juniper/mountain shrub (bitterbrush, mountain snowberry, serviceberry or squawapple).</td>
<td>Magpie Table</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/big sagebrush/bitterbrush/bluebunch wheatgrass.</td>
<td>Horse Ridge RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/big sagebrush/threadleaf sedge.</td>
<td>Powell Rock RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/big sagebrush/bluebunch wheatgrass.</td>
<td>The Island RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/big sagebrush/Idaho fescue.</td>
<td>Haystack Butte PRNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/big sagebrush-bitterbrush/bluebunch wheatgrass &amp; Idaho fescue vegetation.</td>
<td>The Island RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/big sagebrush-bitterbrush/needle-and-thread.</td>
<td>Badlands ACEC</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/bluebunch wheatgrass.</td>
<td>Sheep Rock RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/Thurber needlegrass on ash.</td>
<td>Sheep Rock RNA</td>
</tr>
<tr>
<td>FS, BLM</td>
<td></td>
<td>Western juniper/Idaho fescue.</td>
<td>Crooked River Ash Beds</td>
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### Ponderosa Pine

<table>
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<tr>
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<th>Priority</th>
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<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS, BLM</td>
<td>M</td>
<td>Ponderosa pine-western juniper/big sagebrush-bitterbrush vegetation mosaic.</td>
<td>Garrett Basin</td>
</tr>
<tr>
<td>FS, PVT</td>
<td>H</td>
<td>Ponderosa pine/bluebunch wheatgrass.</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>H</td>
<td>Ponderosa pine/Idaho fescue.</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>Ponderosa pine/mountain snowberry.</td>
<td>Soldier Creek</td>
</tr>
<tr>
<td>FS</td>
<td></td>
<td>Ponderosa pine/mountain mahogany communities with elk sedge &amp; bunchgrasses if possible.</td>
<td>Dry Mountain RNA</td>
</tr>
<tr>
<td>FS</td>
<td>H</td>
<td>Ponderosa pine/common snowberry floodplain.</td>
<td></td>
</tr>
</tbody>
</table>
## BLUE MOUNTAINS ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
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<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tr>
<td></td>
<td></td>
<td><strong>Douglas Fir</strong></td>
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<tr>
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<td></td>
<td></td>
<td>Ochoco Divide RNA</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Stinger Creek PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>23. Douglas fir/common snowberry, including riparian type if possible.</td>
<td>Mill Creek</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>25. Douglas fir/mallow ninebark.</td>
<td>Pleasant Valley PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Grand Fir</strong></td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>27. Douglas fir/oceanspray.</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>29. Grand fir/swordfern-wild ginger with grand fir/oakfern if possible.</td>
<td>Mill Creek</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>30. Grand fir/ladyfern.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>31. Grand fir/twinflower forest.</td>
<td>Elk Flats-Wenaha PRNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>32. Grand fir/pinegrass forest.</td>
<td>Dugout Creek RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33. Grand fir/Columbia brome forest.</td>
<td>Ochoco Divide RNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>34. Grand fir/big huckleberry forest.</td>
<td>Duck Lake PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>L</td>
<td>35. Grand fir/grouse huckleberry</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>36. Grand fir/birchleaf spiraea.</td>
<td>Canyon Creek RNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>37. Grand fir/Pacific yew communities.</td>
<td>Elk Flats-Wenaha PRNA</td>
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<tr>
<td></td>
<td></td>
<td>38. Grand fir/common snowberry with grand fir/douglas maple if possible.</td>
<td>Wenaha-Tucannon WA</td>
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<tr>
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<td></td>
<td>39. Grand fir/ninebark with grand fir/douglas maple if possible.</td>
<td>Wenaha-Tucannon WA</td>
</tr>
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### BLUE MOUNTAINS ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tbody>
<tr>
<td></td>
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<td><strong>Subalpine Fir</strong></td>
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<td>+</td>
<td>40.</td>
<td>Subalpine fir/big huckleberry forest.</td>
<td>Point Prominence PRNA</td>
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<tr>
<td>*</td>
<td>41.</td>
<td>Subalpine fir/grouse huckleberry.</td>
<td>Indian Creek RNA</td>
</tr>
<tr>
<td>FS L</td>
<td>42.</td>
<td>Subalpine fir/elk sedge.</td>
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</tr>
<tr>
<td>FS L</td>
<td>43.</td>
<td>Subalpine fir-Engelmann spruce/beadlily.</td>
<td>Eagle Cap WA</td>
</tr>
<tr>
<td>FS L</td>
<td>44.</td>
<td>Subalpine fir-Engelmann spruce/Labrador tea/mixed sedge.</td>
<td><em>N. Minam Meadows</em></td>
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<td>FS M</td>
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<td>Subalpine fir/arrowleaf groundsel or Engelmann spruce/arrowleaf groundsel.</td>
<td>Eagle Cap WA</td>
</tr>
<tr>
<td>FS M</td>
<td>46.</td>
<td>Subalpine fir/ladyfern or Engelmann spruce/ladyfern.</td>
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</tr>
<tr>
<td>FS M</td>
<td>47.</td>
<td>Subalpine fir/bog blueberry/Holms sedge wetland.</td>
<td><em>Elkhorn Mountains</em></td>
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<tr>
<td>FS M</td>
<td>48.</td>
<td>Subalpine fir/Labrador tea/Holms sedge.</td>
<td>Eagle Cap WA</td>
</tr>
<tr>
<td>FS M</td>
<td>49.</td>
<td>Subalpine fir-whitebark pine.</td>
<td><em>Strawberry Mountain</em></td>
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<td>*</td>
<td>50.</td>
<td>Mountain hemlock/grouse huckleberry forest.</td>
<td>Indian Creek RNA</td>
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<tr>
<td>FS M</td>
<td>51.</td>
<td>Limber pine forest or woodland.</td>
<td><em>Slickrock Creek</em></td>
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### Grassland Communities

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</thead>
<tbody>
<tr>
<td>+</td>
<td>52.</td>
<td>Buckwheat-Sandberg bluegrass complex.</td>
<td>Pleasant Valley PRNA</td>
</tr>
<tr>
<td>+</td>
<td>53.</td>
<td>Buckwheat-bluebunch wheatgrass complex.</td>
<td>Lake Fork PRNA</td>
</tr>
<tr>
<td>*</td>
<td>54.</td>
<td>Bluebunch wheatgrass-Idaho fescue-silky lupine.</td>
<td>Zumwalt Prairie TNC</td>
</tr>
<tr>
<td>+</td>
<td>55.</td>
<td>Bluebunch wheatgrass-Idaho fescue-arrowleaf balsamroot.</td>
<td>Basin Creek PRNA</td>
</tr>
<tr>
<td>*</td>
<td>56.</td>
<td>Bluebunch wheatgrass-Sandberg bluegrass, Balsamroot canyon grassland.</td>
<td>Sheep Rock RNA</td>
</tr>
<tr>
<td>+</td>
<td>57.</td>
<td>Biscuit scabland grasslands.</td>
<td>Vance Knoll RNA</td>
</tr>
<tr>
<td>*</td>
<td>58.</td>
<td>Sandberg bluegrass-onespike oatgrass.</td>
<td>Vance Knoll RNA</td>
</tr>
<tr>
<td>+</td>
<td>59.</td>
<td>Snake River grassland canyon mosaic including: sand dropseed, red threeawn, Sandberg bluegrass, prickly pear cactus and bluebunch wheatgrass if possible.</td>
<td>Clear Lake Ridge (TNC)</td>
</tr>
<tr>
<td>*</td>
<td>60.</td>
<td>Idaho fescue-junegrass high elevation and ridgetop communities.</td>
<td>Clear Lake Ridge (TNC)</td>
</tr>
<tr>
<td>+</td>
<td>61.</td>
<td>Low elevation, Idaho fescue-junegrass.</td>
<td>Basin Creek PRNA</td>
</tr>
</tbody>
</table>
BLUE MOUNTAINS ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Shrubland Communities</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>62. Big sagebrush/Idaho fescue.</td>
<td>Silver Creek RNA</td>
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<td></td>
<td></td>
<td></td>
<td>Sheep Rock RNA</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>63. Big sagebrush/bluebunch wheatgrass.</td>
<td>Dry Mountain RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sheep Rock RNA</td>
</tr>
<tr>
<td>DSL, BLM</td>
<td>H</td>
<td>64. Big sagebrush/needle-and-thread community.</td>
<td></td>
</tr>
<tr>
<td>PRD, BLM</td>
<td>H</td>
<td>65. Big sagebrush/needlegrass community.</td>
<td></td>
</tr>
<tr>
<td>DSL, BLM</td>
<td>H</td>
<td>66. Big sagebrush/Thurber needlegrass community.</td>
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</tr>
<tr>
<td></td>
<td>+</td>
<td>67. Low sagebrush/Idaho fescue.</td>
<td>Shaketable PRNA</td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>68. Low sagebrush/bluebunch wheatgrass.</td>
<td>Sutton Mountain WA</td>
</tr>
<tr>
<td>BLM, FS</td>
<td>L</td>
<td>69. Low sagebrush/Sandberg bluegrass.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>70. Rigid sagebrush/Sandberg bluegrass scabland.</td>
<td>Kelly Creek Butte PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Government Draw PRNA</td>
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<td></td>
<td></td>
<td></td>
<td>Shaketable PRNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>71. Netleaf hackberry/bunchgrass canyon shrubland with mockorange-poison ivy terraces or toeslopes.</td>
<td>Pleasant Valley PRNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>72. Mountain big sagebrush/Idaho fescue.</td>
<td>Vinegar Hill PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>73. Mountain big sagebrush/Cusick's bluegrass, with bluegrass openings if possible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>74. Smooth sumac/bluebunch wheatgrass.</td>
<td>Bobs Creek PRNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>75. Bitterbrush/bunchgrass.</td>
<td>Shaketable PRNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>76. Mountain mahogany/bunchgrass.</td>
<td>Pleasant Valley PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dry Mountain RNA</td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>77. Valley marginor bottomland shrubland/grassland with big sagebrush, three-tip sagebrush, and bunchgrasses.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>L</td>
<td>78. Bitterbrush biscuit scabland.</td>
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<tr>
<td></td>
<td></td>
<td><strong>Subalpine Meadow</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>79. High elevation Idaho fescue grasslands.</td>
<td>Baldy Mountain PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>80. Green fescue-spurred lupine with Parry rush and Hood sedge if possible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Standley PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tenderfoot Basin</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>81. Red mountain-heather communities.</td>
<td>Razz Lake Cirque PRNA</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>82. Alpine vegetation mosaic, including fellfields, heaths, and tundra.</td>
<td>Mt. Joseph PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eagle Cap WA</td>
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### BLUE MOUNTAINS ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tbody>
<tr>
<td>+ 83.</td>
<td></td>
<td>Alpine sedge communities.</td>
<td>Dixie Butte PRNA</td>
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#### Special Types

<table>
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<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tbody>
<tr>
<td>FS, BLM</td>
<td>L</td>
<td>84. Rocky Mountain juniper shrubland.</td>
<td>Hurricane Creek</td>
</tr>
<tr>
<td>* 85.</td>
<td></td>
<td>Lodgepole pine/grouse huckleberry/pinegrass.</td>
<td>Indian Creek RNA</td>
</tr>
<tr>
<td>+ 86.</td>
<td></td>
<td>Lodgepole pine/big huckleberry.</td>
<td>Elk Flats-Wenaha PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>87. Lodgepole pine montane valley wetland with aquatic sedge, bluejoint reedgrass and tufted hairgrass if possible.</td>
<td></td>
</tr>
<tr>
<td>+ 89.</td>
<td></td>
<td>Serpentine vegetation types.</td>
<td>Baldy Mountain PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>90. Maidenhair fern cobble/boulder bank.</td>
<td></td>
</tr>
<tr>
<td>* 91.</td>
<td></td>
<td>Annual forb communities on exposed ash beds.</td>
<td>Painted Hills NM</td>
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</tbody>
</table>

#### Lacustrine

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLM</td>
<td>U</td>
<td>92. Low-elevation alkaline lake or pond.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>U</td>
<td>93. Freshwater lake with aquatic beds and marshy shore.</td>
<td>Razz Lake PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>94. Mid to high elevation lake, with aquatic beds and marshy shore.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 95. Mid elevation pond, with aquatic beds and marshy shore.</td>
<td>Elk Flats-Wenaha PRNA</td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>U</td>
<td>96. Vernal pond on loess or alluvium.</td>
<td></td>
</tr>
<tr>
<td>Pvt, BLM</td>
<td>U</td>
<td>97. Pond with aquatic beds and marshy shore.</td>
<td></td>
</tr>
<tr>
<td>PVT, OFW</td>
<td>M</td>
<td>98. Low elevation vernal pond with saltgrass and cordgrass.</td>
<td>Ladd Marsh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 99. Subalpine pond, with aquatic beds and marshy shore including pondweeds and water lily if possible.</td>
<td>Craig Mountain Lake PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 100. Mid to high elevation vernal pond.</td>
<td>Indian Creek RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 101. Alpine pond with quillworts if possible.</td>
<td>Razz Lake PRNA</td>
</tr>
</tbody>
</table>

#### Palustrine

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>+ 102. Alpine laurel/black sedge and black sedge communities at high elevation.</td>
<td>Craig Mountain Lake PRNA</td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>M</td>
<td>103. Vernal seepage slopes on tabular basalt, with Cusick camas and California oatgrass.</td>
<td>Hells Canyon WA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>104. Shrubby cinquefoil/tufted hairgrass.</td>
<td></td>
</tr>
<tr>
<td>Agency</td>
<td>Priority</td>
<td>Ecosystem Element Name</td>
<td>Present Representation</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>PVT, OFW</td>
<td>U</td>
<td>107. Hot springs.</td>
<td>Eagle Cap WA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 108. Bulrush-cattail marsh, with aquatic beds.</td>
<td>Ladd Marsh WMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 109. Forb flush on seepage slope (including marsh marigold, cowparsnip, shooting-star, bistort, tall larkspur, arrowleaf groundsel and false hellebore).</td>
<td>Eagle Cap WA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 110. Subalpine sphagnum mire, with floating mat and buckbean.</td>
<td>Duck Lake PRNA</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>111. Subalpine sedge fen, with black and Holm sedge.</td>
<td>Eagle Cap WA</td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>112. Small-fruited bullrush wetland.</td>
<td></td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>113. Nebraska sedge meadow.</td>
<td></td>
</tr>
<tr>
<td>PVT, FS</td>
<td>H</td>
<td>114. Cusick bluegrass meadow.</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>115. Devil's club/mixed forb seeps.</td>
<td>Sheep Creek</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>116. Tufted hairgrass meadow.</td>
<td>Cougar Meadow PRNA Elk Flats PRNA</td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>117. Geyer willow shrub swamp.</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>118. Undergreen willow-mountain willow shrub swamp on organic soils.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>120. Prairie sage levee.</td>
<td>Eagle Cap WA</td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>121. Alkali playa and wetlands, including creeping wildrye, spikerush, Baltic rush, Nevada bulrush, alkali bluegrass and Lemmon alkaligrass.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>M</td>
<td>122. Sedge and rush fen, with grass meadows.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>L</td>
<td>123. Bulrush-cattail marsh with aquatic beds.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>M</td>
<td>125. Silver sagebrush/bunchgrass playa.</td>
<td></td>
</tr>
<tr>
<td>PVT, BLM</td>
<td>M</td>
<td>126. Greasewood/saltgrass with greasewood/basin wildrye if possible.</td>
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</tbody>
</table>
### Riparian

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>Low elevation riparian dominated by coyote willow, Pacific willow, or arroyo willow.</td>
<td></td>
</tr>
<tr>
<td>FS, BLM</td>
<td>H</td>
<td>Red-osier dogwood-mockorange riparian.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>Quaking aspen/bluejoint reedgrass forest.</td>
<td>Cougar Meadow PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>Quaking aspen/aquatic sedge wetland woodland.</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>Quaking aspen/wooly sedge woodland with wooly sedge meadows if possible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>Quaking aspen/common snowberry forest.</td>
<td>Elk Flats PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>H</td>
<td>Mid elevation riparian forest, dominated by birch, mountain alder and mixed conifers.</td>
<td>S. Fork Walla-Walla R. ACEC N. Fork Crooked R. ACEC</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>Western birch-mixed shrub riparian.</td>
<td>Pleasant Valley PRNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>Mountain alder-creek dogwood riparian.</td>
<td>Forest Creeks RNA</td>
</tr>
<tr>
<td>FS</td>
<td>M</td>
<td>Mountain alder/common horsetail riparian with ladyfern or tall mannagrass if possible.</td>
<td></td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>Quaking aspen/mountain alder-snowberry.</td>
<td></td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>Mountain alder-snowberry riparian.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*</td>
<td>Mountain alder-black hawthorn riparian.</td>
<td>Keating Riparian RNA</td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>Tall willow (Booth, Geyer, Lemmon, Bebb, or Missouri willow)/bladder sedge.</td>
<td></td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>Tall willow willow/aquatic sedge.</td>
<td></td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>Tall willow/wooly sedge.</td>
<td></td>
</tr>
<tr>
<td>FS, BLM</td>
<td>M</td>
<td>Missouri willow-coyote willow riparian.</td>
<td></td>
</tr>
<tr>
<td>FS, BLM</td>
<td>M</td>
<td>White alder/creek dogwood, snowberry or rose.</td>
<td></td>
</tr>
<tr>
<td>FS, BLM</td>
<td>H</td>
<td>White alder/mockorange.</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>H</td>
<td>White alder-black cottonwood riparian.</td>
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<tr>
<td>FS</td>
<td>M</td>
<td>Black cottonwood/mountain alder-red-osier dogwood.</td>
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</tr>
<tr>
<td>PVT, BLM</td>
<td>M</td>
<td>Black cottonwood/common snowberry.</td>
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</tr>
<tr>
<td>FS</td>
<td></td>
<td>Black cottonwood/red-osier dogwood.</td>
<td></td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>Black cottonwood/red-osier dogwood.</td>
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<tr>
<td>Agency</td>
<td>Priority</td>
<td>Ecosystem Element Name</td>
<td>Present Representation</td>
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<td>-------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>50. Black cottonwood/Pacific willow, with coyote willow if</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>possible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 151. Black cottonwood/black hawthorn.</td>
<td>Joseph Canyon RNA</td>
</tr>
<tr>
<td>PVT, FS</td>
<td>M</td>
<td>152. Black cottonwood/snowberry.</td>
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</table>
## BLUE MOUNTAINS GEOLOGIC FORMATIONS AND FEATURES

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Formation or Feature Name</th>
<th>Present Representation</th>
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<tbody>
<tr>
<td><strong>Holocene</strong></td>
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</tr>
<tr>
<td>BLM</td>
<td>M</td>
<td>1. Landslides</td>
<td>Hole-in-the-Wall Slide, Powder and Snake River confluence</td>
</tr>
<tr>
<td>BLM, PVT</td>
<td>M</td>
<td>2. Alder Springs</td>
<td>Deschutes Canyon, Deschutes Formation Intersection</td>
</tr>
<tr>
<td>* 3. Deschutes Canyon</td>
<td></td>
<td></td>
<td>Cove Palisades State Park</td>
</tr>
<tr>
<td>* 4. Hells Canyon Gorge</td>
<td></td>
<td></td>
<td>Hells Canyon NRA – WA</td>
</tr>
<tr>
<td><strong>Pleistocene</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVT</td>
<td>H</td>
<td>5. Glacial moraines</td>
<td>Wallowa Lake</td>
</tr>
<tr>
<td>* 6. Glacial features – Horns, Cirques, Arêtes…</td>
<td></td>
<td></td>
<td>Matterhorn Mountain</td>
</tr>
<tr>
<td>M</td>
<td>7. Entrenched meander</td>
<td>Grande Ronde River/Perry</td>
<td></td>
</tr>
<tr>
<td><strong>Miocene</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* 8. Mascall Formation</td>
<td></td>
<td>Picture Gorge RNA</td>
<td></td>
</tr>
<tr>
<td>* 9. Picture Gorge Basalt</td>
<td></td>
<td>Picture Gorge RNA</td>
<td></td>
</tr>
<tr>
<td>* 10. Grande Ronde Basalt</td>
<td></td>
<td>Hells Canyon WA</td>
<td></td>
</tr>
<tr>
<td>* 11. Imnaha Basalt</td>
<td></td>
<td>Imnaha Canyon - Hells Canyon WA</td>
<td></td>
</tr>
<tr>
<td><strong>Oligocene</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* 12. John Day Formation</td>
<td></td>
<td>Sheep Rocks Unit - John Day Fossil Bed NM</td>
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</tr>
<tr>
<td><strong>Eocene</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>* 13. Clarno Formation</td>
<td></td>
<td>Clarno Unit-John Day Fossil Beds NM</td>
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<tr>
<td><strong>Cretaceous</strong></td>
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<td>* 14. Gable Creek Formation</td>
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<td>Painted Hills Unit - John Day Fossil Beds NM</td>
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<td>L</td>
<td>15. Hudspeth Shale</td>
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<td>L</td>
<td>16. Bernard Formation</td>
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<td>* 17. Coon Hollow Formation</td>
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<td>Pittsburg Landing – Hells Canyon NRA</td>
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<td>22. Nicely shale</td>
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<td>26. Keller Creek Shale</td>
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<td>27. Murder’s Creek Graywacke</td>
<td>Ingle Rock</td>
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<td>28. Hurwal Formation</td>
<td>Hurwal Divide - Eagle Cap WA</td>
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<td>29. Martin Bridge Limestone</td>
<td>Big Bar – Hells Canyon NRA Matterhorn</td>
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<td>30. Doyle Creek Formation</td>
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<td>31. Wild Sheep Creek Formation</td>
<td>Cottonwood Cr. - Hells Canyon WA</td>
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<td>32. Laycock Graywacke</td>
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<td>36. Burnt River schist</td>
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<td>37. Canyon Mountain Ophiolite</td>
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<td>38. Elkhorn Ridge Argillite</td>
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<td>39. Coyote Butte Limestone</td>
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<td>Hunsaker Creek Formation</td>
<td>Oxbow (Snake River – Hells Canyon NRA)</td>
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<td>* 41.</td>
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<td>Windy Ridge Formation</td>
<td>Oxbow (Snake River – Hells Canyon NRA)</td>
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<td>42. Spotted Ridge Formation</td>
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<td>43. Coffee Creek Formation</td>
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<td>Meadow fritillary (butterfly)</td>
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<td>3. <strong>Boloria selene</strong></td>
<td>Silver-bordered fritillary (butterfly)</td>
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<td>4. <strong>Callophrys johnsoni</strong></td>
<td>Johnson's hairstreak (butterfly)</td>
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<td>5. <strong>Cicindela columbica</strong></td>
<td>Columbia River tiger beetle</td>
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<td>6. <strong>Colligyrus sp. 3</strong></td>
<td>Blue Mountains duskysnail</td>
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<td>7. <strong>Cryptomastix populi</strong></td>
<td>Poplar oregonian (snail)</td>
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<td>8. <strong>Cryptomastix sp. 3</strong></td>
<td>Disc oregonian (snail)</td>
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<td>9. <strong>Fluminicola fuscus</strong></td>
<td>Columbia pebblesnail or spire snail</td>
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<td>10. <strong>Gonidea angulata</strong></td>
<td>Western ridged mussel</td>
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<td>Snake WSRr</td>
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<td>11. <strong>Juga bulbosa</strong></td>
<td>Bulb juga (snail)</td>
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<td>12. <strong>Juga hemphilli maupinensis</strong></td>
<td>Purple-lipped juga (snail)</td>
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<td>13. <strong>Juga newberryi</strong></td>
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<td>14. <strong>Juga sp. 2</strong></td>
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<td>15. <strong>Juga sp. 4</strong></td>
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<td>16. <strong>Megomphix lutarius</strong></td>
<td>Umatilla megomphix (snail)</td>
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<td>17. <strong>Monadenia fidelis ssp. 1</strong></td>
<td>Deschutes sideband (snail)</td>
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<td>18. <strong>Ochlodes yuma</strong></td>
<td>Yuma skipper (butterfly)</td>
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<td>19. <strong>Ogaridiscus subrupicola</strong></td>
<td>Southern tightcoil (snail)</td>
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<td>20. <strong>Oreohelix sp. 29</strong></td>
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<td>21. <strong>Oreohelix strigosa delicata</strong></td>
<td>Blue mountainsnail</td>
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<td>22. <strong>Radiodiscus abietum</strong></td>
<td>Fir pinwheel (snail)</td>
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<td>23. <strong>Taylorconcha insperata</strong></td>
<td>A freshwater snail</td>
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<td>24. <strong>Fish</strong></td>
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<td>24. <strong>Oncorhynchus clarkii lewisi</strong></td>
<td>Westslope cutthroat trout</td>
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<td>25. <strong>Oncorhynchus mykiss pop. 13</strong></td>
<td>Steelhead (Snake River ESU)</td>
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<td>26. <strong>Oncorhynchus mykiss pop. 28</strong></td>
<td>Steelhead (Middle Columbia River ESU, summer run)</td>
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<td>27. <strong>Oncorhynchus mykiss pop. 29</strong></td>
<td>Steelhead (Middle Columbia River ESU, winter run)</td>
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<td>28. <strong>Oncorhynchus nerka pop. 1</strong></td>
<td>Sockeye salmon (Snake River ESU)</td>
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<td>29. <strong>Oncorhynchus tshawytscha pop. 18</strong></td>
<td>Chinook salmon (Deschutes River ESU, summer/fall run)</td>
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<td>30. <strong>Oncorhynchus tshawytscha pop. 2</strong></td>
<td>Chinook salmon (Snake River ESU, fall run)</td>
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<td>31. <strong>Oncorhynchus tshawytscha pop. 8</strong></td>
<td>Chinook salmon (Snake River ESU, spring/summer run)</td>
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<td>32. <strong>Salvelinus confluentus pop. 2</strong></td>
<td>Bull trout (Columbia River population)</td>
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<td><em>Ascaphus montanus</em></td>
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<td><em>Rana luteiventris</em></td>
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<td><em>Rana pipiens</em></td>
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<td><em>Chrysemys picta</em></td>
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<td><em>Coccozus americanus</em></td>
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<td><em>Histrionicus histrionicus</em></td>
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<td><em>Leucosticte tephrocotis wallowa</em></td>
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<td><em>Seiurus noveboracensis</em></td>
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<td><em>Canis lupus</em></td>
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<td>Corynorhinus townsendii</td>
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<td>Spotted bat</td>
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<td>Wolverine</td>
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<td>Canada lynx</td>
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<td>Martes pennanti</td>
<td>Fisher</td>
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<td>Fringed myotis</td>
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<td>Grizzly bear</td>
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<td>Wallowa ricegrass</td>
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<td>Allium dictum</td>
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<td>Allium geyeri var. geyeri</td>
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<td>Allium tolmiei var. platyphyllum</td>
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<td>Anemone multifida var. tetonensis</td>
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<td>Arabis davidsonii</td>
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<td>Asplenium trichomanes-ramosum</td>
<td>Green spleenwort</td>
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<td>Astragalus diaphanus var. diurnus</td>
<td>South John Day milk-vetch</td>
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<td>Astragalus peckii</td>
<td>Peck's milk-vetch</td>
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<td>Bull Flat ACEC, “Innes Market Road” ACEC</td>
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<td>Astragalus tegetarioides</td>
<td>Bastard kentrophyta</td>
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<td>Botrychium ascendens</td>
<td>Upward-lobed moonwort</td>
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151
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<td>79 Botrychium crenulatum</td>
<td>Crenulate grape-fern</td>
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<td>80 Botrychium hesperium</td>
<td>Western moonwort</td>
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CHAPTER 17. NORTHERN BASIN & RANGE ECOREGION

The Northern Basin and Range Ecoregion includes much of southeastern Oregon’s high desert and extends south into Nevada and extreme northeastern California. The ecoregion’s name reflects its topography and geology, with numerous flat basins separated by isolated, generally north-south mountain ranges. Many of the mountains are fault blocks, with gradual slopes on one side and precipitous basalt rims on the other. In Oregon, elevations range from 2,500 feet in the lowest parts of the Owyhee and Malheur Rivers to more than 9,700 feet on Steens Mountain. Soils are generally rocky and thin, low in organic matter and high in minerals.

Another important influence in the ecoregion is the geology, which is mostly of volcanic origin. Over large portions of the landscape, soils have been derived from underlying layers of basalt and rhyolite, or occasionally from sedimentary layers that have been exposed by erosion. Of more interest than these “normal soils” are soils derived from volcanic ash and welded tuffs, which are found in distinct sites such as Leslie Gulch and Succor Creek near the Idaho border, or the extensive young lava flows such as Devil’s Garden, Diamond Craters, Jordan Craters or Saddle Butte Lava Field. The climate is arid, with extreme ranges of daily and seasonal temperatures, with areas in the Alvord Desert (Oregon's driest location) receiving as little as 7 inches of rain annually. Runoff from rainfall and mountain snowpack in the basins often flows into flat alkaline playas, forming seasonal shallow lakes and marshes.

Also known as the sagebrush desert or high desert, the Northern Basin and Range Ecoregion contains many diverse habitats. The most significant of these are the extensive sagebrush steppe areas, dominated primarily by Wyoming big sagebrush and low sagebrush, with many small but important
silver sagebrush playas. The Ecoregion contains large, closed, alkaline basins, the largest of which is the Alvord Desert. These contain large areas of salt desert scrub characterized by alkaline flats, with Oregon’s only populations of mormon tea, iodine bush, and most of Oregon’s winterfat, shadscale and spiny-hopsage alkaline shrublands. The large wildlife refuges, ACECs and Wilderness Areas here support some of the largest populations of pronghorn antelope, white pelicans, sage grouse and waterfowl, and are well known for their wildlife diversity. The refuges and protected areas also contain Oregon’s only narrowleaf cottonwood riparian forests, and the majority of the state’s alkaline wetlands, mountain mahogany and aspen woodlands.

Also included within this section of the plan is a small inclusion of the Snake River Plain ecoregion. This is a major feature in southern Idaho, which extends into Oregon in northeastern Malheur County. It includes the lower Snake River valley from the county line to where the Snake leaves the state, and includes the lower valley of the Malheur River from Ontario to Harper. The Snake River Plain Ecoregion has similar vegetation as the adjacent Northern Basin and Range Ecoregion, but differs markedly in its terrain. The Snake River Plain is basically a broad river valley with low, adjacent foothills.

![Graph](image.png)

**Figure 22.** Represented and Unrepresented Ecosystem Elements and Species for the Northern Basin and Range Ecoregion.
<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Ponderosa Pine and Western Juniper</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 1. Ponderosa pine/big sagebrush-bitterbrush, isolated stand within steppe.</td>
<td>Lost Forest RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 2. Ponderosa pine-western juniper/big sagebrush/needle-and-thread.</td>
<td>Lost Forest RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 3. Ponderosa pine-western juniper/sagebrush-bitterbrush vegetation mosaic.</td>
<td>Castle Rock PRNA, Ott Mountain PRNA, Sheep Mountain PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 4. Ponderosa pine-western juniper/low sagebrush vegetation mosaic.</td>
<td>Silver Creek RNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 5. Western juniper/big sagebrush/bluebunch wheatgrass.</td>
<td>Connley Hills RNA, Stockade Mountain RNA, Black Canyon RNA</td>
</tr>
<tr>
<td>DSL, BLM</td>
<td>M</td>
<td>6. Western juniper/big sagebrush/Idaho fescue.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 7. Western juniper/big sagebrush-bitterbrush.</td>
<td>Rahilly-Gravelly RNA</td>
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<tr>
<td></td>
<td></td>
<td>+ 8. Western juniper/bluebunch wheatgrass.</td>
<td>Connley Hills RNA</td>
</tr>
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<td>+ 9. Western juniper/Idaho fescue.</td>
<td>Connley Hills RNA, Vee Pasture RNA</td>
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<td>* 10. Western juniper/low sagebrush/Idaho fescue.</td>
<td>Poker Jim Ridge RNA</td>
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<td></td>
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<td>+ 11. Western juniper/big sagebrush-bitterbrush steppe.</td>
<td>Juniper Gulch PRNA</td>
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<td></td>
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<td>+ 12. Western juniper-mountain mahogany/mountain big sagebrush/bunchgrass.</td>
<td>Ott Mountain PRNA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* 13. Western juniper/low sagebrush/Sandberg bluegrass.</td>
<td>Poker Jim Ridge RNA</td>
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<td></td>
<td></td>
<td><strong>Big Sagebrush</strong></td>
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<tr>
<td></td>
<td></td>
<td>+ 14. Wyoming big sagebrush/bluebunch wheatgrass.</td>
<td>Connley Hills RNA, Big Alvord Creek RNA, Hawk Mountain II PRNA, <em>Tent Creek Headwaters</em></td>
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<td></td>
<td></td>
<td>+ 15. Wyoming big sagebrush/Idaho fescue.</td>
<td>Hawk Mountain I PRNA, Hawk Mountain II PRNA</td>
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<tr>
<td></td>
<td></td>
<td>* 16. Wyoming big sagebrush/Thurber needlegrass.</td>
<td>North Ridge Bully Creek RNA, South Ridge Bully Creek RNA</td>
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<tr>
<td>BLM</td>
<td>H</td>
<td>17. Wyoming big sagebrush/western needlegrass.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 18. Wyoming big sagebrush/needle-and-thread.</td>
<td>Sink Lakes-Guano Creek RNA</td>
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NORTHERN BASIN AND RANGE ECOLOGICAL ELEMENTS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Priority</th>
<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tr>
<td></td>
<td>20.</td>
<td>Wyoming big sagebrush/Indian ricegrass.</td>
<td>Long Draw RNA</td>
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<td>23.</td>
<td>Basin big sagebrush/basin wildrye.</td>
<td>Three Forks PRNA</td>
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**Mixed Sagebrush and Mountain Big Sagebrush**

<table>
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<td></td>
<td>24.</td>
<td>Big sagebrush-greasewood vegetation.</td>
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<td>25.</td>
<td>Big sagebrush-bitterbrush/Idaho fescue.</td>
<td>Fish Creek Rim RNA</td>
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<td></td>
<td>26.</td>
<td>Mountain brush (Mountain big sagebrush-bitterbrush-squawapple.)</td>
<td>Rahilly-Gravelly RNA</td>
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<td>27.</td>
<td>Snowbrush and bittercherry shrub complex.</td>
<td>Fish Creek Rim RNA</td>
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<td>28.</td>
<td>Big sagebrush-bitterbrush/Idaho fescue.</td>
<td>South Bull Canyon RNA</td>
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<td>29.</td>
<td>Big sagebrush-bitterbrush/Indian ricegrass and big sagebrush/needle and thread mosaic on sandy soils.</td>
<td>Hammond Hill Sand Hills RNA</td>
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<td>30.</td>
<td>Wyoming big sagebrush-squawapple/bluebunch wheatgrass-Thurber needlegrass.</td>
<td>South Ridge Bully Creek RNA</td>
</tr>
<tr>
<td></td>
<td>31.</td>
<td>Wyoming big sagebrush-squawapple/Idaho fescue.</td>
<td>South Ridge Bully Creek RNA</td>
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<td></td>
<td>32.</td>
<td>Mountain big sagebrush/Idaho fescue.</td>
<td>Castle Rock PRNA</td>
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<td>33.</td>
<td>Mountain big sagebrush/needlegrass.</td>
<td>Steens Mountain WA</td>
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<td>34.</td>
<td>Mountain big sagebrush/basin wildrye.</td>
<td>Warner Creek PRNA</td>
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<td>35.</td>
<td>Mountain big sagebrush-mountain snowberry/Idaho fescue.</td>
<td>Spring Mountain RNA</td>
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<td>36.</td>
<td>Mountain big sagebrush, bitterbrush, mountain snowberry/Thurber needlegrass mosaic.</td>
<td>Little Blitzen RNA</td>
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<td>37.</td>
<td>Big sagebrush-threetip sagebrush/bunchgrass.</td>
<td>North Ridge Bully Creek RNA</td>
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<td>38.</td>
<td>Threetip sagebrush/bluebunch wheatgrass.</td>
<td>North Ridge Bully Creek RNA</td>
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<td>39.</td>
<td>Threetip sagebrush/Idaho fescue.</td>
<td>Jordan Crater RNA</td>
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### NORTHERN BASIN AND RANGE ECOLOGICAL ELEMENTS

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<th>Present Representation</th>
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<td>+</td>
<td>40.</td>
<td>Silver sagebrush/Nevada bluegrass flat or playa.</td>
<td>Lake Ridge RNA, Toppin Butte RNA, Jordan Crater RNA</td>
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<td>41.</td>
<td>Low sagebrush/bluebunch wheatgrass.</td>
<td>Poker Jim Ridge RNA, Lake Ridge RNA</td>
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<tr>
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<td>42.</td>
<td>Low sagebrush/Idaho fescue.</td>
<td>Fish Creek Rim RNA, Toppin Butte RNA, Lake Ridge RNA</td>
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<td>43.</td>
<td>Low sagebrush/Thurber needlegrass.</td>
<td>Desert Lake PRNA, Sagehen Hills</td>
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<td>BLM, FWS</td>
<td>M</td>
<td>44. Low sagebrush/Sandberg bluegrass scabland.</td>
<td>Sink Lakes-Guano Creek RNA, Stockade Mountain RNA addition, Steens Mountain WA</td>
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<td>45.</td>
<td>Montane low sagebrush/sheep fescue-Idaho fescue mosaic.</td>
<td>Warner Creek PRNA</td>
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<td>46.</td>
<td>Black sagebrush/bunchgrass community complex.</td>
<td>Foley Lake RNA, Mendi Gore Playa RNA</td>
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<td>47.</td>
<td>Rigid sagebrush/Sandberg bluegrass.</td>
<td>Black Canyon RNA</td>
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<td>48.</td>
<td>Rigid sagebrush/Bluebunch wheatgrass</td>
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<td><strong>Desert or Salt Desert Shrub</strong></td>
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<td>49.</td>
<td>Big sagebrush-spiny hopsage salt desert scrub playa.</td>
<td>Harney Lake RNA, TumTum Lake RNA</td>
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<td>50.</td>
<td>Big sagebrush-spiny hopsage-budsage mosaic on ash.</td>
<td>Coal Mine Basin RNA, Basin PACEC, Dry Creek Gorge PACEC</td>
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<td>51.</td>
<td>Shadscale-spiny hopsage-green mormon tea salt desert scrub.</td>
<td>Pueblo Foothills RNA</td>
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<tr>
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<td>52.</td>
<td>Black greasewood-shadscale/bunchgrass playa margin vegetation.</td>
<td>Harney Lake RNA, TumTum Lake RNA</td>
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<td>53.</td>
<td>Shadscale-budsage/bunchgrass salt desert scrub.</td>
<td>Spanish Lake RNA</td>
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<td>BLM</td>
<td>M</td>
<td>54. Shadscale/bunchgrass steppe.</td>
<td>Dry Creek Buttes</td>
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<td>55.</td>
<td>Black greasewood flat.</td>
<td>Hammond Hill Sand Hills RNA, Crooked Creek SNA</td>
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<td>56.</td>
<td>Shadscale-big sagebrush mosaic.</td>
<td>Palomino Playa RNA, Crooked Creek SNA</td>
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<td>57.</td>
<td>Winterfat playa.</td>
<td>Mickey Basin RNA, Mendi Gore Playa RNA</td>
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<tr>
<td>Agency</td>
<td>Priority</td>
<td>Ecosystem Element Name</td>
<td>Present Representation</td>
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<tr>
<td>* 58.</td>
<td>Sand dune series, from active unvegetated dunes through stabilized (with greasewood, hopsage, Indian ricegrass, and wildrye).</td>
<td>Harney Lake RNA Big Alvord Creek RNA</td>
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<td>BLM</td>
<td>H</td>
<td>59. Iodine bush playa.</td>
<td>McDermitt Mann Lake</td>
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<td></td>
<td></td>
<td>Mountain Mahogany</td>
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<tr>
<td>+ 60.</td>
<td>Mountain mahogany/mountain big sagebrush community with bitterbrush if possible.</td>
<td>Fish Creek Rim RNA Mahogany Ridge RNA</td>
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<tr>
<td>+ 61.</td>
<td>Mountain mahogany/mountain big sagebrush-snowberry/bunchgrass.</td>
<td>Dry Creek Bench PRNA Warner Creek PRNA</td>
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<td>PVT</td>
<td>H</td>
<td>62. Mountain mahogany/pinegrass.</td>
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<td>+ 63.</td>
<td>Mountain mahogany-aspen-cherry snowbank.</td>
<td>Spring Mountain RNA Mahogany Ridge RNA Addition</td>
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<td>* 64.</td>
<td>Mountain mahogany/bluebunch wheatgrass canyon.</td>
<td>Rooster Comb RNA</td>
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<td>Special Types</td>
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<td>+ 65.</td>
<td>White fir forest.</td>
<td>Hart Canyon PRNA Fir Groves PACEC</td>
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<tr>
<td>* 66.</td>
<td>Aspen/blue wildrye.</td>
<td>Little Blitzen RNA</td>
<td></td>
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<td>* 67.</td>
<td>High elevation fescue grassland.</td>
<td>East Kiger Plateau RNA Little Blitzen RNA</td>
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<td>* 68.</td>
<td>Alpine upland vegetation including grasslands with alpine oatgrass, sedge and spikerush meadows, and alpine buckwheat.</td>
<td>Little Wildhorse Lake RNA Little Blitzen RNA Steens Mountain WA</td>
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<td>DSL, BLM</td>
<td>M</td>
<td>69. Intermittent stream dominated by mock orange, bitterbrush or serviceberry.</td>
<td>Canyon south. of Namorf</td>
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<td>* 70.</td>
<td>Annual forb communities on exposed ash beds.</td>
<td>Leslie Gulch RNA Honeycombs RNA</td>
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<td></td>
<td></td>
<td>Lacustrine</td>
<td></td>
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<td>* 71.</td>
<td>Low elevation lake with aquatic beds and marshy shore.</td>
<td>Jordan Crater RNA</td>
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<tr>
<td>PVT, BLM</td>
<td>U</td>
<td>72. Faultblock lake.</td>
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<tr>
<td>* 73.</td>
<td>Low elevation hot lake and associated elevated mineral springs.</td>
<td>Borax Lake (TNC) Micky Hot Springs PACEC</td>
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<tr>
<td>* 74.</td>
<td>Low elevation alkaline lake.</td>
<td>Harney Lake RNA Stinking Lake RNA Tumtum Lake RNA</td>
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<tr>
<td>Agency</td>
<td>Priority</td>
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<td>Present Representation</td>
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<tr>
<td>DSL, BLM U</td>
<td>76.</td>
<td>Low elevation alkaline pond with aquatic beds and marshy shore.</td>
<td></td>
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<tr>
<td>DSL, BLM U</td>
<td>77.</td>
<td>Low elevation freshwater pond with aquatic beds and marshy shore.</td>
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<tr>
<td>DSL, BLM U</td>
<td>78.</td>
<td>Mid to high elevation pond with aquatic beds and marshy shore.</td>
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<td>79.</td>
<td>Low elevation vernal pond.</td>
<td>Sink Lakes-Guano Creek RNA</td>
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<td>Jordan Crater RNA</td>
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<td>80.</td>
<td>Mid to high elevation vernal pond.</td>
<td>Little Blitzen RNA</td>
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<td>81.</td>
<td>Large hot springs.</td>
<td>Borax Lake Preserve (TNC)</td>
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<td></td>
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<td>Mickey Hot Springs PACEC</td>
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<td>82.</td>
<td>Running hot springs</td>
<td>Three Forks PRNA</td>
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<td>Harney Hot Springs</td>
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<td>83.</td>
<td>Cold springs.</td>
<td>Little Blitzen RNA</td>
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<td>84.</td>
<td>Bulrush-cattail marsh, with aquatic beds.</td>
<td>Jordan Crater RNA</td>
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<td>85.</td>
<td>Burreed marsh.</td>
<td>Crump Lake PSNA</td>
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<td>86.</td>
<td>Reedgrass marsh.</td>
<td>Crump Lake PSNA</td>
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<td>South Warner Basin (TNC)</td>
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<td>87.</td>
<td>Nebraska sedge meadow.</td>
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<td>88.</td>
<td>Wet sedge meadow in alpine cirque.</td>
<td>Little Blitzen RNA</td>
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<td></td>
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<td>South Fork Willow Creek RNA</td>
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<td></td>
<td></td>
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<td>Little Wildhorse Creek RNA</td>
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<td>89.</td>
<td>Alkaline marsh, with sedge, spikerush, rush and bulrush.</td>
<td>Harney Lake RNA</td>
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<td>Stinking Lake RNA</td>
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<td>Borax Lake ACEC/(TNC)</td>
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<td>Silver sagebrush/Great Basin wildrye.</td>
<td>Guano Slough PRNA</td>
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<td>Silver sagebrush/Nevada bluegrass</td>
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<td>92.</td>
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<td>93.</td>
<td>Silver sagebrush/Nebraska sedge-Cusick bluegrass playa.</td>
<td>Foster Flat RNA</td>
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<td>PVT, BLM H</td>
<td>94.</td>
<td>Spiny saltbush/saltgrass playa.</td>
<td></td>
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<td>95.</td>
<td>Bare playa with playa margin communities, including creeping wildrye, Baltic rush, Nevada bulrush, alkali</td>
<td>Harney Lake RNA</td>
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<td>Big Alvord Creek RNA</td>
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### Northern Basin and Range Ecological Elements

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<th>Ecosystem Element Name</th>
<th>Present Representation</th>
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<tr>
<td></td>
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<td>bluegrass and Lemmon alkaligrass</td>
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</tr>
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<td>* 96.</td>
<td>Playa with greasewood and Great Basin wildrye.</td>
<td>Serrano Point RNA</td>
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<td>* 97.</td>
<td>Greasewood/saltgrass playa.</td>
<td>Harney Lake RNA</td>
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<td>Greasewood/seablite playa.</td>
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<td>Stinking Lake RNA</td>
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<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>99. Open basin valley bottom alkaline wetland mosaic, with</td>
<td>Crooked Creek</td>
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<td>PRD</td>
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<td>greasewood/saltgrass and greasewood/Basin wildrye.</td>
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<td>+ 100.</td>
<td>Bare playa with Davis' peppergrass if possible.</td>
<td>Palomino Playa RNA</td>
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<td></td>
<td>+ 101.</td>
<td>Bare playa with poverty weed.</td>
<td>Toppin Butte RNA</td>
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#### Riparian

<table>
<thead>
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<th>Present Representation</th>
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<td>PVT, BLM</td>
<td>H</td>
<td>102. Missouri willow/golden currant.</td>
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<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>103. Booth willow-Lemmon willow riparian.</td>
<td></td>
</tr>
<tr>
<td>BLM</td>
<td>H</td>
<td>104. Subalpine willow shrub swamp, with Booth and</td>
<td>Fish Creek Meadows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drummond willows.</td>
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<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>105. Lemmon willow-bog blueberry shrub swamp on organic</td>
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<td></td>
<td></td>
<td>soils.</td>
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<td></td>
<td>* 106.</td>
<td>Lemmon willow, mid elevation riparian.</td>
<td>East Fork Trout Creek RNA</td>
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<td>PVT, BLM</td>
<td>H</td>
<td>107. Low elevation riparian community dominated by coyote</td>
<td>Sink Lakes-Guano Creek RNA</td>
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<tr>
<td></td>
<td></td>
<td>willow, Pacific willow and arroyo willow.</td>
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<tr>
<td>BLM</td>
<td>H</td>
<td>108. Riparian community dominated by arroyo willow, red-</td>
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<tr>
<td></td>
<td></td>
<td>osier dogwood and Woods rose.</td>
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<td></td>
<td>* 109.</td>
<td>Riparian dominated by coyote willow and Pacific willow.</td>
<td>Black Canyon RNA</td>
</tr>
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<td></td>
<td>Three Forks PRNA</td>
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<td>PVT, BLM</td>
<td>M</td>
<td>110. Rigid willow/golden currant riparian.</td>
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<td>FS</td>
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<tr>
<td>DSL, BLM</td>
<td>M</td>
<td>111. Geyer willow riparian.</td>
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</tr>
<tr>
<td></td>
<td>+ 112.</td>
<td>Riparian community dominated by mountain alder and</td>
<td>Little Whitehorse Exclosure RNA</td>
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<tr>
<td></td>
<td></td>
<td>creek dogwood or snowberry.</td>
<td></td>
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<td></td>
<td>* 113.</td>
<td>Mountain alder-quaking aspen riparian.</td>
<td>Little Blitzen RNA</td>
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<td>Agency</td>
<td>Priority</td>
<td>Ecosystem Element Name</td>
<td>Present Representation</td>
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<td>*</td>
<td>114.</td>
<td>Riparian community dominated by quaking aspen and Scouler willow.</td>
<td>East Fork Trout Creek RNA</td>
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<td>*</td>
<td>115.</td>
<td>Riparian community dominated by black cottonwood and creek dogwood.</td>
<td>Rooster Comb RNA, Little Blitzen RNA</td>
</tr>
<tr>
<td>+</td>
<td>116.</td>
<td>Riparian community dominated by black cottonwood and coyote willow.</td>
<td>Big Alvord Creek RNA</td>
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<tr>
<td></td>
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<tr>
<td>PVT, BLM</td>
<td>H</td>
<td>117. Black cottonwood/mountain alder riparian.</td>
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<td>PVT, BLM</td>
<td>H</td>
<td>118. Black cottonwood/snowberry riparian.</td>
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<td>*</td>
<td>119.</td>
<td>Narrowleaf cottonwood riparian area.</td>
<td>Pueblo Foothills RNA</td>
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<td>+</td>
<td>120.</td>
<td>Aspen/mountain snowberry woodland or forest.</td>
<td>Spring Mountain RNA</td>
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<tr>
<td>BLM</td>
<td>M</td>
<td>121. Dwarf aspen-bittercherry-serviceberry snowbank.</td>
<td><em>Spring Mountain RNA</em></td>
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<td>+</td>
<td>122.</td>
<td>White alder riparian.</td>
<td>Succor Creek PSNA</td>
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<td>DSL, BLM</td>
<td>H</td>
<td>123. Bittercherry-coyote willow-rose riparian.</td>
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<td>Agency</td>
<td>Priority</td>
<td>Formation or Feature Name</td>
<td>Present Representation</td>
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<td>* 1. Active fault scarp</td>
<td>Abert Rim ACEC</td>
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<tr>
<td>BLM M</td>
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<td>2. Landslides</td>
<td>* Winter Ridge</td>
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<td>* 3. Eolian dunes</td>
<td>Alvord Dunes ACEC</td>
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<td>Winter Ridge</td>
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<td>Warner Lakes Dunes</td>
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<td>* 4. Playa Lakes</td>
<td>Alvord Lake - Alvord ACEC</td>
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<td>* 5. Tyfoni Weathering</td>
<td>Leslie Gulch RNA</td>
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<tr>
<td>BLM L</td>
<td></td>
<td>6. Pinnacles</td>
<td>* Sand Creek</td>
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<td></td>
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<td>* 7. Cinder cones and craters</td>
<td>Diamond Craters Outstanding Natural Area</td>
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<td>Jordan Craters RNA</td>
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<td>* 8. Desert deposits and features</td>
<td>Big Alvord Creek RNA</td>
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<td>* 9. Glacial valleys</td>
<td>Steens Mountains WA</td>
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<td>Little Blitzen RNA</td>
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<td>* 10. Lake deposits and features</td>
<td>Fort Rock State Park</td>
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<td>Harney Lake RNA</td>
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<td>BLM, PVT M</td>
<td></td>
<td>11. Landslides</td>
<td>* Rome</td>
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<td>BLM H</td>
<td></td>
<td>12. Lava Tube Caves</td>
<td>* Saddle Butte</td>
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<td>* 13. Lava Field</td>
<td>Jordan Craters RNA</td>
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<td>Devils Garden ACEC</td>
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<td>* 14. Rhyolite pillars</td>
<td>Leslie Gulch</td>
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<td>Lower Owyhee Gorge</td>
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<td>* 15. Tuff Ring</td>
<td>Fort Rock State Park</td>
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<td></td>
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</tr>
<tr>
<td>BLM L</td>
<td></td>
<td>16. Glenns Ferry Formation</td>
<td>* Malheur Butte</td>
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<tr>
<td>BLM L</td>
<td></td>
<td>17. Harney Formation</td>
<td>Burns</td>
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<td>PVT L</td>
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<td>18. Rattlesnake Ash-Flow Tuff</td>
<td>Burns</td>
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<td></td>
<td>* 19. Jump Creek Rhyolite</td>
<td>Succor Creek State Park</td>
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<tr>
<td>BLM, PVT L</td>
<td></td>
<td>20. Wildcat Creek Welded Ash-Flow Tuff</td>
<td>* Skull Springs</td>
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<tr>
<td>Agency</td>
<td>Priority</td>
<td>Formation or Feature Name</td>
<td>Present Representation</td>
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<tr>
<td>BLM</td>
<td>L</td>
<td>21. Rhyolite and Rhyodacite of Dry Creek</td>
<td>Skull Springs</td>
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<tr>
<td>BLM</td>
<td>L</td>
<td>22. Prater Creek Ash-Flow Tuff</td>
<td>Burns</td>
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<tr>
<td>BLM</td>
<td>L</td>
<td>23. Devine Canyon Ash-Flow Tuff</td>
<td>Burns</td>
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<td>L</td>
<td>24. Littlefield Rhyolite</td>
<td>Namorf</td>
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<td>BLM, PRD</td>
<td>L</td>
<td>25. Owyhee Basalt</td>
<td>Owyhee River Canyon</td>
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<td>* 26. Sucker Creek Formation</td>
<td>Succor Creek State Park</td>
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<td>* 27. Steens Mountain Basalt</td>
<td>Steens Mountain WA</td>
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<tr>
<td>BLM</td>
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<td>28. Pike Creek Volcanics</td>
<td>Steens Mountain Cooperative Management and Protection Area</td>
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<td>29. Alvord Creek Formation</td>
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<td>Scientific Name</td>
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<td><strong>1</strong> Amerigoniscus malheurensis</td>
<td>Malheur isopod</td>
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<td>Malheur Cave</td>
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<td><strong>2</strong> Anodonta californiensis</td>
<td>California floater (mussel)</td>
<td>2</td>
<td>Harney Lake RNA, Malheur NWR</td>
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<td><strong>3</strong> Anodonta nuttalliana</td>
<td>Winged floater</td>
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<td><strong>4</strong> Anodonta wahlametensis</td>
<td>Willamette floater (mussel)</td>
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<td><strong>5</strong> Apochthonius malheuri</td>
<td>Malheur pseudoscorpion</td>
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<td>Malheur Cave</td>
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<td><strong>6</strong> Colligyrus depressus</td>
<td>Harney Basin dusksnail</td>
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<td><strong>7</strong> Fluminicola insolitus</td>
<td>Donner und Blitzen</td>
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<td><strong>8</strong> Fluminicola sp. 9</td>
<td>Malheur pebblesnail</td>
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<td><strong>9</strong> Fluminicola turbiniformis</td>
<td>Turban pebblesnail</td>
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<td><strong>10</strong> Gonidea angulata</td>
<td>Western ridged mussel</td>
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<td>Lower Owyhee Canyon, WSA, Malheur NWR, Owyhee River Canyon</td>
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<td><strong>11</strong> Helisoma newberryi newberryi</td>
<td>Great Basin ramshorn (snail)</td>
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<td><strong>12</strong> Kenkia rhynchida</td>
<td>A flatworm (planarian)</td>
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<td><strong>13</strong> Micracanthia fennica</td>
<td>Harney Hot Spring shore bug</td>
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<td><strong>14</strong> Ochlodes yuma</td>
<td>Yuma skipper (butterfly)</td>
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<td><strong>15</strong> Oncopodura mala</td>
<td>Malheur Cave springtail</td>
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<td><strong>16</strong> Petrophysa sp. 1</td>
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<td><strong>17</strong> Physa megalochlamys</td>
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<td><strong>20</strong> Pyrgulopsis intermedia</td>
<td>Crooked Creek springsnail</td>
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<td><strong>21</strong> Pyrgulopsis owyheensis</td>
<td>A springsnail</td>
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<td><strong>22</strong> Pyrgulopsis robusta</td>
<td>Jackson Lake springsnail</td>
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<td><strong>23</strong> Stygobromus hubbsi</td>
<td>Malheur Cave amphipod</td>
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<td><strong>24</strong> Taylorconcha insperata</td>
<td>A freshwater snail</td>
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<td><strong>Fish</strong></td>
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<td><strong>25</strong> Catostomus tahoensis</td>
<td>Tahoe sucker</td>
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<td><strong>26</strong> Catostomus warnerensis</td>
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<td><strong>27</strong> Gila alvordensis</td>
<td>Alvord chub</td>
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<td><strong>28</strong> Gila bicolor eurysoma</td>
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<td>Warner Basin tui chub</td>
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<td>Hutton tui chub</td>
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<td>Catlow tui chub</td>
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<td><strong>34</strong> Gila boraxobius</td>
<td>Borax Lake chub</td>
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<td><strong>35</strong> Oncorhynchus anaden alvordensis</td>
<td>Alvord cutthroat trout</td>
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<td><strong>36</strong> Oncorhynchus anaden henshawi</td>
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<td>38 Oncorhynchus mykiss pop. 4</td>
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<td>Lahontan redside</td>
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<td>Woodhouse's toad</td>
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<td>42 Rana luteiventris</td>
<td>Columbia spotted frog</td>
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<td>43 Rana pipiens</td>
<td>Northern leopard frog</td>
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<td>44 Ammodramus savannarum</td>
<td>Grasshopper sparrow</td>
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<td>45 Anser albifrons eliasi</td>
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<td>46 Bucephala albeola</td>
<td>Bufflehead</td>
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<td>47 Centrocercus urophasianus</td>
<td>Greater sage-grouse</td>
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<td>48 Charadrius anadensiss nivosus</td>
<td>Western snowy plover</td>
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<td>49 Coccyzus americanus</td>
<td>Yellow-billed cuckoo</td>
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<td>Trumpeter swan</td>
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<td>Malheur NWR</td>
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<td>Bobolink</td>
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<td>Merlin</td>
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<td>Franklin’s gull</td>
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<td>Malheur NWR</td>
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<td>Black rosy-finch</td>
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<td>Lewis’s woodpecker</td>
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<td>Malheur NWR, Summer Lake WMA</td>
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<td>American white pelican</td>
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## NORTHERN BASIN AND RANGE SPECIAL SPECIES (BR)

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### Vascular Plants

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<td>168 <em>Stephanomeria malheurensis</em></td>
<td>Malheur wire-lettuce</td>
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<td>169 <em>Stylocline psilocarphoides</em></td>
<td>Malheur stylocline</td>
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<td>170 <em>Symphoricarpus longiflorus</em></td>
<td>Long-flowered snowberry</td>
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<td>171 <em>Thelypodium brachycarpum</em></td>
<td>Short-podded thelypod</td>
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<td>172 <em>Thelypodium howellii ssp. howellii</em></td>
<td>Howell's thelypod</td>
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<tr>
<td>173 <em>Trifolium leibergii</em></td>
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<td>Dreysey</td>
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<tr>
<td>174 <em>Trifolium owyheense</em></td>
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<td>1</td>
<td>Leslie Gulch RNA, Honeycombs RNA</td>
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<td><strong>Nonvascular Plants</strong></td>
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<td>175 <em>Tortula mucronifolia</em></td>
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The Biodiversity Information Center staff and the Oregon Natural Heritage Advisory Council are grateful for the work of all the volunteers and experts who helped make the publication of the Oregon Natural Areas Plan possible. In particular, we would like to mention our partnership with the interagency Research Natural Area committee and the staff coordinator Todd Wilson, and the other authors of the *Interagency Strategy for the Pacific Northwest Natural Areas Network*: Reid Schuller, Russ Holmes, Curt Pavola, Robert A. Fimbel, Cynthia N. McCain, John G. Gamon, Pene Speaks, Joan I. Seevers, Thomas E. DeMeo, and Steve Gibbons. We would not have been able to include the important chapters on Management, Monitoring, Research, and Education were it not for their hard work and their willingness to share.

The Ecosystem Elements were carefully reviewed by a number of U.S. Forest Service ecologists, including Tom DeMeo, Diane White, Gregg Reigel, Jane Kertis, and Cindy McCain.

Charles Carter gets full credit for assuring that the Geology portions of the plan make sense. In this effort, he was assisted by Ian Madin and other staff from the Department of Geology and Mineral Industries.

Thanks also to our new council member, Scott Heppell, who was responsible for our marine and estuarine revisions, along with John Christy of ORBIC. We thank Mike Graybill, Jan Hodder and David Fox for their work to revise the Marine and Intertidal Ecosystem Elements in the Oregon Coast Range Ecoregion. Bruce Taylor and others at the Oregon Biodiversity Project provided most of the ecoregional descriptions.

Thanks also go to the many who helped revise the lists of special plant and animals included in this plan. These comments not only helped in the production of this plan, but also in the development of the recently updated ODFW sensitive species list, and the 2010 edition of *Rare, Threatened and Endangered Species of Oregon*.

Snowy plover (*Charadrius alexandrinus nivosus*) by Jay Miner
REFERENCES


RELEVANT LITERATURE NOT CITED


http://www.fs.fed.us/pnw/publications/pnw_1972_franklin001/


Chinook salmon (*Oncorhynchus tshawytscha*) by Jay Miner
APPENDIX 1. FORMS AND PROCEDURES USED IN THE NATURAL AREA PROGRAM

Comparative Analysis Format for Natural Area Designation

A. Introduction and Methods

B. Abstract of Each Site
1) Site Description - Brief descriptive sentences about the vegetation or elements at the site, its relationship to the landscape, and geomorphology.
2) Elements - List of the target and secondary elements present at the site and brief description as to: (a) size, (b) quantity, (c) quality, and (d) natural variation represented for each.
3) Legal Considerations
   a) Preserve Boundaries - Description of boundaries for entire proposed area.
   b) Tract Ownership Summary - Names and addresses of owners or managers and legal description of property.
   c) Protection Costs - Costs of buying, if privately owned, or taking out of production, if currently used or designated for commodity use. Includes property values (assessed and real, if applicable).
   d) Stewardship Costs - Costs of executing any necessary management recommendations, e.g. fencing, burning, etc. Briefly states management needs.

C. Comparison of Sites
1) Physical Attributes - Size, aspects, soil, scenic qualities, etc.
2) Ecological Attributes - Quality in terms of species composition, absence of invaders, lack of sign of physical disturbance, general vigor, presence of indicator species (for communities), viability (for species).
3) Overall Attributes - Costs and ease of actual protection.
4) Tabular Summary of Ranking Considerations.

Model Dedication Agreement Form for State Natural Areas

The Oregon State Land Board and the [name of agency] hereby agree to the following provisions as they pertain to [name of site] located at [legal description of site location]. By virtue of this agreement, the above-described site is dedicated as a Natural Area as provided for in the Oregon Natural Heritage Act, as amended.

This agreement is entered into for the purpose of promoting natural diversity of native species and ecosystems in Oregon, and specifically to protect the designated area as the primary representative site for the natural element(s) [name of element(s)] as identified in the Oregon Natural Heritage Plan of [date].

This agreement includes as additional instruments of dedication the appended documents as follows:
   a) A statement of management objectives for the site;
   b) The Natural Heritage Registry Summary Form for the site;
   c) Any other documents as needed.

Either party to this agreement may terminate it in accordance with the provisions of the Oregon Natural Heritage Act upon 60 days written notice, including specific reasons for termination.

Approved and signed on [date].

Signatures.
Model Procedures for State Agency Dedication of Natural Areas

Model dedication procedures are included to assist natural resource state agencies in establishing natural areas on their lands. Agencies may wish to further refine these guidelines.

Oregon's Natural Areas Program has rules in force for dedicating and managing such areas (Oregon Administrative Rules 141-50-500 to 141-50-599). The procedures recommended here are designed to keep the process as simple as possible in conformity with these existing rules.

Step 1: Agency Receives Dedication Proposal from the Council

A letter from the council to the agency includes reasons why the site is proposed for dedication, a general description of the site and its boundaries, and management considerations.

Step 2: Agency Evaluates Dedication Proposal

1) Within one month, the agency designates the person responsible for evaluating the proposal and preparing the dedication documents and communicates this information informally or in writing to the council.
2) Using staff or consultants and consulting with the council, the agency evaluates the proposal to determine whether or not it is feasible.
3) The agency takes into account the Natural Area Program rules (referenced above), recognizing that the council is empowered to waive any of its own rules which would prevent dedication of a natural area due to conflict with agency statutes, rules, regulations, or policy.
4) The agency determines within six months after receiving the council proposal whether or not to go forward with dedication procedures for that site, and communicates this decision to the council in writing. The council recognizes that evaluations that depend on seasonal opportunities for study may take longer.

Step 3: Agency and Council Draft Dedication Documents

The agency, in consultation with the council, drafts two dedication documents. One is a dedication agreement specifying the boundaries of the site, the natural heritage values the agreement is designed to protect, and any other considerations as needed.

The other document is a statement of management objectives for the site. This outlines major known threats to the resources in question, as well as the best and most realistic methods of protecting them. It includes activities to be encouraged, allowed or proscribed, and options for management agreements involving outside parties.

Additional documents to accompany the dedication agreement may also on occasion be required to meet the needs of the agency, the council, the State Land Board, or other parties.

Step 4: Public Notice, Hearing, and Agency Approval

The agency, according to its existing rules and procedures for public notice and hearing, publishes notice of intent to dedicate the site and places the matter on the agenda of the regular public meeting of the board or commission which oversees the agency. The meeting or meetings at which the dedication proposal is discussed and approved constitute the required public hearing.

After taking into account any public comment, the board or commission revises the dedication documents as needed and accords them final approval.
Step 5: Dedication by State Land Board

The agency and council together bring the dedication agreement and accompanying documents before a regular State Land Board meeting for approval.

Step 6: Dedication Ceremony

This step is optional, and can include whatever ceremony and activities the agency and the council believe are appropriate.

Summary Form for Sites included in the Register of Natural Heritage Resources

NATURAL HERITAGE ADVISORY COUNCIL
OREGON REGISTER OF NATURAL HERITAGE RESOURCES
SUMMARY FORM

1. NATURAL AREA NAME:
2. LOCATION:
3. SIZE:
4. REGISTER CATEGORY:
5. PRINCIPAL NATURAL HERITAGE RESOURCES:
6. SPECIAL SPECIES:
7. EVALUATION OF CRITERIA FOR REGISTRATION
   A. PRIORITY IN PLAN:
   B. ADEQUATE REPRESENTATION:
   C. DEGREE OF DISTURBANCE:
   D. VIABILITY:
   E. UNIQUE GEOLOGICAL VALUES:
   F. PRIORITY FOR SPECIAL SPECIES:
   G. SPECIAL SPECIES PROTECTION CAPABILITY:
   H. MANAGEABILITY:
8. SPECIAL REMARKS OR COMMENTS:
9. OWNERSHIP:
10. CONSENT OF OWNER (PRIVATE), DATE:
11. DATE OF COUNCIL RECOMMENDATION:
12. DATE OF LAND BOARD APPROVAL:
13. SOURCES OF ADDITIONAL INFORMATION:
14. VALUE OF NATURAL AREA IN LAY TERMS:
## APPENDIX 2. OREGON STATE REGISTER OF NATURAL HERITAGE RESOURCES AS OF 30 JUNE 2010

<table>
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<tr>
<th>Name (Owner) – Date Registered</th>
<th>Name (Owner) – Date Registered</th>
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<tr>
<td>Ace Williams Mountain (TNC) - 2/01</td>
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<td>Logan Valley (TNC) - 4/99</td>
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<td>Luckiamute Landing (OPRD) - 3/93</td>
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<td>Billy Burr Lake (TNC) - 3/93</td>
<td>Memaloose (OPRD) - 6/93</td>
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<td>Middle Fork John Day - Dunston (TNC) - 3/90</td>
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<td>Blind Slough Swamp (TNC) - 6/95</td>
<td>Middle Fork John Day River - Oxbow (TNC) - 4/99</td>
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<td>Borax Lake (TNC) - 2/94</td>
<td>Miller Island (ODFW) - 1/92</td>
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<td>Nehalem Bay (OPRD) - 2/91</td>
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<td>Nesika Beach (TNC) - 10/98</td>
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<td>Ophir Dunes (ODOT) - 6/88</td>
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Whetstone Savanna (TNC) - 6/95
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Willow Creek (TNC) - 4/98

Winchuck Slope (DSL) - dedicated 1979
Woodcock Creek (DSL) - 3/90
Yamhill Oaks (TNC) – 1/09
Zumwalt Prairie (TNC) - 2/01

COE – Corps of Engineers   TNC – The Nature Conservancy   TWC – The Wetlands Conservancy
ODF – Department of Forestry   ODFW – Department of Fish and Wildlife   DSL – Department of State Lands
ODOT – Department of Transportation   OPRD – Parks and Recreation Department

Ponderosa pine (*Pinus ponderosa*) savanna at Round Top Butte RNA (Jimmy Kagan)
APPENDIX 2A. OREGON’S NATURAL AREAS

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APPENDIX 3. HOW NHAC PREVIOUSLY DESCRIBED AND DESIGNATED NATURAL AREAS FOR ECOSYSTEM PROCESS ELEMENTS

Ecosystem Process Ecological Elements

In order to represent biodiversity in a network of protected areas, it is necessary to consider not only the current condition of vegetation communities but also the landscape processes, generally related to disturbance, that either maintain or frequently affect ecosystems. The need for natural areas dealing specifically with landscape ecosystem processes is evident by recent work in landscape ecology.

Key disturbance processes, such as fire, wind, floods, insects and pathogens, are among the most important influences on Oregon's ecosystems. A natural area that allows for the study of dynamic ecological processes over time should also capture pattern or mosaic at broad to fine scales. Establishing these ecological communities will increase the probability that processes can continue spatially and temporally at the natural area, unaffected by manipulative management.

The objective of the process element is to represent landscape disturbance and the concomitant successional processes across a wide range of gradients in environment, vegetation zones or habitats, and disturbance intensities. In order for disturbance processes to be significant enough to merit the creation of an element, two primary criteria must be met. First, the process must occur on a landscape scale, at a minimum impacting entire stands. The second is that the disturbances must occur at a frequency that is shorter than the life cycle of the affected stands. For example, throughout most of eastern Oregon, fires occur with return intervals ranging from 10 to 100 years, which is shorter than the duration of most stands. Volcanism, while occurring widely, rarely occurs at frequent enough intervals.

Generally a process natural area should be big enough to allow landscape flows and related successional processes to occur with minimal influence from adjacent lands. The size will depend on the area's landscape context and the type of disturbance. Typically several thousands of acres are necessary to accommodate major disturbances such as fire and to allow replication of research sites across environmental, vegetational, and disturbance intensity gradients.

When selecting sites, those with minimal previous human impacts to the site are preferable, recognizing regional context (i.e. historical grazing). A preliminary threshold of 10% of the total reserve in previously impacted conditions is proposed. When possible, topographic features should be used to delineate natural area boundaries for process ecological communities. Boundaries should minimize current and future edge influences such as microclimate differences, invasion routes for exotics, impacts of genetic material from nearby plantations, etc. Inclusion of some previously managed areas may be necessary to manage edges as well as to ensure connection to nearby landscape units (wilderness, major ridge or riparian systems, etc.) needed for critical landscape flows.

In this first effort to define process ecological communities, only those that have been clearly defined are included. Wildfire is the process used to model the ecological communities defined in the plan. To date, no fire process natural areas have been established. Once the process of defining and establishing fire process ecological communities is underway by the federal and state agencies, work on other
process ecological communities such as insects and pathogens will begin. As a result, fire is the only process element included in this plan.

Fire process ecological communities are included at the end of the natural area ecological communities for each ecoregion. In some ecoregions such as the Oregon Coast Range, the diversity of vegetation zones and the accompanying fire effects is low, so ecological communities have not been defined. In others, such as the Blue Mountains, the diversity of vegetation zones and fire effects are high, and multiple ecological communities have been defined.

**How to Define a Fire Process Element**

The steps to define a process element follow.

1) Define the element and objective

   Fire is a major process that impacts most of Oregon's natural terrestrial habitats with varying effects among ecoregions. The objective is to include fire effects and successional processes, beginning with the earliest successional stages and including as wide a range of disturbance intensities and environmental gradients as possible.

2) Outline significant process components and landscape criteria.

   A. Fire event components consist of fire event types and range of post-fire successional stages present on the landscape. Three fire event types have been defined.

   1. Stand replacement (greater than 70% mortality)
   2. Partial stand replacement (30-70% mortality)
   3. Underburn (less than 30% mortality)

   Single or multiple event types may be present in a fire element, depending on the representative fire regime for the ecoregion and vegetation zone.

   B. Potential landscape conditions to be considered:

      | Most desirable | Wildfire with natural regeneration |
      |                | some planting                      |
      |                | Wildfire with some salvage         |
      |                | natural post-fire regeneration     |
      |                | planting                          |

      Least desirable Partial Cut or clear-cut and burn
      (to be used in very rare circumstances, or in conjunction with more desirable circumstances)

3) Apply Process Element Components in Ecoregions

   Identify ecological communities by appropriate event types and vegetation zones used in the plan. The fire example continues below for two typical ecoregions.
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Only the vegetation zones in which fire is a significant, natural disturbance occurring at a minimum of a stand scale and a regular frequency have been included.

**Assigning Priorities to Ecosystem Process Ecological communities**

Ecosystem process ecological communities were not assigned priorities in this edition of the plan. It is anticipated that the primary criteria would be the rarity of examples of the ecosystem process.