


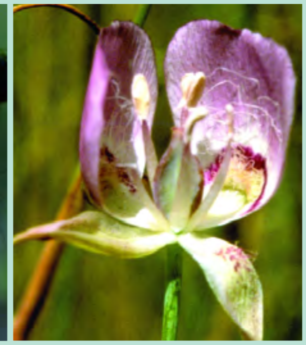


East Cascades – Modoc Plateau and West Cascades

ECOREGIONAL ASSESSMENTS
APPENDICES

JUNE 2007

The Nature Conservancy
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Washington's Natural Heritage Program

Washington Department of FISH and WILDLIFE

The East Cascades - Modoc Plateau
and
West Cascades
Ecoregional Assessments

Appendices

Prepared by
The Nature Conservancy
and the
Washington Department of Fish and Wildlife

June 2007

Citation:

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Index to Appendices for the East Cascades – Modoc Plateau and West Cascades Ecoregional Assessments

Appendix numbers correspond to chapter numbers in the Main Report

4A Target Lists for Terrestrial Ecological Systems

4B Terrestrial Ecological Systems Classifications of the East Cascades – Modoc Plateau and West Cascades Ecoregions

4C Terrestrial Ecological Systems Methodology

4D Target List for Plants

4E Wildlife Targets Methodology

4F Target List for Wildlife and Invertebrates

4G Freshwater Systems Classification and Target Selection

4H Target Lists for Freshwater Systems and Communities by Ecological Drainage Unit

4I Fish Target Selection Methodology

4J Target Lists for Fishes

5A List of Currently Protected Areas

6A Suitability Indices Methodology and Factors

7A Prioritization of Assessment Units

8A Portfolio Design Using Vertical Integration

8B List of Review Meetings and Reviewers

8C List of Integrated Portfolio Sites by Ecoregion

8D List of River Corridor Portfolio Sites by Ecological Drainage Unit

8E Site Summaries - West Cascades Ecoregion (separately bound by state)

8F Site Summaries - East Cascades and Modoc Plateau Ecoregion (separately bound by state)

8G West Cascades Targets and Goals Summary

8H East Cascades Targets and Goals Summary

10A Draft Ecological Integrity Analysis for the East and West Cascades Ecoregions

Appendix 4A -- Targets Lists for Terrestrial Ecological Systems

Table 1. West Cascades Targets

Elcode	System Name	Type	Total Ha
CES204.862	North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fellfield and Meadow	Alpine	5,217
CES306.810	Rocky Mountain Alpine Dwarf-Shrubland	Alpine	1
CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	Forest	966,127
CES204.839	North Pacific Western Hemlock-Silver Fir Forest	Forest	575,680
CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest	Forest	378,857
CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland	Forest	254,284
CES204.838	North Pacific Mountain Hemlock Forest	Forest	237,667
CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	Forest	85,529
CES306.807	Northern Rocky Mountain Subalpine Dry Parkland	Forest	38,742
CES206.913	Mediterranean California Red Fir Forest and Woodland	Forest	38,130
CES204.883	North Pacific Wooded Lava Flows	Forest	18,385
CES306.820	Rocky Mountain Lodgepole Pine Forest	Forest	15,105
CES204.846	North Pacific Broadleaf Landslide Forest and Shrubland	Forest	11,740
CES206.911	Northern California Mesic Subalpine Woodland	Forest	8,320
CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	Forest	2,900
CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	Forest	1,382
CES204.086	East Cascades Mesic Montane Conifer Forest	Forest	670
CES204.852	North Pacific Oak Woodland	Forest	203
CES206.917	Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland	Forest	170
CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	Forest	124
CES306.806	Northern Rocky Mountain Subalpine Dry Grassland	Grassland	3,473
CES206.940	Mediterranean California Subalpine Meadow	Grassland	1,703
CES306.836	Northern Rocky Mountain Montane Grassland	Grassland	1,021
CES304.993	Columbia Basin Foothill and Canyon Dry Grassland	Grassland	7
CES204.100	North Pacific Montane Grassland	Grassland	1
CES304.785	Inter-Mountain Basins Montane Sagebrush Steppe	Shrubland	1,319
CES204.088	North Pacific Hypermaritime Shrub and Herbaceous Headland	Shrubland	1,211
CES204.854	North Pacific Avalanche Chute Shrubland	Shrubland	874
CES304.778	Inter-Mountain Basins Big Sagebrush Steppe	Shrubland	125
CES304.083	Columbia Plateau Steppe and Grassland	Shrubland	22
CES204.093	North Pacific Montane Massive Bedrock, Cliff and Talus	Sparsely Vegetated	32,015
CES304.081	Columbia Plateau Ash and Tuff Badland	Sparsely Vegetated	7,322

Elcode	System Name	Type	Total Ha
CES204.063	North Pacific Bog and Fen	Wetland	10,206
CES204.090	North Pacific Hardwood - Conifer Swamp	Wetland	9,916
CES204.866	North Pacific Montane Riparian Woodland and Shrubland	Wetland	7,492
CES200.998	Temperate Pacific Montane Wet Meadow	Wetland	1,102
CES204.865	North Pacific Shrub Swamp	Wetland	687
CES200.877	Temperate Pacific Freshwater Emergent Marsh	Wetland	311
CASCADE008	Umpqua Cascades Upper Forest and Woodland	Aggregated System	
CASCADE007	Umpqua Cascades Lower Forest and Woodland	Aggregated System	
CASCADE006	Middle Oregon Cascades Upper Forest and Woodland	Aggregated System	
CASCADE005	Middle Oregon Cascades Lower Forest and Woodland	Aggregated System	
CASCADE004	Columbian Cascades Section Upper Forest and Woodland	Aggregated System	
CASCADE003	Columbian Cascades Section Lower Forest and Woodland	Aggregated System	
CASCADE002	Mount Rainier Upper Forest and Woodland	Aggregated System	
CASCADE001	Mount Rainier Lower Forest and Woodland	Aggregated System	
OLDGROWTH	Late Seral Forest (>30 inch DBH)	Late Seral	

Table 2. East Cascades Targets

Elcode	System Name	Type	Total Ha
CES204.862	North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fellfield and Meadow	Alpine	10,439
CES206.939	Mediterranean California Alpine Dry Tundra	Alpine	6,457
CES306.810	Rocky Mountain Alpine Dwarf-Shrubland	Alpine	497
CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	Forest	1,562,471
CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	Forest	445,565
CES304.082	Columbia Plateau Western Juniper Woodland and Savanna	Forest	438,263
CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland	Forest	432,078
CES306.820	Rocky Mountain Lodgepole Pine Forest	Forest	367,350
CES204.838	North Pacific Mountain Hemlock Forest	Forest	302,499
CES204.086	East Cascades Mesic Montane Conifer Forest	Forest	152,373
CES204.839	North Pacific Western Hemlock-Silver Fir Forest	Forest	147,290
CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	Forest	129,498
CES206.911	Northern California Mesic Subalpine Woodland	Forest	118,948
CES306.807	Northern Rocky Mountain Subalpine Dry Parkland	Forest	81,045
CES206.925	California Montane Woodland and Chaparral	Forest	80,313
CES204.085	East Cascades Oak-Pine Forest and Woodland	Forest	72,072
CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	Forest	61,549
CES206.913	Mediterranean California Red Fir Forest and Woodland	Forest	59,673

Elcode	System Name	Type	Total Ha
CES204.883	North Pacific Wooded Lava Flows	Forest	50,062
CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	Forest	28,912
CES206.912	Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland	Forest	20,089
CES304.772	Inter-Mountain Basins Mountain Mahogany Woodland	Forest	11,616
CES204.846	North Pacific Broadleaf Landslide Forest and Shrubland	Forest	9,901
CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest	Forest	8,782
CES206.918	Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland	Forest	5,421
CES306.819	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	Forest	3,637
CES306.813	Rocky Mountain Montane Aspen Forest and Woodland	Forest	3,045
CES206.935	California Central Valley Mixed Oak Savanna	Forest	2,761
CES306.833	Rocky Mountain Subalpine-Montane Riparian Woodland	Forest	2,205
CES206.936	California Lower Montane Pine-Oak Woodland and Savanna	Forest	973
CES206.910	Mediterranean California Subalpine Woodland	Forest	768
CES306.837	Northern Rocky Mountain Western Larch Woodland	Forest	106
CES206.917	Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland	Forest	35
CES204.837	North Pacific Maritime Mesic Parkland	Forest	6
CES304.787	Inter-Mountain Basins Semi-Desert Grassland	Grassland	46,282
CES304.993	Columbia Basin Foothill and Canyon Dry Grassland	Grassland	25,603
CES306.836	Northern Rocky Mountain Montane Grassland	Grassland	16,778
CES306.806	Northern Rocky Mountain Subalpine Dry Grassland	Grassland	6,036
CES206.940	Mediterranean California Subalpine Meadow	Grassland	3,013
CES204.100	North Pacific Montane Grassland	Grassland	234
CES304.778	Inter-Mountain Basins Big Sagebrush Steppe	Shrubland	823,529
CES304.080	Columbia Plateau Low Sagebrush Steppe	Shrubland	117,156
CES304.785	Inter-Mountain Basins Montane Sagebrush Steppe	Shrubland	89,213
CES304.083	Columbia Plateau Steppe and Grassland	Shrubland	10,526
CES204.854	North Pacific Avalanche Chute Shrubland	Shrubland	9,696
CES304.788	Inter-Mountain Basins Semi-Desert Shrub-Steppe	Shrubland	6,646
CES306.994	Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland	Shrubland	1,814
CES206.931	Northern and Central California Dry-Mesic Chaparral	Shrubland	868
CES204.088	North Pacific Hypermaritime Shrub and Herbaceous Headland	Shrubland	231
CES304.780	Inter-Mountain Basins Greasewood Flat	Shrubland	19
CES304.784	Inter-Mountain Basins Mixed Salt Desert Scrub	Shrubland	5
CES204.093	North Pacific Montane Massive Bedrock, Cliff and Talus	Sparsely Vegetated	54,729
CES304.770	Columbia Plateau Scabland Shrubland	Sparsely Vegetated	18,191
CES304.775	Inter-Mountain Basins Active and Stabilized Dunes	Sparsely Vegetated	2

Elcode	System Name	Type	Total Ha
CES200.998	Temperate Pacific Montane Wet Meadow	Wetland	105,487
CES200.877	Temperate Pacific Freshwater Emergent Marsh	Wetland	26,867
CES204.866	North Pacific Montane Riparian Woodland and Shrubland	Wetland	20,659
CES204.090	North Pacific Hardwood - Conifer Swamp	Wetland	17,499
CES304.768	Columbia Basin Foothill Riparian Woodland and Shrubland	Wetland	5,102
CES304.057	Columbia Plateau Vernal Pool	Wetland	2,112
CES206.947	Mediterranean California Alkali Marsh	Wetland	1,312
CES204.063	North Pacific Bog and Fen	Wetland	1,018
CES204.869	North Pacific Lowland Riparian Forest and Shrubland	Wetland	636
CES200.876	Temperate Pacific Freshwater Aquatic Bed	Wetland	102
CES204.865	North Pacific Shrub Swamp	Wetland	45
CASCADE015	Modoc Plateau Montane Forest and Woodland	Aggregated System	
CASCADE013	Upper Klamath Basin Forest and Woodland	Aggregated System	
CASCADE012	Pumice and Pine Shrub Steppe and Montane Forest and Woodland	Aggregated System	
CASCADE011	Eastside Oak Shrub Steppe and Montane Forest and Woodland	Aggregated System	
CASCADE010	Yakima Shrub Steppe and Montane Forest and Woodland	Aggregated System	
CASCADE009	Wenatchee Shrub Steppe and Montane Forest and Woodland	Aggregated System	
OLDGROWTH	Late Seral Forest (>20 inch DBH)	Late Seral	

APPENDIX 4B

Terrestrial Ecological Systems Classifications of the East Cascades - Modoc Plateau and West Cascades Ecoregions

INTERNATIONAL ECOLOGICAL CLASSIFICATION STANDARD

15 June 2006
reprinted from Biotics

by

NatureServe

1101 Wilson Blvd., 15th floor
Arlington, VA 22209

This subset of the International Ecological Classification Standard covers ecological systens attributed to the West Cascades Ecoregion (#81) and East Cascade / Modoc Plateau Ecoregion (#4). This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC <mary_russo@natureserve.org> and Gwen Kittel, Regional Vegetation Ecologist, Boulder, CO <gwen_kittel@natureserve.org>.

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Citations:

The following citation should be used in any published materials which reference ecological system and/or International Vegetation Classification (IVC hierarchy) and association data:

NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 15 June 2006.

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1101 Wilson Blvd, 15th floor
Arlington, VA 22209

These data are extracted from:

NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 15 June 2006.

This document may be generally cited as follows:

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[1] NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

United States
Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database Program, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque , NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

Canada
Alberta Natural Heritage Information Centre, Edmonton, AB, Canada; Atlantic Canada Conservation Data Centre, Sackville, New Brunswick, Canada; British Columbia Conservation Data Centre, Victoria, BC, Canada; Manitoba Conservation Data Centre. Winnipeg, MB, Canada; Ontario Natural Heritage Information Centre, Peterborough, ON, Canada; Quebec Conservation Data Centre, Quebec, QC, Canada; Saskatchewan Conservation Data Centre, Regina, SK, Canada; Yukon Conservation Data Centre, Yukon, Canada

Latin American and Caribbean
Centro de Datos para la Conservacion de Bolivia, La Paz , Bolivia; Centro de Datos para la Conservacion de Colombia, Cali,Valle, Columbia; Centro de Datos para la Conservacion de Ecuador, Quito, Ecuador; Centro de Datos para la Conservacion de Guatemala, Ciudad de Guatemala , Guatemala; Centro de Datos para la Conservacion de Panama, Querry Heights , Panama; Centro de Datos para la Conservacion de Paraguay, San Lorenzo , Paraguay; Centro de Datos para la Conservacion de Peru, Lima, Peru; Centro de Datos para la Conservacion de Sonora, Hermosillo, Sonora , Mexico; Netherlands Antilles Natural Heritage Program, Curacao , Netherlands Antilles; Puerto Rico-Departmento De Recursos Naturales Y Ambientales, Puerto Rico; Virgin Islands Conservation Data Center, St. Thomas, Virgin Islands.

NatureServe also has partnered with many International and United States Federal and State organizations, which have also contributed significantly to the development of the International Classification. Partners include the following The Nature Conservancy; Provincial Forest Ecosystem Classification Groups in Canada; Canadian Forest Service; Parks Canada; United States Forest Service; National GAP Analysis Program; United States National Park Service; United States Fish and Wildlife Service; United States Geological Survey; United States Department of Defense; Ecological Society of America; Environmental Protection Agency; Natural Resource Conservation Services; United States Department of Energy; and the Tennessee Valley Authority. Many individual state organizations and people from academic institutions have also contributed to the development of this classification.

TABLE OF CONTENTS

Forest and Woodland **1**
CES206.918 California Montane Jeffrey Pine-(Ponderosa Pine) Woodland 1
CES304.082 Columbia Plateau Western Juniper Woodland and Savanna 1
CES204.086 East Cascades Mesic Montane Mixed-Conifer Forest and Woodland 2
CES204.085 East Cascades Oak-Ponderosa Pine Forest and Woodland 3
CES304.772 Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland 4
CES206.917 Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland 5
CES206.916 Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland 5
CES206.915 Mediterranean California Mesic Mixed Conifer Forest and Woodland 6
CES206.913 Mediterranean California Red Fir Forest 7
CES206.910 Mediterranean California Subalpine Woodland 8
CES204.846 North Pacific Broadleaf Landslide Forest and Shrubland 8
CES204.001 North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest 9
CES204.837 North Pacific Maritime Mesic Subalpine Parkland 10
CES204.002 North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest 11
CES204.838 North Pacific Mountain Hemlock Forest 12
CES204.852 North Pacific Oak Woodland 13
CES204.883 North Pacific Wooded Volcanic Flowage 14
CES206.911 Northern California Mesic Subalpine Woodland 15
CES306.805 Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest 15
CES306.030 Northern Rocky Mountain Ponderosa Pine Woodland and Savanna 17
CES306.807 Northern Rocky Mountain Subalpine Woodland and Parkland 19
CES306.837 Northern Rocky Mountain Western Larch Savanna 20
CES306.813 Rocky Mountain Aspen Forest and Woodland 21
CES306.820 Rocky Mountain Lodgepole Pine Forest 23
CES306.830 Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland 24
CES306.819 Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland 25
CES206.912 Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland 26

Shrubland **27**
CES206.925 California Montane Woodland and Chaparral 27
CES304.770 Columbia Plateau Scabland Shrubland 27
CES304.784 Inter-Mountain Basins Mixed Salt Desert Scrub 28
CES204.854 North Pacific Avalanche Chute Shrubland 30
CES204.862 North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow 31
CES306.994 Northern Rocky Mountain Montane-Foothill Deciduous Shrubland 31
CES206.931 Northern and Central California Dry-Mesic Chaparral 32
CES306.810 Rocky Mountain Alpine Dwarf-Shrubland 33

Steppe/Savanna **34**
CES206.935 California Central Valley Mixed Oak Savanna 34
CES206.936 California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna 34
CES304.080 Columbia Plateau Low Sagebrush Steppe 35
CES304.083 Columbia Plateau Steppe and Grassland 36
CES304.778 Inter-Mountain Basins Big Sagebrush Steppe 36
CES304.785 Inter-Mountain Basins Montane Sagebrush Steppe 37
CES304.788 Inter-Mountain Basins Semi-Desert Shrub-Steppe 39

Herbaceous **40**
CES304.993 Columbia Basin Foothill and Canyon Dry Grassland 40
CES304.787 Inter-Mountain Basins Semi-Desert Grassland 41
CES206.939 Mediterranean California Alpine Dry Tundra 42

CES206.940 Mediterranean California Subalpine Meadow 43
CES204.088 North Pacific Hypermaritime Shrub and Herbaceous Headland 43
CES204.100 North Pacific Montane Grassland 44
CES306.806 Northern Rocky Mountain Subalpine-Upper Montane Grassland 44

Woody Wetland 45
CES304.768 Columbia Basin Foothill Riparian Woodland and Shrubland 45
CES206.947 Mediterranean California Alkali Marsh 46
CES204.063 North Pacific Bog and Fen 46
CES204.090 North Pacific Hardwood-Conifer Swamp 47
CES204.869 North Pacific Lowland Riparian Forest and Shrubland 48
CES204.866 North Pacific Montane Riparian Woodland and Shrubland 49
CES204.865 North Pacific Shrub Swamp 49
CES306.833 Rocky Mountain Subalpine-Montane Riparian Woodland 50

Herbaceous Wetland 51
CES304.057 Columbia Plateau Vernal Pool 51
CES200.876 Temperate Pacific Freshwater Aquatic Bed 52
CES200.877 Temperate Pacific Freshwater Emergent Marsh 52
CES200.998 Temperate Pacific Subalpine-Montane Wet Meadow 53

Mixed Upland and Wetland 54
CES304.780 Inter-Mountain Basins Greasewood Flat 54

Barren 54
CES304.081 Columbia Plateau Ash and Tuff Badland 54
CES304.775 Inter-Mountain Basins Active and Stabilized Dune 55
CES204.093 North Pacific Montane Massive Bedrock, Cliff and Talus 56

Bibliography 57

Forest and Woodland

CES206.918 CALIFORNIA MONTANE JEFFREY PINE-(PONDEROSA PINE) WOODLAND

Primary Division: Mediterranean California (206)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Mediterranean [Mediterranean Xeric-Oceanic]; F-Patch/Low Intensity; Needle-Leaved Tree; Broad-Leaved Evergreen Shrub; Pinus jeffreyi
Concept Summary: These forests are found on relatively xeric sites in mountains and plateaus from southern Oregon (600-1830 m [1800-5000 feet] elevation) south into the Sierra Nevada, throughout the Transverse Ranges of California, and into northern Baja California (1200-2740 m [4000-8300 feet]), Mexico. While the two dominant pines tend to segregate by soil fertility and temperature regimes, they may co-occur in certain areas (e.g., Modoc Plateau). These stands are more common on the east side of the Sierra Nevada, although they do occur on the west side. Ponderosa pine and/or Jeffery pine on the west slope with other conifer species are part of ~Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916)$$. These are sites where *Pinus ponderosa* and/or *Pinus jeffreyi* are the predominant conifers and other tree species do not occur in high abundance, if at all. *Pinus jeffreyi* is more tolerant of colder, drier and poorer sites and replaces *Pinus ponderosa* as the dominant at higher elevations. In the north, *Pinus jeffreyi* may be replaced by *Pinus washoensis* (Carson Range and Warner Mountains). Throughout California, pure stands of ponderosa pine are relatively uncommon. Only on the Modoc Plateau do these pines co-occur in mixed stands. *Juniperus occidentalis* (both var. *australis* [in the south] and var. *occidentalis*) can co-occur in these stands but typically is not dominant. On moister and cooler sites, *Abies concolor* can be present in some stands. There can be well-developed shrub understories with strong Great Basin affinities; species can include *Artemisia tridentata, Purshia tridentata, Symphoricarpos rotundifolius var. parishii (= Symphoricarpos parishii), Arctostaphylos patula, Ceanothus cordulatus, Ceanothus prostratus, Ceanothus integerrimus, Chrysolepis sempervirens, Eriogonum wrightii, Quercus vacciniifolia*, and *Lupinus elatus*. *Cercocarpus ledifolius* is common on steeper slopes throughout the range. Historically, frequent localized ground fires maintained these systems. Stands of ponderosa pine on the east side of the Cascades transition into ~East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085)$$, or ~Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)$$ north of the Warm Springs Reservation of central Oregon.
Comments: *Pinus ponderosa* forests with *Calocedrus decurrens* found on the west side of the Sierra Nevada and in the Klamath Mountains are accommodated in ~Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland (CES206.916)$$.

DISTRIBUTION

Range: This system occurs in foothills and mountains from southern Oregon south into the Sierra Nevada, throughout the Transverse Ranges of California and into northern Baja California, Mexico.
Divisions: 206:C
TNC Ecoregions: 5:C, 12:C, 14:C, 15:C, 16:C
Subnations: CA, MXBC, NV, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 25 Apr 2006 **Stakeholders:** Latin America, West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES304.082 COLUMBIA PLATEAU WESTERN JUNIPER WOODLAND AND SAVANNA

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Aridic; Juniperus occidentalis
Concept Summary: This woodland system is found along the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. Elevations range from under 200 m along the Columbia River in central Washington to over 1500 m. Generally soils are medium-textured, with abundant coarse fragments, and derived from volcanic parent materials. In central Oregon, the center of distribution, all aspects and slope positions occur. Where this system grades into relatively mesic forest or grassland habitats, these woodlands become restricted to rock outcrops or escarpments with excessively drained soils. *Pinus monophylla* is not present in this region, so *Juniperus occidentalis* is the only tree species, although *Pinus ponderosa* or *Pinus jeffreyi* may be present in some stands. *Cercocarpus ledifolius* may occasionally codominate. *Artemisia tridentata* is the most common shrub; others are *Purshia tridentata, Ericameria nauseosa, Chrysothamnus viscidiflorus, Ribes cereum*, and *Tetradymia* spp. Graminoids include *Carex filifolia, Festuca idahoensis, Poa secunda*, and *Pseudoroegneria spicata*. These woodlands are generally restricted to rocky areas where fire frequency is low. Throughout much of its range, fire exclusion and removal of fine fuels by grazing livestock have reduced fire frequency and allowed *Juniperus occidentalis* seedlings to colonize adjacent alluvial soils and expand into the shrub-steppe and grasslands. *Juniperus occidentalis* savanna may occur on the drier edges of the woodland where trees are intermingling with or invading the surrounding grasslands and where local edaphic or climatic conditions favor grasslands over shrublands.
Comments: These woodlands are composed of two very different types. There are old-growth *Juniperus occidentalis* woodlands with trees and stands often over 1000 years old, with fairly well-spaced trees with rounded crowns. There are also large areas where juniper has expanded into sagebrush steppe and bunchgrass-dominated areas, with young, pointed-crowned trees growing closely together. Currently, these two very different types are about equally distributed across the landscape, with *Juniperus occidentalis* continuing to expand, either from the combination of fire exclusion, past grazing or climate change. *Juniperus occidentalis* has also expanded into *Pinus ponderosa* and *Pinus ponderosa - Pinus contorta* stands in central Oregon.

DISTRIBUTION

Range: This woodland and savanna system is found along the northern and western margins of the Great Basin, from southwestern Idaho, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern California. It also occurs in scattered localities of northern Nevada and south-central Washington.
Divisions: 304:C
TNC Ecoregions: 6:C, 7:C, 68:C
Subnations: CA, ID, NV, OR, WA

CONCEPT

SOURCES

References: Barbour and Major 1988, Eyre 1980, Holland and Keil 1995, Johnson and Clausnitzer 1992, Shiflet 1994, Volland 1976, West et al. 1998, Western Ecology Working Group n.d.
Version: 08 Sep 2004 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES204.086 East Cascades Mesic Montane Mixed-Conifer Forest and Woodland

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Needle-Leaved Tree; Abies grandis - Mixed; Tsuga heterophylla, Thuja plicata; Pseudotsuga menziesii; Long (>500 yrs) Persistence
Concept Summary: This ecological system occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon. Elevations range from 610 to 1220 m (2000-4000 feet) in a very restricted range occupying less than 5% of the forested landscape in the east Cascades. This system is

associated with a submesic climate regime with annual precipitation ranging from 100 to 200 cm (40-80 inches) and maximum winter snowpacks that typically melt off in spring at lower elevations. This ecological system is composed of variable montane coniferous forests typically below Pacific silver fir forests along the crest east of the Cascades. This system also includes montane forests along rivers and slopes, and in mesic "coves" which were historically protected from wildfires. Most occurrences of this system are dominated by a mix of *Pseudotsuga menziesii* with *Abies grandis* and/or *Tsuga heterophylla*. Several other conifers can dominate or codominate, including *Thuja plicata, Pinus contorta, Pinus monticola*, and *Larix occidentalis*. *Abies grandis* and other fire-sensitive, shade-tolerant species dominate forests on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by wildfire. They are very productive forests in the eastern Cascades which have been priority stands for timber production. *Mahonia nervosa, Linnaea borealis, Paxistima myrsinites, Acer circinatum, Spiraea betulifolia, Symphoricarpos hesperius, Cornus nuttallii, Rubus parviflorus*, and *Vaccinium membranaceum* are common shrub species. The composition of the herbaceous layer reflects local climate and degree of canopy closure and contains species more restricted to the Cascades, for example, *Achlys triphylla, Anemone deltoidea*, and *Vancouveria hexandra*. Typically, stand-replacement fire-return intervals are 150-500 years with moderate-severity fire-return intervals of 50-100 years.
Comments: Includes *Tsuga heterophylla* and *Thuja plicata* associations and moister *Abies grandis* associations in eastern Cascades.

DISTRIBUTION

Range: This ecological system occurs on the upper east slopes of the Cascades in Washington, south of Lake Chelan and south to Mount Hood in Oregon.
Divisions: 204:C
TNC Ecoregions: 4:C
Subnations: BC, OR, WA

CONCEPT

Dynamics: Landfire VDDT models: R#MCONm Eastside mixed conifer moist (GF/DF) model is applied with stages A-B-E.

SOURCES

References: Eyre 1980, Hessburg et al. 1999, Hessburg et al. 2000, Lillybridge et al. 1995, Topik 1989, Topik et al. 1988, Western Ecology Working Group n.d.
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: R. Crawford **LeadResp:** West

CES204.085 EAST CASCADES OAK-PONDEROSA PINE FOREST AND WOODLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; F-Patch/Medium Intensity
Concept Summary: This narrowly restricted ecological system appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Elevations range from 460 to 1920 m. Most occurrences of this system are dominated by a mix of *Quercus garryana* and *Pinus ponderosa* or *Pseudotsuga menziesii*. Isolated, taller *Pinus ponderosa* or *Pseudotsuga menziesii* over *Quercus garryana* trees characterize parts of this system. Clonal *Quercus garryana* can create dense patches across a grassy landscape or can dominate open woodlands or savannas. The understory may include dense stands of shrubs or, more often, be dominated by grasses, sedges or forbs. Shrub-steppe shrubs may be prominent in some stands and create a distinct tree / shrub / sparse grassland habitat, including *Purshia tridentata, Artemisia tridentata, Artemisia nova*, and *Chrysothamnus viscidiflorus*. Understories are generally dominated by herbaceous species, especially graminoids. Mesic sites have an open to closed sodgrass understory dominated by *Calamagrostis rubescens, Carex geyeri, Carex rossii, Carex inops*, or *Elymus glaucus*. Drier savanna and woodland understories typically contain bunchgrass steppe species such as *Festuca idahoensis* or *Pseudoroegneria spicata*. Common exotic grasses that often appear in high abundance are *Bromus tectorum* and

Poa bulbosa. These woodlands occur at the lower treeline/ecotone between *Artemisia* spp. or *Purshia tridentata* steppe or shrubland and *Pinus ponderosa* and/or *Pseudotsuga menziesii* forests or woodlands. In the Columbia River Gorge, this system appears as small to large patches in transitional areas in the Little White Salmon and White Salmon river drainages in Washington and Hood River, Rock Creek, Moiser Creek, Mill Creek, Threemile Creek, Fifteen Mile Creek, and White River drainages in Oregon. *Quercus garryana* can create dense patches often associated with grassland or shrubland balds within a closed *Pseudotsuga menziesii* forest landscape. Commonly the understory is shrubby and composed of *Ceanothus integerrimus, Holodiscus discolor, Symphoricarpos albus*, and *Toxicodendron diversilobum*. Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. In the past, most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Soil drought plays a role, maintaining an open tree canopy in part of this dry woodland habitat.
Comments: Mapping this system presents a typical scale problem. Areas of pure ponderosa pine are found directly adjacent to oak stands. This system is a matrix type with stands of *Pinus ponderosa, Quercus garryana, Pinus ponderosa - (Pseudotsuga menziesii) - Quercus garryana*; still need to get a mapping protocol and concept to distinguish *Pseudotsuga menziesii* with *Quercus garryana* patches in the east gorge White Salmon. The Little White Salmon drainage near Augspurger Mountain is the transition area between ~North Pacific Oak Woodland (CES204.852)$$ and this system (Dog Mountain is the westernmost in Washington).

DISTRIBUTION

Range: This narrowly restricted ecological system appears at or near lower treeline in foothills of the eastern Cascades in Washington and Oregon within 65 km (40 miles) of the Columbia River Gorge. It also appears in the adjacent Columbia Plateau ecoregion. Disjunct occurrences in Klamath and Siskiyou counties, Oregon, have more sagebrush and bitterbrush in the understory, along with other shrubs.
Divisions: 204:C, 304:C
TNC Ecoregions: 4:C, 6:C
Subnations: BC, OR, WA

CONCEPT

Dynamics: Fire plays an important role in creating vegetation structure and composition in this habitat. Decades of fire suppression have led to invasion by *Pinus ponderosa* along lower treeline and by *Pseudotsuga menziesii* in the gorge and other oak patches on xeric sites in the east Cascade foothills. Most of the habitat experienced frequent low-severity fires that maintained woodland or savanna conditions. The mean fire-return interval is 20 years, although variable. Landfire VDDT models: #R OAP1 Oregon White Oak-Ponderosa Pine model describes general successional pathways treating drier pine succession separate from more mesic Douglas-fir pathways.

SOURCES

References: Eyre 1980, John and Tart 1986, Lillybridge et al. 1995, Topik et al. 1988, Western Ecology Working Group n.d.
Version: 23 Jan 2006 **Stakeholders:** Canada, West
Concept Author: R. Crawford **LeadResp:** West

CES304.772 INTER-MOUNTAIN BASINS MOUNTAIN MAHOGANY WOODLAND AND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Aridic; Cercocarpus ledifolius
Concept Summary: This ecological system occurs in hills and mountain ranges of the Intermountain basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Big Horn Mountains. It typically occurs from 600 m to over 2650 m in elevation on rocky outcrops or escarpments and forms small- to large-patch stands in forested areas. Most stands occur as shrublands on ridges and steep rimrock slopes, but they may be composed of small trees in steppe areas. Scattered junipers or pines may also occur. This system includes both woodlands and shrublands dominated by *Cercocarpus ledifolius*. *Artemisia tridentata ssp. vaseyana, Purshia tridentata*, with

species of *Arctostaphylos, Ribes*, or *Symphoricarpos* are often present. Undergrowth is often very sparse and dominated by bunch grasses, usually *Pseudoroegneria spicata* and *Festuca idahoensis*. *Cercocarpus ledifolius* is a slow-growing, drought-tolerant species that generally does not resprout after burning and needs the protection from fire that rocky sites provide.

DISTRIBUTION

Range: Occurs in hills and mountain ranges of the Intermountain basins from the eastern foothills of the Sierra Nevada northeast to the foothills of the Big Horn Mountains.
Divisions: 206:?, 304:C, 306:C
TNC Ecoregions: 6:P, 9:C, 10:P, 11:C, 12:C
Subnations: CA, CO, ID, MT, NV, OR, UT, WY

CONCEPT

SOURCES

References: Comer et al. 2003, Dealy 1975, Dealy 1978, Knight 1994, Knight et al. 1987, Lewis 1975b, Mueggler and Stewart 1980, Shiflet 1994
Version: 31 Aug 2005 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES206.917 KLAMATH-SISKIYOU LOWER MONTANE SERPENTINE MIXED CONIFER WOODLAND

Primary Division: Mediterranean California (206)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Serpentine; Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Ultramafic with low Ca:Mg ratio
Concept Summary: This system occurs throughout the Klamath - Siskiyou region below 1500 m (4550 feet) elevation on thin, rocky, ultramafic (gabbro, peridotite, serpentinite) soils below winter snow accumulations and typically experiences hot and dry summers. Soils are not always rocky; they can be loamy, up to 76 cm (30 inches) in depth, and can be heavy clay. Not all ultramafic outcrops support distinct vegetation; only those with very low Ca:Mg ratios impact biotic composition. These systems are highly variable and spotty in distribution. These sites are more productive and can support large-statured (dbh, height) trees, although they tend to be widely spaced. Common species include *Pseudotsuga menziesii, Pinus sabiniana, Pinus lambertiana, Pinus jeffreyi, Pinus attenuata, Lithocarpus densiflorus var. echinoides, Calocedrus decurrens , Arctostaphylos* spp., *Quercus vacciniifolia*, and *Xerophyllum tenax*. Perennial grasses such as *Festuca idahoensis* may also be characteristic. *Chamaecyparis lawsoniana* communities can occur within occurrences of this system in mesic and linear riparian zones. Herbaceous-dominated serpentine fens (and bogs) are treated in ~Mediterranean California Serpentine Fen (CES206.953)$$.

DISTRIBUTION

Range: This system occurs throughout the Klamath - Siskiyou region below 1500 m (4550 feet) elevation.
Divisions: 206:C
TNC Ecoregions: 5:C
Subnations: CA, OR

CONCEPT

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Jimerson 1993, Jimerson 1994, Jimerson and Daniel 1999, Jimerson et al. 1995, Sawyer and Keeler-Wolf 1995
Version: 23 Jan 2006 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES206.916 MEDITERRANEAN CALIFORNIA DRY-MESIC MIXED CONIFER FOREST AND WOODLAND

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Forest and Woodland (Treed); Mediterranean [Mediterranean Xeric-Oceanic]; Ustic; Needle-Leaved Tree
Concept Summary: These mixed-conifer forests, always with at least two species codominating, occur on all aspects in lower montane zones (600-1800 m elevation in northern California; 1200-2150 m in southern California). This system occurs in a variety of topo-edaphic positions, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and south- and west-facing slopes which burn relatively frequently. Often, several conifer species co-occur in individual stands. *Pseudotsuga menziesii, Pinus ponderosa*, and *Calocedrus decurrens* are the most common conifers. Other conifers that can occasionally be present include *Pinus jeffreyi, Pinus attenuata*, and *Pinus lambertiana* (not as common in this as in ~Mediterranean California Mesic Mixed Conifer Forest and Woodland (CES206.915)$$). Common subcanopy trees include *Quercus chrysolepis* and *Quercus kelloggii*. *Arbutus menziesii* and *Lithocarpus densiflorus* may be common with the oaks in northern areas. *Pseudotsuga macrocarpa* and *Pinus coulteri* can be present but are not dominant species in this system in the Transverse Ranges of southern California. Codominant *Abies concolor - Calocedrus decurrens* communities in southern California are also included in this system. Understories are variable, except in the Sierra Nevada where in some stands there can be dense understory mats of *Chamaebatia foliolosa* (and other low, spreading shrubs) which foster relatively high-frequency, low-intensity ground fires. In Oregon, shrubs such as *Holodiscus discolor, Toxicodendron rydbergii, Mahonia nervosa, Mahonia aquifolium*, and *Symphoricarpos mollis* are common in addition to graminoids such as *Festuca californica, Elymus glaucus*, and *Danthonia californica*. In the north, where *Calocedrus decurrens* and *Pinus ponderosa* drop out, this system shifts to ~North Pacific Dry Douglas-fir Forest and Woodland (CES204.845)$$.

DISTRIBUTION

Range: This system occurs in lower montane zones (600-1800 m elevation in northern California; 1200-2150 m in southern California), including the eastern Klamath-Siskiyou, interior Coast Ranges, Transverse Ranges and Sierra Nevada.
Divisions: 206:C
TNC Ecoregions: 5:C, 12:C, 14:C, 15:C, 16:C
Subnations: CA, NV, OR

CONCEPT

Dynamics: Historically, frequent and low-intensity fires maintained these woodlands. Due to fire suppression, the majority of these forests now have closed canopies, whereas in the past, a moderately high fire frequency (every 20-30 years) formerly maintained an open forest of many conifers.

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Fites 1994, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995
Version: 07 Oct 2005 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES206.915 MEDITERRANEAN CALIFORNIA MESIC MIXED CONIFER FOREST AND WOODLAND

Primary Division: Mediterranean California (206)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Toeslope/Valley Bottom; Mediterranean [Mediterranean Xeric-Oceanic]; Udic
Concept Summary: This ecological system occurs in cool ravines and north-facing slopes (typically with 100-150 cm annual precipitation; 50% as snow). It is found from 800-1000 m (2400-3000 feet) elevation in the Sierra Nevada and 1250-2200 m (3800-6700 feet) in the Klamath Mountains. The most characteristically co-occurring conifers are *Abies concolor var. lowiana, Calocedrus decurrens*, and *Pinus lambertiana*. *Pinus jeffreyi, Pinus ponderosa*, and *Pseudotsuga menziesii* occur frequently but are not dominant. In limited locations in the central

Sierra Nevada, *Sequoiadendron giganteum* dominates, usually with *Abies concolor*, and at the highest elevations also with *Abies magnifica*. *Acer macrophyllum* is common in lower elevation mesic pockets; *Chrysolepis chrysophylla* also occurs in the western Klamaths. Common understory species include *Corylus cornuta, Cornus nuttallii*, and at higher elevations *Chrysolepis sempervirens*. In areas of recent fire or other disturbance, *Arctostaphylos patula, Ceanothus integerrimus, Ceanothus cordulatus, Ceanothus parvifolius*, and *Ribes* spp. are more common. Fire of highly variable patch size and return interval maintains the structure of these woodlands

DISTRIBUTION

Range: This system is found from 800-1000 m (2400-3000 feet) elevation in the Sierra Nevada and 1250-2200 m (3800-6700 feet) in the Klamath Mountains.
Divisions: 206:C
TNC Ecoregions: 5:C, 12:C, 14:C
Subnations: CA, NV, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995
Version: 23 Jan 2006 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES206.913 MEDITERRANEAN CALIFORNIA RED FIR FOREST

Primary Division: Mediterranean California (206)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Mediterranean [Mediterranean Pluviseasonal-Oceanic]; Deep Soil; Ustic; Long Disturbance Interval; Abies magnifica (= var. magnifica)
Concept Summary: This ecological system includes high-elevation (1600-2700 m [4850-9000 feet]) forests and woodlands dominated by *Abies magnifica (= var. magnifica), Abies X shastensis (= Abies magnifica var. shastensis)*, and/or *Abies procera*. This system is typically found on deep, well-drained soils throughout this elevation zone from the central Sierra Nevada north and west into southern Oregon. Heavy snowpack is a major source of soil moisture throughout the growing season. The limiting factors can be either cold-air drainages or ponding, or coarser soils (pumice versus ash, for example). Other conifers that can occur in varying mixtures with *Abies magnifica* include *Pinus contorta var. murrayana, Pinus monticola, Tsuga mertensiana, Pinus jeffreyi*, and *Abies concolor*. At warmer and lower sites of the North Coast Ranges and Sierra Nevada, *Abies concolor* can codominate with *Abies magnifica*. *Pinus contorta* in Oregon indicates lower productivity where it intergrades with *Abies X shastensis*. This system ranges from dry to moist, and some sites have mesic indicator species, such as *Ligusticum grayi* or *Thalictrum fendleri*. Common understory species include *Quercus vacciniifolia, Ribes viscosissimum, Chrysolepis sempervirens, Ceanothus cordulatus* (in seral stands), *Vaccinium membranaceum, Symphoricarpos mollis*, and *Symphoricarpos rotundifolius*. Characteristic forbs include *Eucephalus breweri, Pedicularis semibarbata*, and *Hieracium albiflorum*. This system commonly occurs above mixed conifer forests with *Abies concolor* and overlaps in elevation with forests and woodlands of *Pinus contorta var. murrayana*. On volcanic sites of lower productivity, stands may be more open woodland in structure and with poor-site understory species such as *Wyethia mollis*. Driving ecological processes include occasional blow-down, insect outbreaks and stand-replacing fire.

DISTRIBUTION

Range: This system is typically found on deep, well-drained soils throughout the high-elevation zone (1600-2700 m [4850-8200 feet]) from the central Sierra Nevada north and west into southern Oregon.
Divisions: 206:C
TNC Ecoregions: 5:C, 12:C
Subnations: CA, NV, OR

CONCEPT

Dynamics: Stand-replacing fire is important but so are moderately frequent (about once every 40 years) low- to moderate-severity fires. The whole system is characterized by a "moderate-severity fire regime" (Agee 1993), i.e., high variability in severity and moderate frequency of fires. See also Chappell and Agee (1996), Pitcher (1987), and Taylor and Halpern (1991) for documentation of fire regime in these forests.

SOURCES

References: Agee 1993, Barbour and Billings 2000, Barbour and Major 1988, Chappell and Agee 1996, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Version: 23 Jan 2006 **Stakeholders:** West

Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES206.910 MEDITERRANEAN CALIFORNIA SUBALPINE WOODLAND

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Very Shallow Soil; W-Landscape/High Intensity; Krummholz

Concept Summary: This ecological system occurs on ridges and rocky slopes around timberline at 2900 m (9500 feet) elevation in the southern Sierra Nevada and Transverse and Peninsular ranges, up to 3500 m (11,500 feet) in the Sierra Nevada, and 2450 m (8000 feet) in the southern Cascades. Tree species often occur as krummholz growth forms with a wind-pruned, prostrate, and/or shrublike appearance, but in more protected sites they form true woodland physiognomy. Stands are dominated by *Pinus albicaulis* and/or *Pinus contorta var. murrayana*; other important conifers and locally dominant species include *Pinus balfouriana* (only in the Klamath Mountains and southern Sierra Nevada where it may replace *Pinus albicaulis*), *Pinus flexilis* (but only in small patches on the eastern flank of the Sierra Nevada escarpment when it does occur), *Pinus monticola* (not in Transverse or Peninsular ranges), and *Juniperus occidentalis var. australis* (mostly in the central and southern Sierra Nevada but not in the Klamath Mountains). Important shrubs include *Arctostaphylos nevadensis, Chrysolepis sempervirens*, and *Holodiscus discolor (= Holodiscus microphyllus)*. Grasses and forbs include *Carex rossii, Carex filifolia, Poa wheeleri, Eriogonum incanum, Penstemon newberryi*, and *Penstemon davidsonii*. Due to landscape position and very thin soils, these are harsh sites exposed to desiccating winds with ice and snow blasts, and rocky substrates. In addition, a short growing season limits plant growth. The highest tree diversity occurs in the Klamath Mountains, with sometimes five or more conifers sharing codominance in one stand.

DISTRIBUTION

Range: This system occurs on ridges and rocky slopes around timberline at 2900 m (9500 feet) elevation in the southern Sierra Nevada and Transverse and Peninsular ranges and 2450 m (8000 feet) in the southern Cascades.

Divisions: 204:P, 206:C

TNC Ecoregions: 4:C, 5:C, 12:C, 16:C

Subnations: CA, MXBC, NV, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994

Version: 07 Oct 2005 **Stakeholders:** Latin America, West

Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES204.846 NORTH PACIFIC BROADLEAF LANDSLIDE FOREST AND SHRUBLAND

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree
Concept Summary: These forests and shrublands occur throughout the northern Pacific mountains and lowlands, becoming less prominent in the northern half of this region. They occur on steep slopes and bluffs that are subject to mass movements on a periodic basis. They are found in patches of differing age associated with different landslide events. The vegetation is deciduous broadleaf forests, woodlands, or shrublands, sometimes with varying components of conifers. *Alnus rubra* and *Acer macrophyllum* are the major tree species. *Rubus spectabilis, Rubus parviflorus, Ribes bracteosum*, and *Oplopanax horridus* are some of the major shrub species. Shrublands tend to be smaller in extent than woodlands or forests. Small patches of sparsely vegetated areas or herbaceous-dominated vegetation (especially *Petasites frigidus*) also often occur as part of this system. On earthflows, once stable, vegetation may succeed to dominance by conifers.
Comments: Early-successional shrubby patches dominated by *Alnus* or *Acer* not associated with landslide disturbance are removed from this system and are placed within the forest types they are successional to, for example see ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$. More stable patches generally belong to ~North Pacific Montane Shrubland (CES204.087)$$. For other disturbance driven shrublands, see ~North Pacific Avalanche Chute Shrubland (CES204.854)$$.

DISTRIBUTION

Range: This system occurs throughout the northern Pacific mountains and lowlands (latter especially adjacent to coastlines), becoming less prominent in the northern half of this region.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 69:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Eyre 1980, Franklin and Dyrness 1973
Version: 25 Apr 2006 **Stakeholders:** Canada, West
Concept Author: C. Chappell **LeadResp:** West

CES204.001 NORTH PACIFIC MARITIME DRY-MESIC DOUGLAS-FIR-WESTERN HEMLOCK FOREST

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Tsuga heterophylla, Pseudotsuga menziesii
Concept Summary: This ecological system comprises much of the major lowland forests of western Washington, northwestern Oregon, eastern Vancouver Island, and the southern Coast Ranges in British Columbia. In southwestern Oregon, it becomes local and more small-patch in nature. It occurs throughout low-elevation western Washington, except on extremely dry or moist to very wet sites. In Oregon, it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, and in the Coast Ranges. These forests occur on the drier to intermediate moisture habitats and microhabitats within the Western Hemlock Zone of the Pacific Northwest. Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 20 inches in the extreme rainshadow) falling predominantly as winter rain. Snowfall ranges from rare to regular, and summers are relatively dry. Elevation ranges from sea level to 610 m (2000 feet) in northern Washington to 1067 m (3500 feet) in Oregon. Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. This is generally the most extensive forest in the lowlands on the west side of the Cascades and forms the matrix within which other systems occur as patches. Throughout its range it occurs in a mosaic with ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$; in dry areas it occurs adjacent to or in a mosaic with ~North Pacific Dry Douglas-fir Forest and Woodland (CES204.845)$$, and at higher elevations it intermingles with either ~North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)$$ or ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$.

Overstory canopy is dominated by *Pseudotsuga menziesii*, with *Tsuga heterophylla* generally present in the subcanopy or as a canopy dominant in old-growth stands. *Abies grandis, Thuja plicata*, and *Acer macrophyllum* codominants are also represented. In the driest climatic areas, *Tsuga heterophylla* may be absent, and *Thuja plicata* takes its place as a late-seral or subcanopy tree species. *Gaultheria shallon, Mahonia nervosa, Rhododendron macrophyllum, Linnaea borealis, Achlys triphylla*, and *Vaccinium ovatum* typify the poorly to well-developed shrub layer. *Acer circinatum* is a common codominant with one or more of these other species. The fern *Polystichum munitum* can be codominant with one or more of the evergreen shrubs on sites with intermediate moisture availability (mesic). If *Polystichum munitum* is thoroughly dominant or greater than about 40-50% cover, then the stand is probably in the more moist ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$. Young stands may lack *Tsuga heterophylla* or *Thuja plicata*, especially in the Puget Lowland. *Tsuga heterophylla* is generally the dominant regenerating tree species. Other common associates include *Acer macrophyllum, Abies grandis*, and *Pinus monticola*. In southwestern Oregon, *Pinus lambertiana, Calocedrus decurrens*, and occasionally *Pinus ponderosa* may occur in these forests. Soils are generally well-drained and are mesic to dry for much of the year. This is in contrast to ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$, which occurs on sites where soils remain moist to subirrigated for much of the year and fires were less frequent. Fire is (or was) the major natural disturbance. In the past (pre-1880), fires were less commonly high-severity, typically mixed-severity or moderate-severity, with natural return intervals of 100 years or less in the driest areas, to a few hundred years in areas with more moderate to wet climates. In the drier climatic areas (central Oregon Cascades, Puget Lowlands, Georgia Basin), this system was typified by a (mixed) moderate-severity fire regime involving occasional stand-replacing fires and more frequent moderate-severity fires. This fire regime would create a complex mosaic of stand structures across the landscape.

DISTRIBUTION

Range: This system comprises the major lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. In British Columbia and Washington, it is uncommon to absent on the windward side of the coastal mountains where fire is rare. It also occurs locally in far southwestern Oregon (Klamath ecoregion) as small to large patches.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 5:C, 69:C, 81:C
Subnations: BC, OR, WA

CONCEPT

Dynamics: Fire is (or was) the major natural disturbance. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of 100 years or less in the driest areas, to a few hundred years in areas with more moderate to wet climates. In the drier climatic areas (central Oregon Cascades, Puget Lowlands, Georgia Basin), this system was typified by a moderate-severity fire regime involving occasional stand-replacement fires and more frequent moderate-severity fires. This fire regime would create a complex mosaic of stand structures across the landscape. Landfire VDDT models: #RDFHEdry Douglas-fir Hemlock dry mesic describes general successional stage relationship with bias to OR.

SOURCES

References: Eyre 1980, Western Ecology Working Group n.d.
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: G. Kittel and C. Chappell **LeadResp:** West

CES204.837 NORTH PACIFIC MARITIME MESIC SUBALPINE PARKLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Tsuga mertensiana; Late-lying snowpack
Concept Summary: This system occurs throughout the mountains of the Pacific Northwest, from the southern Cascades of Oregon to the mountains of south-central Alaska. It occurs at the transition zone of forest to alpine, forming a subalpine forest-meadow ecotone. Clumps of trees to small patches of forest interspersed with low shrublands and meadows characterize this system. Krummholz often occurs near the upper elevational limit of this

type where it grades into alpine vegetation. Associations include woodlands, forested and subalpine meadow types. It occurs on the west side of the Cascade Mountains where deep, late-lying snowpack is the primary environmental factor. Major tree species are *Tsuga mertensiana, Abies amabilis, Chamaecyparis nootkatensis*, and *Abies lasiocarpa*. This system includes British Columbia Hypermaritime and Maritime Parkland (*Tsuga mertensiana*). Dominant dwarf-shrubs include *Phyllodoce empetriformis, Cassiope mertensiana*, and *Vaccinium deliciosum*. Dominant herbaceous species include *Lupinus arcticus ssp. subalpinus, Valeriana sitchensis, Carex spectabilis*, and *Polygonum bistortoides*. There is very little disturbance, either windthrow or fire. The major process controlling vegetation is the very deep long-lasting snowpacks (deepest in the North Pacific region) limiting tree regeneration. Trees get established only in favorable microsites (mostly adjacent to existing trees) or during drought years with low snowpack. It is distinguished from more interior dry parkland primarily by the presence of *Tsuga mertensiana* or *Abies amabilis* and absence or paucity of *Pinus albicaulis* and *Larix lyallii*.

DISTRIBUTION

Range: This system occurs throughout the mountains of the Pacific Northwest, from the central Oregon Cascades (Diamond Peak, 30 miles north of Crater Lake National Park), north to the mountains of south-central Alaska.
Divisions: 204:C, 306:C
TNC Ecoregions: 1:C, 4:C, 7:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Banner et al. 1993, Comer et al. 2003, Eyre 1980, Franklin and Dyrness 1973, Green and Klinka 1994
Version: 08 Feb 2005 **Stakeholders:** Canada, West
Concept Author: G. Kittel **LeadResp:** West

CES204.002 North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix, Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Tsuga heterophylla, Pseudotsuga menziesii
Concept Summary: This ecological system is a significant component of the lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. It occurs throughout low-elevation western Washington, except on extremely dry sites and in the hypermaritime zone near the outer coast where it is rare. In Oregon, it occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, and on the west side of the Coast Ranges, and is reduced to locally small patches in southwestern Oregon. In British Columbia, it occurs on the eastern (leeward) side of Vancouver Island, commonly and rarely on the windward side, and in the southern Coast Ranges. These forests occur on moist habitats and microhabitats, mainly lower slopes or valley landforms, within the Western Hemlock Zone of the Pacific Northwest. They differ from ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$ primarily in having more hydrophilic undergrowth species, moist to subirrigated soils, high abundance of shade- and moisture-tolerant canopy trees, as well as higher stand productivity, due to higher soil moisture and lower fire frequency. Climate is relatively mild and moist to wet. Mean annual precipitation is mostly 90-254 cm (35-100 inches) (but as low as 20 inches in the extreme rainshadow) predominantly as winter rain. Snowfall ranges from rare to regular (but consistent winter snowpacks are absent or minimal), and summers are relatively dry. Elevation ranges from sea level to 610 m (2000 feet) in northern Washington to 1067 m (3500 feet) in Oregon. Topography ranges from relatively flat glacial tillplains to steep mountainous terrain. This is an extensive forest in the lowlands on the west side of the Cascades. In some wetter climatic areas, it forms the matrix within which other systems occur as patches, especially riparian wetlands. In many rather drier climatic areas, it occurs as small to large patches within a matrix of ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$; in dry areas, it can occur adjacent to or in a mosaic with ~North Pacific Dry Douglas-fir Forest and Woodland (CES204.845)$$, and at higher elevations it intermingles with either ~North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest (CES204.098)$$ or ~North Pacific Mesic Western Hemlock-Silver Fir Forest (CES204.097)$$.

Overstory canopy is dominated by *Pseudotsuga menziesii, Tsuga heterophylla*, and/or *Thuja plicata*, as well as *Chamaecyparis lawsoniana* in western Oregon, away from the coast. *Pseudotsuga menziesii* is usually at least present to more typically codominant or dominant. *Acer macrophyllum* and *Alnus rubra* (the latter primarily where there has been historic logging disturbance) are commonly found as canopy or subcanopy codominants, especially at lower elevations. In a natural landscape, small patches can be dominated in the canopy by these broadleaf trees for several decades after a severe fire. *Polystichum munitum, Oxalis oregana, Rubus spectabilis*, and *Oplopanax horridus* typify the poorly to well-developed herb and shrub layers. *Gaultheria shallon, Mahonia nervosa, Rhododendron macrophyllum*, and *Vaccinium ovatum* are often present but are generally not as abundant as the aforementioned indicators; except where *Chamaecyparis lawsoniana* is a canopy codominant, they may be the dominant understory. *Acer circinatum* is a very common codominant as a tall shrub. Forested stands with abundant *Lysichiton americanus*, an indicator of seasonally flooded or saturated soils, belong in ~North Pacific Coniferous Swamp (CES204.867)$$. Stands included are best represented on lower mountain slopes of the coastal ranges with high precipitation, long frost-free periods, and low fire frequencies. Young stands may lack *Tsuga heterophylla* or *Thuja plicata*, especially in the Puget Lowland. *Tsuga heterophylla* is generally the dominant regenerating tree species. Other common associates include *Abies grandis*, which can be a codominant especially in the Willamette Valley - Puget Trough - Georgia Basin ecoregion. Soils are moist to somewhat wet but not saturated for much of the year and are well-drained to somewhat poorly drained. Typical soils for *Polystichum* sites would be deep, fine- to moderately coarse-textured, and for *Oplopanax* sites, soils typically have an impermeable layer at a moderate depth. Both types of soils are well-watered from upslope sources, seeps, or hyperheic sources. This is in contrast to ~North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest (CES204.001)$$, which occurs on well-drained soils, south-facing slopes, and dry ridges and slopes where soils remain mesic to dry for much of the year. Fire is (or was) the major natural disturbance in all but the wettest climatic areas. In the past (pre-1880), fires were less commonly high-severity, typically mixed-severity or moderate-severity, with natural return intervals of a few hundred to several hundred years. This system was formerly supported by occasional, stand-replacing fires. More frequent moderate-severity fires would generally not burn these moister microsites.
Comments: Stands dominated or codominated with *Chamaecyparis lawsoniana* that are within 25 km (15 miles) of the coast are part of either ~California Coastal Redwood Forest (CES206.921)$$ (extreme southern Oregon and northern California) or ~North Pacific Hypermaritime Sitka Spruce Forest (CES204.841)$$ (central and northern coastal Oregon). Stands in these areas may or may not have redwood or Sitka spruce present. Stands away for the coast and not on serpentine soils are considered part of ~North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest (CES204.002)$$.

DISTRIBUTION

Range: This system is a significant component of the lowland and low montane forests of western Washington, northwestern Oregon, and southwestern British Columbia. This system may also occur as very small patches in northern California, in the northern Coast Ranges.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 5:C, 69:C, 81:C
Subnations: BC, CA?, OR, WA

CONCEPT

Dynamics: Fire is (or was) the major natural disturbance in all but the wettest climatic areas. In the past (pre-1880), fires were high-severity or, less commonly, moderate-severity, with natural return intervals of a few hundred to several hundred years. This system was formerly supported by occasional, stand-replacing fires. More frequent moderate-severity fires would generally not burn these moister microsites. Wind may be equally as important as fire, and in the Bull Run Watershed more important.

SOURCES

References: Eyre 1980, Western Ecology Working Group n.d.
Version: 23 Jan 2006 **Stakeholders:** Canada, West
Concept Author: G. Kittel and C. Chappell **LeadResp:** West

CES204.838 NORTH PACIFIC MOUNTAIN HEMLOCK FOREST

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Tsuga mertensiana
Concept Summary: This forested ecological system occurs throughout the mountains of the North Pacific, from the southern Cascades of Oregon north to southeastern Alaska. It is the predominant forest of subalpine elevations in the coastal mountains of British Columbia, southeastern Alaska, western Washington and western Oregon. On the leeward side of the Cascades, this is usually a dense canopy composed of *Abies lasiocarpa* and *Tsuga mertensiana*, with some *Picea engelmannii* or *Abies amabilis*. These occur between 1275 and 1675 m elevation. It also occurs on mountain slopes on the outer coastal islands of British Columbia and Alaska. It lies between the Western Hemlock, Pacific Silver Fir, or Shasta Red Fir zones and the Subalpine Parkland or Alpine Tundra Zone, at elevations ranging from 300 to 2300 m (1000-7500 feet). The lower and upper elevational limits decrease from south to north and from east to west. The climate is generally characterized by short, cool summers, rainy autumns and long, cool, wet winters with heavy snow cover for 5-9 months. The heavy snowpack is ubiquitous, but at least in southern Oregon and perhaps the northern Rocky Mountains and eastern Cascades, summer drought is more significant. These more summer-dry climatic areas also have occasional high-severity fires with return intervals of 400-600 years (J. Kertis pers. comm. 2006, K. Kopper pers. comm. 2006) unlike the majority of the range of the system which experiences fires very rarely or never. *Tsuga mertensiana* and *Abies amabilis* are the characteristic dominant tree species over most of the range. *Abies amabilis* is absent from southern Oregon and less abundant than elsewhere in the central Oregon Cascades and the eastern slopes of the Cascades. *Chamaecyparis nootkatensis* is abundant in the more coastal portions, while *Abies lasiocarpa* is found inland and becomes increasingly common near the transition to the Subalpine Fir-Engelmann Spruce Zone. In the Cascades of central to southern Oregon, *Abies X shastensis* is typically present and often codominant. *Tsuga heterophylla* often occurs at lower elevations in this system but is much less abundant than *Tsuga mertensiana*. On drier sites *Abies lasiocarpa* and *Pinus contorta* can be the first forests to develop after stand-replacing fire. These early-seral stages, with lodgepole pine dominant in the upper canopy, could be classified and mapped as ~Rocky Mountain Lodgepole Pine Forest (CES306.820)$$ but should be considered part of this system if other tree species listed above are present, as it will succeed as a mixed pine type, then mountain hemlock becomes characteristic. *Picea sitchensis* and *Thuja plicata* are occasionally present, especially on the outer coast of Alaska. Deciduous trees are rare. Parklands (open woodlands or sparse trees with dwarf-shrub or herbaceous vegetation) are not part of this system but of ~North Pacific Maritime Mesic Subalpine Parkland (CES204.837)$$.
Comments: Farther inland, *Tsuga mertensiana* becomes limited to the coldest and wettest pockets of the more continental subalpine fir forests, described from the eastern Cascades and northern Rocky Mountains. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as patches within the matrix of ~Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland (CES306.830)$$ only in the most maritime of environments and is included in the spruce-fir system. In the northern Rocky Mountains, this forest system is codominated by *Abies lasiocarpa* and/or *Picea engelmannii*.

DISTRIBUTION

Range: This system occurs throughout the mountains of the North Pacific, from the southern Cascades of Oregon north to southeastern Alaska.
Divisions: 204:C, 306:C
TNC Ecoregions: 1:C, 3:C, 69:C, 81:C
Subnations: AB, BC, OR, WA

CONCEPT

Dynamics: Landfire VDDT models: R#ABAMup.

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Eyre 1980, Franklin 1988, Kertis pers. comm., Klinka and Chourmouzis 2002, Kopper pers. comm.
Version: 25 Apr 2006 **Stakeholders:** Canada, West
Concept Author: G. Kittel and C. Chappell **LeadResp:** West

CES204.852 NORTH PACIFIC OAK WOODLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Quercus garryana
Concept Summary: This ecological system is limited to the southern portions of the North Pacific region. It occurs primarily in the Puget Trough and Willamette Valley but trickles down into the Klamath ecoregion and into California. This system is associated with dry, predominantly low-elevation sites and/or sites that experienced frequent presettlement fires. In the Willamette Valley, soils are mesic yet well-drained, and the type is clearly large patch in nature. In the Puget Lowland and Georgia Basin, this system is primarily found on dry sites, typically either shallow bedrock soils or deep gravelly glacial outwash soils. It occurs on various soils in the interior valleys of the Klamath Mountains, and on shallow soils of "bald hill" toward the coast. Even where more environmentally limited, the system is strongly associated with a pre-European settlement, low-severity fire regime. Succession in the absence of fire tends to favor increased shrub dominance in the understory, increased tree density, and increased importance of conifers, with the end result being conversion to a conifer forest. The vegetation ranges from savanna and woodland to forest dominated by deciduous broadleaf trees, mostly *Quercus garryana*. Codominance by the evergreen conifer *Pseudotsuga menziesii* is common, and *Pinus ponderosa* is important in some stands. In the south, common associates also include *Quercus kelloggii* and *Arbutus menziesii*. This system merges into ~Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923)$$ on sites that support more conifer cover, and into ~Mediterranean California Mixed Oak Woodland (CES206.909)$$ in the southern portion of its distribution. This system is borderline between small patch and large patch in its dynamics.
Comments: East of the Cascade Crest is a different system dominated by Oregon white oak (i.e., ~East Cascades Oak-Ponderosa Pine Forest and Woodland (CES204.085)$$). While *Quercus garryana* does occur in California, it is uncertain that this system (a Garry oak-dominated woodland) does not occur that far south. Garry oak in California may be mostly shrubby form around the edges of balds or else mixed into woodlands dominated by other species; this needs further review.

DISTRIBUTION

Range: This system occurs primarily in the Puget Trough and Willamette Valley and extends southward at low elevations in the Klamath Mountains on both sides of the Oregon/California stateline.
Divisions: 204:C
TNC Ecoregions: 1:C, 2:C, 5:C, 14:C
Subnations: BC, CA, OR, WA

CONCEPT

Dynamics: Landfire VDDT models: #R OWOA Oregon White Oak applies to southern occurrences.

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Eyre 1980, Franklin and Dyrness 1973
Version: 23 Jan 2006 **Stakeholders:** Canada, West
Concept Author: C. Chappell **LeadResp:** West

CES204.883 NORTH PACIFIC WOODED VOLCANIC FLOWAGE

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Rock Outcrops/Barrens/Glades; Very Shallow Soil; Lava Flow
Concept Summary: This ecological system is found from foothill to subalpine elevations and includes woodland to sparsely vegetated landscapes (generally >10% plant cover) on recent lava flows, excessively well-drained lahars, debris avalanches and pyroclastic flows. The characteristic feature of this system is the substrate limiting characteristic that creates an environment for a more open vegetation than the surrounding closed matrix forest. Examples are recent lava flows (3500-8200 years ago) on the north side of Mount Adams (andecite) and the big lava beds (basalt) south of Indian Heaven west of Mount Adams, Washington, and lahars (200-2000 years old) at Old Maid Flat west of Mount Hood, Oregon. These areas support open to sparse tree cover; characteristic species include *Pseudotsuga menziesii, Pinus contorta, Pinus monticola*, and *Abies lasiocarpa*. Tree cover can range from scattered (5%) up to 70% or occasionally even more. There may be scattered to dense shrubs present, such as *Acer*

circinatum, Vaccinium membranaceum, Arctostaphylos uva-ursi (very characteristic), *Mahonia nervosa, Amelanchier alnifolia*, and *Xerophyllum tenax*. Soil development is limited, and mosses and lichens often cover the soil or rock surface.
Comments: This system will include areas that fit the sparsely vegetated system type definition but are included here and delineated by the boundary of lava or other volcanic flowage. Elevation range (>3350 m) for this system is great, but the specialized substrate is the overriding factor defining it. These are mid-stages of primary succession that differ in degree of forest cover, soil development and productivity. Early primary succession on these substrates are included in ~North Pacific Volcanic Rock and Cinder Land (CES204.092)$$. Later primary succession stages (increased soil development) are included in appropriate matrix forest systems.

DISTRIBUTION

Range: This uncommon system is found in the east and west Cascades of Washington and Oregon, and may occur in small patches in northern California in the vicinity of Mount Lassen or Mount Shasta.
Divisions: 204:C
TNC Ecoregions: 3:P, 4:C, 81:C
Subnations: CA?, OR, WA

CONCEPT

SOURCES

References: Eyre 1980, Western Ecology Working Group n.d.
Version: 31 Aug 2005 **Stakeholders:** West
Concept Author: R. Crawford **LeadResp:** West

CES206.911 NORTHERN CALIFORNIA MESIC SUBALPINE WOODLAND

Primary Division: Mediterranean California (206)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Temperate [Temperate Oceanic]; Udic
Concept Summary: This ecological system occurs on ridges and rocky slopes around timberline at 2600 m (7900 feet) elevation in the central Sierra Nevada and 2450 m (8000 feet) in the southern Cascades. These woodlands are found on concave or mesic slopes in areas with long-lasting snowpack and better soil development than other drier and more exposed subalpine woodlands. The tree canopy is characterized by *Tsuga mertensiana* and may include *Abies magnifica, Abies procera, Pinus albicaulis*, and *Pinus monticola*. Mesic-site shrubs will include *Cassiope mertensiana, Phyllodoce breweri, Phyllodoce empetriformis, Vaccinium membranaceum*, and others. *Juniperus communis* is found in most stands of the northern Sierra Nevada. *Penstemon davidsonii*, as well as patches of grasses, sedges, and forbs grade into adjacent meadows.

DISTRIBUTION

Range: This system occurs on ridges and rocky slopes around timberline at 2600 m (7900 feet) elevation in the central Sierra Nevada and 2450 m (8000 feet) in the southern Cascades.
Divisions: 204:C, 206:C
TNC Ecoregions: 4:C, 5:P, 12:C, 81:P
Subnations: CA, NV, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Potter 1994, Sawyer and Keeler-Wolf 1995
Version: 07 Oct 2005 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES306.805 NORTHERN ROCKY MOUNTAIN DRY-MESIC MONTANE MIXED CONIFER FOREST

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Montane]; Forest and Woodland (Treed); Ustic; Short Disturbance Interval; F-Patch/Low Intensity; Needle-Leaved Tree; Abies grandis - Mixed
Concept Summary: This ecological system is composed of highly variable montane coniferous forests found in the interior Pacific Northwest, from southernmost interior British Columbia, eastern Washington, eastern Oregon, northern Idaho, western and north-central Montana, and south along the east slope of the Cascades in Washington and Oregon. In central Montana it occurs on mountain islands (the Snowy Mountains). This system is associated with a submesic climate regime with annual precipitation ranging from 50 to 100 cm, with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from 460 to 1920 m. Most occurrences of this system are dominated by a mix of *Pseudotsuga menziesii* and *Pinus ponderosa* (but there can be one without the other) and other typically seral species, including *Pinus contorta, Pinus monticola* (not in central Montana), and *Larix occidentalis* (not in central Montana). *Picea engelmannii* (or *Picea glauca* or their hybrid) becomes increasingly common towards the eastern edge of the range. The nature of this forest system is a matrix of large patches dominated or codominated by one or combinations of the above species; *Abies grandis* (a fire-sensitive, shade-tolerant species not occurring in central Montana) has increased on many sites once dominated by *Pseudotsuga menziesii* and *Pinus ponderosa*, which were formerly maintained by low-severity wildfire. Presettlement fire regimes may have been characterized by frequent, low-intensity ground fires that maintained relatively open stands of a mix of fire-resistant species. Under present conditions the fire regime is mixed severity and more variable, with stand-replacing fires more common, and the forests are more homogeneous. With vigorous fire suppression, longer fire-return intervals are now the rule, and multi-layered stands of *Pseudotsuga menziesii, Pinus ponderosa*, and/or *Abies grandis* provide fuel "ladders," making these forests more susceptible to high-intensity, stand-replacing fires. They are very productive forests which have been priorities for timber production. They rarely form either upper or lower timberline forests. Understories are dominated by graminoids, such as *Pseudoroegneria spicata, Calamagrostis rubescens, Carex geyeri*, and *Carex rossii*, that may be associated with a variety of shrubs, such as *Acer glabrum, Juniperus communis, Physocarpus malvaceus, Symphoricarpos albus, Spiraea betulifolia*, or *Vaccinium membranaceum* on mesic sites. *Abies concolor* and *Abies grandis X concolor* hybrids in central Idaho (the Salmon Mountains) are included here but have very restricted range in this area. *Abies concolor* and *Abies grandis* in the Blue Mountains of Oregon are probably hybrids of the two and mostly *Abies grandis*.
Comments: Need to re-assess the concept of this system in relation to ~Northern Rocky Mountain Western Larch Savanna (CES306.837)$$ and ~East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)$$. In PNV (PAGs) concept, this is mostly *Pseudotsuga menziesii*, moist *Pinus ponderosa* series, dry *Abies grandis* or warm, dry *Abies lasiocarpa* series in the Canadian Rockies, northern Middle Rockies, East Cascades and Okanagan ecoregions. Everett et al. (2000) indicate that in the eastern Cascades of Washington this system forms fire polygons due to abrupt north and south topography with presettlement fire-return intervals of 11-12 years typically covering less than 810 ha. Currently, fires have 40- to 45-year return intervals with thousands of hectares in size. ~Northern Rocky Mountain Western Larch Savanna (CES306.837)$$ is a large-patch type that occurs typically within this matrix or the ~Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)$$ matrix. We need to define the percent cover of larch over 50% or over 75% relative cover of all trees for an occurrence to be placed in ~Northern Rocky Mountain Western Larch Savanna (CES306.837)$$. This needs to be relative because these look(ed) like ponderosa savanna in places. ~East Cascades Mesic Montane Mixed-Conifer Forest and Woodland (CES204.086)$$ has North Pacific floristic composition, and is mostly east Cascades ecoregion, peripheral in Okanagan ecoregion, and west Cascades. PAGs most of the *Abies grandis*, dry western red-cedar and western hemlock in the east Cascades. Environmentally, it is equivalent to ~Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)$$. Contrasting this system (CES306.805) with ~Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)$$ and ~Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)$$ is important in the Middle Rockies ecoregion and Oregon.

DISTRIBUTION

Range: This system is found in the interior Pacific Northwest, from southern interior British Columbia south and east into Oregon, Idaho (including north and central Idaho, down to the Boise Mountains), and western Montana, and south along the east slope of the Cascades in Washington and Oregon.

Divisions: 204:C, 304:P, 306:C
TNC Ecoregions: 2:P, 4:C, 6:C, 7:C, 8:C, 26:C, 68:C
Subnations: BC, ID, MT, OR, WA

CONCEPT

Dynamics: Landfire VDDT models: R#MCONdy.

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1987, Crawford and Johnson 1985, Daubenmire and Daubenmire 1968, Eyre 1980, Lillybridge et al. 1995, Pfister et al. 1977, Steele and Geier-Hayes 1995, Steele et al. 1981, Topik 1989, Topik et al. 1988, Williams and Lillybridge 1983
Version: 23 Jan 2006 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.030 NORTHERN ROCKY MOUNTAIN PONDEROSA PINE WOODLAND AND SAVANNA

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; F-Patch/Medium Intensity; Needle-Leaved Tree; Graminoid; Pinus ponderosa with grassy understory; Pinus ponderosa with shrubby understory
Concept Summary: This inland Pacific Northwest ecological system occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia. These woodlands and savannas occur at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 500 m in British Columbia to 1600 m in the central Idaho mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on glacial till, glacio-fluvial sand and gravel, dune, basaltic rubble, colluvium, to deep loess or volcanic ash-derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. In the Oregon "pumice zone" this system occurs as matrix-forming, extensive woodlands on rolling pumice plateaus and other volcanic deposits. These woodlands in the eastern Cascades, Okanagan and northern Rockies regions receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the central Rockies. *Pinus ponderosa* (primarily *var. ponderosa*) is the predominant conifer; *Pseudotsuga menziesii* may be present in the tree canopy but is usually absent. In southern interior British Columbia, *Pseudotsuga menziesii* or *Pinus flexilis* may form woodlands or fire-maintained savannas with and without *Pinus ponderosa var. ponderosa* at the lower treeline transition into grassland or shrub-steppe. The understory can be shrubby, with *Artemisia tridentata, Arctostaphylos patula, Arctostaphylos uva-ursi, Cercocarpus ledifolius, Physocarpus malvaceus, Purshia tridentata, Symphoricarpos oreophilus* or *Symphoricarpos albus, Prunus virginiana, Amelanchier alnifolia*, and *Rosa* spp. common species. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. These more open stands support grasses such as *Pseudoroegneria spicata, Hesperostipa* spp., *Achnatherum* spp., dry *Carex* species (*Carex inops*), *Festuca idahoensis*, or *Festuca campestris*. The more mesic portions of this system may include *Calamagrostis rubescens* or *Carex geyeri*, species more typical of ~Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)$$. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands typically with a shrub-dominated or patchy shrub layer, depending on climate, degree of soil development, and understory density. This includes the northern race of Interior Ponderosa Pine old-growth (USFS Region 6, USFS Region 1). Historically, many of these woodlands and savannas lacked the shrub component as a result of 3- to 7-year fire-return intervals.
Comments: Hot, dry Douglas-fir types with grass are included here. ~Rocky Mountain Ponderosa Pine Woodland (CES306.827)$$ and ~Southern Rocky Mountain Ponderosa Pine Savanna (CES306.826)$$ contain mostly *Pinus ponderosa var. scopulorum* and *Pinus arizonica var. arizonica (= Pinus ponderosa var. arizonica)*. The FRIS site describes different varieties of *Pinus ponderosa* and associated species. Johansen and Latta (2003) have mapped the

distribution of the two varieties using mitochondrial DNA. They hybridize along the Continental Divide in Montana backing up the FRIS information. Another ponderosa pine system remains to be defined and described for the woodlands and savannas occurring in central and eastern Montana and the Black Hills region. These "northwestern Great Plains ponderosa pine woodlands" are likely to have a floristic component that is more northern Great Plains mixedgrass in nature, as well as being open woodlands generally found in a grassland matrix. Further work is need to identify the geographic and conceptual boundaries between ~Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)$$ and the northwestern Great Plains system.

Meeting of Pacific Northwest ecologists for Landfire concluded that the "true savanna" of high-frequency / low-intensity fires and grassy understories is now minimally in existence. Most areas that may have been savanna in the past are now more nearly closed-canopy woodlands/forests. Conclusion was that these true savannas should be included with this woodland system, rather than with the climatically-edaphically controlled ~Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958)$$. Hence, the "true fire-maintained savanna" is included in this woodland system.

Louisa Evers (pers. comm. 2006) notes that she has not found any evidence that ponderosa pine savanna existed historically in north-central and central Oregon. In north-central Oregon, the savanna would have been oak or pine-oak. In central Oregon, it may well have been western juniper. Condition surveys of the Cascades Forest Reserve and General Land Office survey notes suggest that ponderosa pine formed a woodland with grassy understories, but still was often referred to as open-parklike. Conversely pine-oak and Douglas-fir-oak savannas appeared to have once been quite common in the Willamette Valley (and are classified in ~North Pacific Oak Woodland (CES204.852)$$).

DISTRIBUTION

Range: This system is found in the Fraser River drainage of southern British Columbia south along the Cascades and northern Rocky Mountains of Washington, Oregon and California. In the northeastern part of its range, it extends across the northern Rocky Mountains west of the Continental Divide into northwestern Montana, south to the Snake River Plain in Idaho, and east into the foothills of western Montana.
Divisions: 204:C, 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 7:C, 8:C, 9:C, 10:C, 26:?, 33:?, 68:C
Subnations: BC, ID, MT, NV?, OR, WA

CONCEPT

Environment: This ecological system within the region occurs at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forests typically in warm, dry, exposed sites at elevations ranging from 500-1600 m (1600-5248 feet). It can occur on all slopes and aspects; however, it commonly occurs on moderately steep to very steep slopes or ridgetops. This ecological system generally occurs on most geological substrates from weathered rock to glacial deposits to eolian deposits. Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Surface textures are highly variable in this ecological system ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations.
Dynamics: *Pinus ponderosa* is a drought-resistant, shade-intolerant conifer which usually occurs at lower treeline in the major ranges of the western United States. Historically, ground fires and drought were influential in maintaining open-canopy conditions in these woodlands. With settlement and subsequent fire suppression, occurrences have become denser. Presently, many occurrences contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. These altered occurrence structures have affected fuel loads and alter fire regimes. Presettlement fire regimes were primarily frequent (5- to 15-year return intervals), low-intensity ground fires triggered by lightning strikes or deliberately set fires by Native Americans. With fire suppression and increased fuel loads, fire regimes are now less frequent and often become intense crownfires, which can kill mature *Pinus ponderosa* (Reid et al. 1999).

Establishment is erratic and believed to be linked to periods of adequate soil moisture and good seed crops as well as fire frequencies, which allow seedlings to reach sapling size. Longer fire-return intervals have resulted in many occurrences having dense subcanopies of overstocked and unhealthy young *Pinus ponderosa* (Reid et al. 1999).

White-headed woodpecker, pygmy nuthatch, and flammulated owl are indicators of a healthy ponderosa pine woodland. All of these birds prefer mature trees in an open woodland setting (Winn 1998, Jones 1998, Levad 1998 as cited in Rondeau 2001).

Landfire VDDT models: R#PIPOm.

SOURCES

References: Camp et al. 1997, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Everett et al. 2000, Evers pers. comm., Eyre 1980, Franklin and Dyrness 1973, Johansen and Latta 2003, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Pfister et al. 1977, Reid et al. 1999, Shiflet 1994, USFS 1993, Western Ecology Working Group n.d., Youngblood and Mauk 1985

Version: 23 Feb 2006 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.807 NORTHERN ROCKY MOUNTAIN SUBALPINE WOODLAND AND PARKLAND

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Oligotrophic Soil; Very Short Disturbance Interval; W-Patch/High Intensity; W-Patch/Medium Intensity; W-Landscape/Medium Intensity; Larix lyallii; Upper Treeline; Long (>500 yrs) Persistence

Concept Summary: This system of the northern Rockies, Cascade Mountains, and northeastern Olympic Mountains is typically a high-elevation mosaic of stunted tree clumps, open woodlands, and herb- or dwarf-shrub-dominated openings, occurring above closed forest ecosystems and below alpine communities. It includes open areas with clumps of *Pinus albicaulis*, as well as woodlands dominated by *Pinus albicaulis* or *Larix lyallii*. In the Cascade Mountains and northeastern Olympic Mountains, the tree clump pattern is one manifestation, but these are also woodlands with an open canopy, without a tree clump/opening patchiness to them; in fact, that is quite common with *Pinus albicaulis*. The climate is typically very cold in winter and dry in summer. In the Cascades and Olympic Mountains, the climate is more maritime in nature and wind is not as extreme. The upper and lower elevational limits, due to climatic variability and differing topography, vary considerably; in interior British Columbia, this system occurs between 1000 and 2100 m elevation, and in northwestern Montana it occurs up to 2380 m. Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, landslides and rockslides, and cirque headwalls and basins. Some sites have little snow accumulation because of high winds and sublimation. *Larix lyallii* stands generally occur at or near upper treeline on north-facing cirques or slopes where snowfields persist until June or July. In this harsh, often wind-swept environment, trees are often stunted and flagged from damage associated with wind and blowing snow and ice crystals, especially at the upper elevations of the type. The stands or patches often originate when *Picea engelmannii, Larix lyallii*, or *Pinus albicaulis* colonize a sheltered site such as the lee side of a rock. *Abies lasiocarpa* can then colonize in the shelter of the *Picea engelmannii* and may form a dense canopy by branch layering. Major disturbances are windthrow and snow avalanches. Fire is known to occur infrequently in this system, at least where woodlands are present; lightning damage to individual trees is common, but sparse canopies and rocky terrain limit the spread of fire. These high-elevation coniferous woodlands are dominated by *Pinus albicaulis, Abies lasiocarpa*, and/or *Larix lyallii*, with occasional *Picea engelmannii*. In the Cascades and Olympics, *Abies lasiocarpa* sometimes dominates the tree layer without *Pinus albicaulis*, though in this dry parkland *Tsuga mertensiana* and *Abies amabilis* are largely absent. The undergrowth is usually somewhat depauperate, but some stands support a near sward of heath plants, such as *Phyllodoce glanduliflora, Phyllodoce empetriformis, Empetrum nigrum, Cassiope mertensiana*, and *Kalmia polifolia*, and can include a slightly taller layer of *Ribes montigenum, Salix brachycarpa, Salix glauca, Salix planifolia, Vaccinium membranaceum, Vaccinium myrtillus*, or *Vaccinium scoparium* that may be present to codominant. The herbaceous layer is sparse under dense shrub canopies or may be dense where the shrub canopy is open or absent. *Vahlodea atropurpurea (= Deschampsia atropurpurea), Luzula glabrata var. hitchcockii*, and *Juncus parryi* are the most commonly associated graminoids.

Comments: There is a proposal to either split the dry, subalpine *Pinus albicaulis* woodlands of the Blue Mountains (Oregon) and northern Nevada into a different system; or else to include them in ~Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819)$$. For Landfire, these *Pinus albicaulis* woodlands were included in this subalpine parkland system, but ecologically and floristically they are more similar to Rocky Mountain dry subalpine woodlands.

DISTRIBUTION

Range: This system occurs in the northern Rocky Mountains, west into the Cascade Mountains and northeastern Olympic Mountains, and east into the mountain "islands" of central Montana.
Divisions: 204:C, 306:C
TNC Ecoregions: 3:C, 7:C, 8:C, 9:P, 26:C, 68:C
Subnations: AB, BC, ID, MT, WA, WY

CONCEPT

Environment: In the Cascades and Olympic Mountains, the climate is more maritime in nature and wind is not as extreme, but summer drought is a more important process than in the related ~North Pacific Maritime Mesic Subalpine Parkland (CES204.837)$$.
Dynamics: *Larix lyallii* is a very slow-growing, long-lived tree, with individuals up to 1000 years in age. It is generally shade-intolerant; however, extreme environmental conditions limit potentially competing trees.

SOURCES

References: Arno 1970, Arno and Habeck 1972, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1999, Ecosystems Working Group 1998, Eyre 1980, Lillybridge et al. 1995, Meidinger and Pojar 1991, Williams and Lillybridge 1983, Williams and Smith 1990
Version: 06 Sep 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.837 NORTHERN ROCKY MOUNTAIN WESTERN LARCH SAVANNA

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Udic; Very Long Disturbance Interval; F-Landscape/Medium Intensity; Other Floristics/Dominants [User-defined]; Moderate (100-500 yrs) Persistence
Concept Summary: This ecological system is restricted to the interior montane zone of the Pacific Northwest in northern Idaho and adjacent Montana, Washington, Oregon, and in southeastern interior British Columbia. It also appears in the east Cascades of Washington. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from 680 to 2195 m (2230-7200 feet), and sites include drier, lower montane settings of toeslopes and ash deposits. This system is composed of open-canopied "savannas" of the deciduous conifer *Larix occidentalis*, which may have been initiated following stand-replacing crownfires of other conifer systems, but are maintained by a higher frequency, surface-fire regime. These savannas are found in settings where low-intensity, high-frequency fires create open larch woodlands, often with the undergrowth dominated by low-growing *Arctostaphylos uva-ursi, Calamagrostis rubescens, Linnaea borealis, Spiraea betulifolia, Vaccinium caespitosum*, or *Xerophyllum tenax*. Less frequent or absence of fire creates mixed-dominance stands with often shrubby undergrowth; *Vaccinium caespitosum* is common, and taller shrubs can include *Acer glabrum, Ceanothus velutinus, Shepherdia canadensis, Physocarpus malvaceus, Rubus parviflorus*, or *Vaccinium membranaceum*. Fire suppression has led to invasion of the more shade-tolerant tree species *Abies grandis, Abies lasiocarpa, Picea engelmannii*, or *Tsuga* spp. and loss of much of the single-story canopy woodlands.
Comments: Stands initiated following crownfires in areas with stand-replacing fire frequencies greater than 150 years are included in the more mesic adjacent forest systems (~Northern Rocky Mountain Mesic Montane Mixed Conifer Forest (CES306.802)$$ and ~Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)$$). This is a fire-dependant system and was much more extensive in the past; it is now very patchy in distribution. Most *Larix occidentalis* is a seral component of the dry-mesic mixed montane forest.

DISTRIBUTION

Divisions: 204:C, 306:C

TNC Ecoregions: 3:C, 4:C, 6:P, 7:C, 8:P, 68:C
Subnations: BC?, ID, MT, OR, WA

CONCEPT

Dynamics: *Larix occidentalis* is a long-lived species (in excess of 700 years in the northern Rocky Mountains), and thus stands fitting this concept are themselves long-persisting; the life of *Larix*-dominated stands probably does not much exceed 250 years due to various mortality sources and the ingrowth of shade-tolerant species. Occurrences of this ecological system are generated by stand-replacing fire, the fire-return interval for which is speculated to be on the order of 80 to 200 years. These sites may be maintained in a seral status for hundreds of years due to the fact that *Larix occidentalis* is a long-lived species and the understory is often dominated by *Pseudotsuga*, which will grow into the upper canopy. The potential dominants *Abies lasiocarpa, Picea engelmannii*, or *Abies grandis* are slow to establish on these sites and grow slowly presenting the distinct probability, given the fire-return intervals for this type, that the "climax" (long-term stable) condition is never realized.

It has been noted in northern Idaho that, following disturbance (particularly logging) in some mesic-site occurrences, *Larix occidentalis* does not necessarily succeed itself, the first tree-dominated successional stages being dominated by *Pseudotsuga menziesii, Pinus contorta*, or less frequently by more shade-tolerant species (Cooper et al. 1987); this response is a consequence of the episodic nature of favorable cone crop years in *Larix occidentalis*.

Landfire VDDT models: #RMCONm and #RMCONdy classes B, C, & D.

SOURCES

References: Agee 1993, Cooper et al. 1987, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Eyre 1980, Hessburg et al. 1999, Hessburg et al. 2000, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Leavell 2000, Lillybridge et al. 1995, Pfister et al. 1977, Steele et al. 1981, Western Ecology Working Group n.d., Williams et al. 1995

Version: 01 Sep 2005 **Stakeholders:** Canada, West
Concept Author: R.C. Crawford and M.S. Reid **LeadResp:** West

CES306.813 ROCKY MOUNTAIN ASPEN FOREST AND WOODLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Broad-Leaved Deciduous Tree; Populus tremuloides
Concept Summary: This widespread ecological system is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. An eastern extension occurs along the Rocky Mountains foothill front and in mountain "islands" in Montana (Big Snowy and Highwood mountains), and the Black Hills of South Dakota. In California, this system is only found on the east side of the Sierra Nevada adjacent to the Great Basin. Large stands are found in the Inyo and White mountains, while small stands occur on the Modoc Plateau. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand. Secondarily, it is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. In California, *Symphyotrichum spathulatum (= Aster occidentalis)* is a common forb. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus, Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests. It differs from ~Northwestern Great Plains Aspen Forest and Parkland (CES303.681)$$, which is limited to plains environments.

DISTRIBUTION

Range: This system is more common in the southern and central Rocky Mountains, but it does occur in the montane and subalpine zones throughout much of the western U.S. and north into Canada, as well as west into California. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions.

Divisions: 204:C, 206:P, 304:C, 306:C

TNC Ecoregions: 1:P, 3:C, 4:P, 5:P, 7:C, 8:C, 9:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 26:C, 81:P

Subnations: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

Environment: Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 15 inches and typically greater than 20 inches, except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or large snow drifts. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable, sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. The soils are typically deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Vegetation: Occurrences have a somewhat closed canopy of trees of 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers that may be present but never codominant include *Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 15% of the tree canopy before the occurrence is reclassified as a mixed occurrence. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors like disturbance, the understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs.

Common shrubs include *Acer glabrum, Amelanchier alnifolia, Artemisia tridentata, Juniperus communis, Prunus virginiana, Rosa woodsii, Shepherdia canadensis, Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium* spp., *Geranium viscosissimum, Heracleum sphondylium, Ligusticum filicinum, Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Pteridium aquilinum, Rudbeckia occidentalis, Thalictrum fendleri, Valeriana occidentalis, Wyethia amplexicaulis*, and many others. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual *Bromus tectorum* are often common in occurrences disturbed by grazing.

Dynamics: Occurrences in this ecological system often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease and windthrow, or clearcutting by man or beaver. The stems of these thin-barked, clonal trees are easily killed by ground fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1993). The stems are relatively short-lived (100-150 years), and the occurrence will succeed to longer-lived conifer forest if undisturbed. Occurrences are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because of the long moist conditions required to establish are rare in the habitats that it occurs in. Superficial soil drying will kill seedlings (Knight 1993).

SOURCES

References: Bartos 1979, Bartos and Cambell 1998, Bartos and Mueggler 1979, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, DeByle and Winokur 1985, DeVelice et al. 1986, Eyre 1980, Henderson et al. 1977, Hess and Wasser 1982, Johnston and Hendzel 1985, Keammerer 1974a, Mueggler 1988, Neely et al. 2001, Powell 1988a, Shiflet 1994, Tuhy et al. 2002, Youngblood and Mauk 1985

Version: 20 Apr 2006 **Stakeholders:** Canada, Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.820 ROCKY MOUNTAIN LODGEPOLE PINE FOREST

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Acidic Soil; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic; Long Disturbance Interval; F-Patch/High Intensity [Seasonality/Fall Fire]; F-Landscape/High Intensity; Needle-Leaved Tree; Pinus contorta; Moderate (100-500 yrs) Persistence
Concept Summary: This ecological system is widespread in upper montane to subalpine elevations of the Rocky Mountains, Intermountain West region, north into the Canadian Rockies and east into mountain "islands" of north-central Montana. These are subalpine forests where the dominance of *Pinus contorta* is related to fire history and topo-edaphic conditions. Following stand-replacing fires, *Pinus contorta* will rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests which developed following fires. This system includes *Pinus contorta*-dominated stands that, while typically persistent for >100-year time frames, may succeed to spruce-fir; in the southern and central Rocky Mountains it is seral to ~Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (CES306.828)$$. More northern occurrences are seral to ~Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland (CES306.830)$$. Soils supporting these forests are typically well-drained, gravelly, coarse-textured, acidic, and rarely formed from calcareous parent materials. These forests are dominated by *Pinus contorta* with shrub, grass, or barren understories. Sometimes there are intermingled mixed conifer/*Populus tremuloides* stands, with the latter occurring with inclusions of deeper, typically fine-textured soils. The shrub stratum may be conspicuous to absent; common species include *Arctostaphylos uva-ursi, Ceanothus velutinus, Linnaea borealis, Mahonia repens, Purshia tridentata, Spiraea betulifolia, Spiraea douglasii, Shepherdia canadensis, Vaccinium caespitosum, Vaccinium scoparium, Vaccinium membranaceum, Symphoricarpos albus*, and *Ribes* spp. In southern interior British Columbia, this system is usually an open lodgepole pine forest found extensively between 500 and 1600 m elevation in the Columbia Range. In the Interior Cedar Hemlock and Interior Douglas-fir zones, *Tsuga heterophylla* or *Pseudotsuga menziesii* may present.

DISTRIBUTION

Range: This system occurs at upper montane to subalpine elevations of the Rocky Mountains, Intermountain West region, north into the Canadian Rockies, and east onto mountain "islands" of north-central Montana. In Washington, this system occurs mostly on the east side of the Cascade Crest. In Oregon, this system only occurs in the Blue Mountains; all Oregon Cascades lodgepole pine forest are included in other systems.
Divisions: 304:C, 306:C
TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 20:C, 26:C, 68:C
Subnations: AB, BC, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Dynamics: *Pinus contorta* is an aggressively colonizing, shade-intolerant conifer which usually occurs in lower subalpine forests in the major ranges of the western United States. Establishment is episodic and linked to stand-replacing disturbances, primarily fire. The incidence of serotinous cones varies within and between varieties of *Pinus contorta*, being most prevalent in Rocky Mountain populations. Closed, serotinous cones appear to be strongly favored by fire, and allow rapid colonization of fire-cleared substrates (Burns and Honkala 1990a). Hoffman and Alexander (1980, 1983) report that in stands where *Pinus contorta* exhibits a multi-aged population structure, with regeneration occurring, there is typically a higher proportion of trees bearing nonserotinous cones.

SOURCES

References: Alexander 1986, Alexander et al. 1987, Anderson 1999a, Arno et al. 1985, Barrows et al. 1977, Burns and Honkala 1990a, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Despain 1973a, Despain 1973b, Ecosystems Working Group 1998, Eyre 1980, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson and Clausnitzer 1992, Johnston 1997, Kingery 1998, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Moir 1969a, Nachlinger et al. 2001, Neely et al. 2001, Pfister et al. 1977, Steele et al. 1981, Whipple 1975, Williams and Smith 1990

Version: 20 Apr 2006 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.830 ROCKY MOUNTAIN SUBALPINE MESIC-WET SPRUCE-FIR FOREST AND WOODLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Forest and Woodland (Treed); Acidic Soil; Udic; Very Long Disturbance Interval [Seasonality/Summer Disturbance]; F-Patch/High Intensity; F-Landscape/Medium Intensity; Abies lasiocarpa - Picea engelmannii; RM Subalpine Dry-Mesic Spruce-Fir; Long (>500 yrs) Persistence
Concept Summary: This is a high-elevation system of the Rocky Mountains, dry eastern Cascades and eastern Olympic Mountains dominated by *Picea engelmannii* and *Abies lasiocarpa*. It extends westward into the northeastern Olympic Mountains and the northeastern side of Mount Rainier in Washington, and as far east at mountain "islands" of north-central Montana. *Picea engelmannii* is generally more important in southern forests than those in the Pacific Northwest. Occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate. These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. In the northern Rocky Mountains of northern Idaho and Montana, *Tsuga mertensiana* occurs as small to large patches within the matrix of this mesic spruce-fir system and only in the most maritime of environments (the coldest and wettest of the more Continental subalpine fir forests). In the Olympics and northern Cascades, the climate is more maritime than typical for this system, but due to the lower snowfall in these rainshadow areas, summer drought may be more significant than snowpack in limiting tree regeneration in burned areas. *Picea engelmannii* is rare in these areas. Mesic understory shrubs include *Menziesia ferruginea, Vaccinium membranaceum, Rhododendron albiflorum, Amelanchier alnifolia, Rubus parviflorus, Ledum glandulosum, Phyllodoce empetriformis*, and *Salix* spp. Herbaceous species include *Actaea rubra, Maianthemum stellatum, Cornus canadensis, Erigeron eximius, Gymnocarpium dryopteris, Rubus pedatus, Saxifraga bronchialis, Tiarella* spp., *Lupinus arcticus ssp. subalpinus, Valeriana sitchensis*, and graminoids *Luzula glabrata var. hitchcockii* or *Calamagrostis canadensis*. Disturbances include occasional blowdown, insect outbreaks (30-50 years), mixed-severity fire, and stand-replacing fire (every 150-500 years). The more summer-dry climatic areas also have occasional high-severity fires.
Comments: While the name of this system ("Rocky Mountain") suggests a Rocky Mountain distribution, floristic affinities of Engelmann spruce-subalpine fir forests in western Washington and the Oregon Cascades are such that the spruce-fir forests of those regions are included in this system. The subalpine fir-dominated forests of the northeastern Olympic Mountains and the northeastern side of Mount Rainier are included here. They are more similar to subalpine fir forests on the eastern slopes of the Cascades than they are to mountain hemlock forests.

DISTRIBUTION

Range: This system is found at high elevations of the Rocky Mountains, extending west into the northeastern Olympic Mountains and the northeastern side of Mount Rainier in Washington, and as far east as mountain "islands" of north-central Montana.
Divisions: 204:C, 304:C, 306:C
TNC Ecoregions: 1:C, 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 26:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Dynamics: Landfire VDDT models: #RSPFI and #RABLA.

SOURCES

References: Alexander and Ronco 1987, Alexander et al. 1984a, Alexander et al. 1987, Anderson 1999a, Brand et al. 1976, Canadian Rockies Ecoregional Plan 2002, Clagg 1975, Comer et al. 2002, Comer et al. 2003, Cooper et al. 1987, Daubenmire and Daubenmire 1968, DeVelice et al. 1986, Ecosystems Working Group 1998, Eyre 1980, Fitzgerald et al. 1994, Graybosch and Buchanan 1983, Henderson et al. 1989, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1976, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnson

and Clausnitzer 1992, Johnson and Simon 1987, Komarkova et al. 1988b, Lillybridge et al. 1995, Major et al. 1981, Mauk and Henderson 1984, Mehl 1992, Meidinger and Pojar 1991, Muldavin et al. 1996, Neely et al. 2001, Peet 1978a, Peet 1981, Pfister 1972, Pfister et al. 1977, Romme 1982, Schaupp et al. 1999, Steele and Geier-Hayes 1995, Steele et al. 1981, Tuhy et al. 2002, Veblen 1986, Whipple and Dix 1979, Williams and Lillybridge 1983, Williams et al. 1995, Wong and Iverson 2004, Wong et al. 2003, Youngblood and Mauk 1985
Version: 19 Apr 2006 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES306.819 ROCKY MOUNTAIN SUBALPINE-MONTANE LIMBER-BRISTLECONE PINE WOODLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Forest and Woodland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Ridge/Summit/Upper Slope; Calcareous; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Aridic; W-Patch/High Intensity; W-Landscape/High Intensity; Needle-Leaved Tree; Pinus flexilis, P. aristata; Upper Treeline
Concept Summary: This ecological system occurs throughout the Rocky Mountains, south of Montana, on dry, rocky ridges and slopes near upper treeline above the matrix spruce-fir forest. It extends down to the lower montane in the northeastern Great Basin mountains where dominated by *Pinus flexilis*. Sites are harsh, exposed to desiccating winds, with rocky substrates and a short growing season that limit plant growth. Higher-elevation occurrences are found well into the subalpine-alpine transition on wind-blasted, mostly west-facing slopes and exposed ridges. Calcareous substrates are important for *Pinus flexilis*-dominated communities in the northern Rocky Mountains and possibly elsewhere. The open tree canopy is often patchy and is strongly dominated by *Pinus flexilis* or *Pinus aristata* with the latter restricted to southern Colorado, northern New Mexico and the San Francisco Mountains in Arizona. In the Wyoming Rockies and northern Great Basin, *Pinus albicaulis* is found in some occurrences, but is a minor component. Other trees such as *Juniperus* spp., *Pinus contorta, Pinus ponderosa*, or *Pseudotsuga menziesii* are occasionally present. *Arctostaphylos uva-ursi, Cercocarpus ledifolius, Juniperus communis, Mahonia repens, Purshia tridentata, Ribes montigenum*, or *Vaccinium* spp. may form an open shrub layer in some stands. The herbaceous layer, if present, is generally sparse and composed of xeric graminoids, such as *Calamagrostis purpurascens, Festuca arizonica, Festuca idahoensis, Festuca thurberi*, or *Pseudoroegneria spicata*, or more alpine plants.
Comments: This system is distinguished from lower montane and foothill limber pine stands in Wyoming and Montana. The foothill system (~Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)$$) is found at the lower treeline, below the zone of continuous *Pinus ponderosa* or *Pseudotsuga menziesii* woodlands and forest, and extends out into the eastern portions of these states in the foothill zones of mountain ranges, along rock outcrops, breaks along rivers, and on sheltered sites where soil moisture is slightly higher than surrounding grasslands.

This system needs to be more clearly distinguished from ~Northern Rocky Mountain Subalpine Woodland and Parkland (CES306.807)$$, which also includes woodlands of *Pinus flexilis* and *Pinus albicaulis* and occurs in similar environmental settings of the northern Rocky Mountains, particularly northwestern Wyoming, Montana, and north into Alberta and British Columbia. There is a proposal to include the dry, subalpine *Pinus albicaulis* woodlands of the Blue Mountains (Oregon) and northern Nevada into this system, ~Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland (CES306.819)$$. For Landfire, these *Pinus albicaulis* woodlands were included in this subalpine parkland system, but ecologically and floristically they are more similar to Rocky Mountain dry subalpine woodlands.

DISTRIBUTION

Range: This system occurs throughout the Rocky Mountains, south of Montana, on dry, rocky ridges and slopes near upper treeline, including the Uinta and northern Wasatch mountains, and the Jarbridge Mountains in northeastern Nevada.
Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 20:C, 21:C, 26:C, 68:P
Subnations: CO, ID?, MT?, NM, NV, OR?, UT, WA?, WY

CONCEPT

SOURCES

References: Baker n.d., Beasley and Klemmedson 1980, Brunstein and Yamaguchi 1992, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Eyre 1980, Knight 1994, Krebs 1972, LaMarche and Mooney 1972, Lanner and Vander Wall 1980, Neely et al. 2001, Ranne 1995, Ranne et al. 1997, Steele et al. 1983

Version: 05 Oct 2004 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES206.912 SIERRA NEVADA SUBALPINE LODGEPOLE PINE FOREST AND WOODLAND

Primary Division: Mediterranean California (206)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Upper Montane]; Mediterranean [Mediterranean Xeric-Oceanic]; Shallow Soil; Xeric; Short Disturbance Interval [Periodicity/Irregular Disturbance]; Pinus contorta

Concept Summary: This ecological system is widespread in glacial basins at upper montane to subalpine elevations of the central and northern Sierra Nevada and Transverse and Peninsular ranges where cold-dry conditions exist (1800-2450 m [6000-8000 feet] in the north and 2450-3600 m [8000-12,000 feet] in the south). It also occurs on extensive broad ridges and pumice plateaus of the southern Cascades in Oregon (the broad ridges that form the Cascade crest in southern Oregon tend to be dominated by extensive stands of lodgepole pine). These forests and woodlands are dominated by *Pinus contorta var. murrayana* with shrub, grass or barren understories. Soils are often shallow and coarse-textured. Avalanche as well as tree mortality from insect outbreak and disease, drought and associated wildfire are drivers of community structure and composition. Understories are open, with scattered shrubs and herbaceous species, which do not carry fire should one get started. Trees can be very large and old and can attain diameters of 1.2 m (4 feet). Associated plant species include *Arctostaphylos nevadensis, Ceanothus cordulatus, Cercocarpus ledifolius* (although not that common, just occasional in drier sites), *Chrysolepis sempervirens, Phyllodoce breweri*, and *Ribes montigenum*. Common graminoids include *Poa wheeleri, Carex filifolia, Carex rossii*, and *Carex exserta*. Fire-return intervals are many hundreds of years. This system occurs in less severe settings than ~Mediterranean California Subalpine Woodland (CES206.910)$$ and ~Northern California Mesic Subalpine Woodland (CES206.911)$$ and is made up of trees that are not usually krummholz. Avalanches are less of a factor except in association with the volcanic peaks. Low-elevation stands of *Pinus contorta* in the pumice zone of Oregon are included in ~Rocky Mountain Poor-Site Lodgepole Pine Forest (CES306.960)$$.

DISTRIBUTION

Range: This system occurs in glacial basins at upper montane to subalpine elevations of the central and northern Sierra Nevada and Transverse and Peninsular ranges where cold-dry conditions exist (1800-2450 m [6000-8000 feet] in the north and 2450-3600 m [8000-12,000 feet] in the south). It also extends south into Baja California, Mexico, in the San Pedro Martir Mountains.

If present in Oregon, the most likely location is the southern Oregon Cascades. The broad ridges that form the Cascade Crest in southern Oregon tend to be dominated by extensive stands of lodgepole pine (south of Crater Lake and north maybe to Mount Bachelor). There are also relatively large areas of lodgepole pine along the broad crest from Mt. Jefferson to a little ways north of Olallie Butte that may also fit this type better than the Rocky Mountain lodgepole pine type, as these stands are more likely dominated by *Pinus contorta var. murrayana* than var. *latifolia*. Understory species are probably different from those listed, however.

Divisions: 206:C

TNC Ecoregions: 4:C, 5:C, 12:C

Subnations: CA, MXBC, NV, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995

Version: 23 Jan 2006 **Stakeholders:** Latin America, West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

Shrubland

CES206.925 CALIFORNIA MONTANE WOODLAND AND CHAPARRAL

Primary Division: Mediterranean California (206)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Shrubland (Shrub-dominated); Mediterranean [Mediterranean Xeric-Oceanic]; Shallow Soil; Short (50-100 yrs) Persistence
Concept Summary: This ecological system includes chaparral or open shrubby woodlands found among montane forests above 1500 m (4550 feet) elevation from the southern Cascades of Oregon to the Peninsular Ranges of California into Baja California, Mexico, where much annual precipitation occurs as snow. These are often locations with steep, exposed slopes with rocky and/or shallow soils, often glaciated. These are mosaics of woodlands with chaparral understories, shrub-dominated chaparral, or short-lived chaparral with conifer species invading if good seed source is available. Shrubs will often have higher densities than the trees which are more limited due to the rocky/thin soils. These can also be short-duration chaparrals in previously forested areas that have experienced crownfires. Trees tend to have a scattered open canopy or can be clustered, over a usually continuous dense shrub layer. Trees can include *Pinus jeffreyi, Abies concolor, Abies magnifica, Pinus monticola, Pinus lambertiana, Pinus coulteri, Pinus attenuata, Cupressus forbesii, Cupressus arizonica ssp. stephensonii*, and *Cupressus arizonica ssp. nevadensis (= Cupressus nevadensis)*. Typical sclerophyllous chaparral shrubs include *Arctostaphylos nevadensis, Arctostaphylos patula, Arctostaphylos glandulosa, Ceanothus cordulatus, Ceanothus diversifolius, Ceanothus pinetorum, Ceanothus velutinus*, and *Chrysolepis sempervirens (= Castanopsis sempervirens)*. Some stands can be dominated by winter deciduous shrubs, such as *Prunus emarginata, Prunus subcordata* and *Ceanothus sanguineus* (in Oregon), *Prunus virginiana, Ceanothus integerrimus, Holodiscus discolor (= Holodiscus microphyllus)*, and *Quercus garryana var. breweri*. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Occurrences of this system likely shift across montane forested landscapes with catastrophic fire events.
Comments: Two phases are recognized: first, early-seral and post-fire shrub fields with conifers, and second, edaphically controlled sites, with soils that are too dry or shallow-soiled for trees, hence sites where shrubs stay dominant (such as *Quercus vacciniifolia, Arctostaphylos patula, Chrysolepis sempervirens*). This treatment combines "interior closed-cone conifer" woodlands (obligate fire-reproducing species) with montane chaparral and may need to be revisited.

DISTRIBUTION

Range: This system occurs above 1500 m (4550 feet) elevation from the southern Cascades of Oregon to the Klamath Mountains and Peninsular Ranges of California into Baja California, Mexico.
Divisions: 206:C
TNC Ecoregions: 5:C, 12:C, 14:C, 15:C, 16:C
Subnations: CA, MXBC, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 07 Oct 2005 **Stakeholders:** Latin America, West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES304.770 COLUMBIA PLATEAU SCABLAND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Shrubland
Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Basalt; Shallow Soil
Concept Summary: This ecological system is found in the Columbia Plateau region and forms extensive low shrublands. These xeric shrublands occur under relatively extreme soil-moisture conditions. Substrates are typically shallow lithic soils with limited water-holding capacity over fractured basalt. Because of poor drainage through basalt, these soils are often saturated from fall to spring by winter precipitation but typically dry out completely to bedrock by midsummer. Total vegetation cover is typically low, generally less than 50% and often much less than that. Vegetation is characterized by an open dwarf-shrub canopy dominated by *Artemisia rigida* along with other shrub and dwarf-shrub species, particularly *Eriogonum* spp. Other shrubs are uncommon in this system; mixes of *Artemisia rigida* and other *Artemisia* species typically belong to different ecological systems than this. Low cover of perennial bunch grasses, such as *Danthonia unispicata, Elymus elymoides, Festuca idahoensis*, or primarily *Poa secunda*, as well as scattered forbs, including species of *Allium, Antennaria, Balsamorhiza, Lomatium, Phlox*, and *Sedum*, characterize these sites. Individual sites can be dominated by grasses and semi-woody forbs, such as *Stenotus stenophyllus*. Annuals may be seasonally abundant, and cover of moss and lichen is often high in undisturbed areas (1-60% cover).

DISTRIBUTION

Range: This system occurs in the Columbia Plateau region of southern Idaho, eastern Oregon and eastern Washington, and extreme northern Nevada.
Divisions: 304:C
TNC Ecoregions: 6:C, 7:C, 68:C
Subnations: CA?, ID, NV, OR, UT?, WA

CONCEPT

SOURCES

References: Comer et al. 2003, Copeland 1980a, Daubenmire 1970, Ganskopp 1979, Hall 1973, Johnson and Simon 1985, Poulton 1955, Shiflet 1994
Version: 25 Apr 2006 **Stakeholders:** West
Concept Author: J. Kagan **LeadResp:** West

CES304.784 INTER-MOUNTAIN BASINS MIXED SALT DESERT SCRUB

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Alluvial flat; Alluvial plain; Plain; Alkaline Soil; Saline Substrate Chemistry; Calcareous; Silt Soil Texture; Clay Soil Texture; Xeromorphic Shrub; Dwarf-Shrub; Atriplex spp.
Concept Summary: This extensive ecological system includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain western U.S. This type also extends in limited distribution into the southern Great Plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species, such as *Atriplex confertifolia, Atriplex canescens, Atriplex polycarpa*, or *Atriplex spinifera*. Northern occurrences lack *Atriplex* species and are typically dominated by *Grayia spinosa, Krascheninnikovia lanata*, and/or *Artemisia tridentata*. Other shrubs present to codominate may include *Artemisia tridentata ssp. wyomingensis, Chrysothamnus viscidiflorus, Ericameria nauseosa, Ephedra nevadensis, Grayia spinosa, Krascheninnikovia lanata, Lycium* spp., *Picrothamnus desertorum*, or *Tetradymia* spp. *Sarcobatus vermiculatus* is generally absent, but if present does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus ssp. lanceolatus, Pascopyrum smithii, Pleuraphis jamesii, Pleuraphis rigida, Poa secunda*, or *Sporobolus airoides*. Various forbs are also present.

DISTRIBUTION

Range: Intermountain western U.S., extending in limited distribution into the southern Great Plains.
Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 4:?, 6:C, 8:?, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C, 27:C, 28:C
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Environment: This salt-desert shrubland system is a matrix system in the Intermountain West. This system is comprised of arid to semi-arid shrublands on lowland and upland sites usually at elevations between 1520 and 2200 m (4987-7218 feet). Sites can be found on all aspects and include valley bottoms, alluvial and alkaline flats, mesas and plateaus, playas, drainage terraces, washes and interdune basins, bluffs, and gentle to moderately steep sandy or rocky slopes. Slopes are typically gentle to moderately steep but are sometimes unstable and prone to surface movement. Many areas within this system are degraded due to erosion and may resemble "badlands." Soil surface is often very barren in occurrences of this system. The interspaces between the characteristic plant clusters are commonly covered by a microphytic crust (West 1982).

This is typically a system of extreme climatic conditions, with warm to hot summers and freezing winters. Annual precipitation ranges from approximately 13-33 cm. In much of the ecological system, the period of greatest moisture will be mid- to late summer, although in the more northern areas a moist period is to be expected in the cold part of the year. However, plotted seasonality of occurrence is probably of less importance on this desert system than in other ecosystems because desert precipitation comes with an extreme irregularity that does not appear in graphs of long-term seasonal or monthly averages (Blaisdell and Holmgren 1984). Soils are shallow to moderately deep, poorly developed, and a product of an arid climate and little precipitation. Soils are often alkaline or saline. Vegetation within this system is tolerant of these soil conditions but not restricted to it. The shallow soils of much of the area are poorly developed Entisols. Vegetation within this system can occur on level pediment remnants where coarse-textured and well-developed soil profiles have been derived from sandstone gravel and are alkaline, or on Mancos shale badlands, where soil profiles are typically fine-textured and non-alkaline throughout (West and Ibrahim 1968). They can also occur in alluvial basins where parent materials from the other habitats have been deposited over Mancos shale and the soils are heavy-textured and saline-alkaline throughout the profile (West and Ibrahim 1968).
Vegetation: Occurrences of this ecological system vary from almost pure occurrences of single species to fairly complex mixtures. The characteristic mix of low shrubs and grasses is sparse, with large open spaces between the plants (Blaisdell and Holmgren 1984). Occurrences have a sparse to moderately dense cover of woody species that is dominated by *Atriplex canescens* (may codominate with *Artemisia tridentata*), *Atriplex confertifolia* (may codominate with *Lycium andersonii*), *Atriplex obovata, Picrothamnus desertorum*, or *Krascheninnikovia lanata*. Other shrubs that may occur within these occurrences include *Purshia stansburiana, Psorothamnus polydenius, Ephedra* spp., *Acacia greggii, Encelia frutescens, Tiquilia latior, Parthenium confertum, Atriplex polycarpa, Atriplex lentiformis, Atriplex spinifera, Picrothamnus desertorum (= Artemisia spinescens), Frankenia salina, Artemisia frigida, Chrysothamnus* spp., *Lycium* ssp., *Suaeda* spp., *Yucca glauca*, and *Tetradymia spinosa*. Dwarf-shrubs include *Gutierrezia sarothrae* and *Eriogonum* spp. Warm-season medium-tall and short perennial grasses dominate in the sparse to moderately dense graminoid layer. The species present depend on the geographic range of the grasses, alkalinity/salinity and past land use. Species may include *Pleuraphis jamesii, Bouteloua gracilis, Sporobolus airoides, Sporobolus cryptandrus, Achnatherum hymenoides, Elymus elymoides, Distichlis spicata, Leymus salinus, Pascopyrum smithii, Hesperostipa comata, Pseudoroegneria spicata, Poa secunda, Leymus ambiguus*, and *Muhlenbergia torreyi*. A number of annual species may also grow in association with the shrubs and grasses of this system, although they are usually rare and confined to areas of recent disturbance (Blaisdell and Holmgren 1984). Forb cover is generally sparse. Perennial forbs that might occur include *Sphaeralcea coccinea, Chaetopappa ericoides, Xylorhiza venusta, Descurainia sophia*, and *Mentzelia* species. Annual natives include *Plantago* spp., *Vulpia octoflora*, or *Monolepis nuttalliana*. Associated halophytic annuals include *Salicornia rubra, Salicornia bigelovii*, and *Suaeda* species. Exotic annuals that may occur include *Salsola kali, Bromus rubens*, and *Bromus tectorum*. Cacti like *Opuntia* spp. and *Echinocereus* spp. may be present in some occurrences. Trees are not usually present but some scattered *Juniperus* spp. may be found.
Dynamics: West (1982) stated that "salt desert shrub vegetation occurs mostly in two kinds of situations that promote soil salinity, alkalinity, or both. These are either at the bottom of drainages in enclosed basins or where marine shales outcrop." However, salt-desert shrub vegetation may be an indication of climatically dry as well as

physiologically dry soils (Blaisdell and Holmgren 1984). Not all salt-desert shrub soils are salty, and their hydrologic characteristics may often be responsible for the associated vegetation (Naphan 1966). Species of the salt-desert shrub complex have different degrees of tolerance to salinity and aridity, and they tend to sort themselves out along a moisture/salinity gradient (West 1982). Species and communities are apparently sorted out along physical, chemical, moisture, and topographic gradients through complex relations that are not understood and are in need of further study (Blaisdell and Holmgren 1984).

The winter months within this system are a good time for soil moisture accumulation and storage. There is generally at least one good snow storm per season that will provide sufficient moisture to the vegetation. The winter moisture accumulation amounts will affect spring plant growth. Plants may grow as little as a few inches to 1 m. Unless more rains come in the spring, the soil moisture will be depleted in a few weeks, growth will slow and ultimately cease, and the perennial plants will assume their various forms of dormancy (Blaisdell and Holmgren 1984). If effective rain comes later in the warm season, some of the species will renew their growth from the stage at which it had stopped. Others, having died back, will start over as if emerging from winter dormancy (Blaisdell and Holmgren 1984). *Atriplex confertifolia* shrubs often develop large leaves in the spring, which increase the rate of photosynthesis. As soil moisture decreases, the leaves are lost, and the plant takes on a dead appearance. During late fall, very small overwintering leaves appear which provide some photosynthetic capability through the remainder of the year (IVC 1999). Other communities are maintained by intra- or inter-annual cycles of flooding followed by extended drought, which favor accumulation of transported salts. The moisture supporting these intermittently flooded wetlands is usually derived off-site, and they are dependent upon natural watershed function for persistence (Reid et al. 1999).

In summary, desert communities of perennial plants are dynamic and changing. The composition within this system may change dramatically and may be both cyclic and unidirectional. Superimposed on the compositional change is great variation from year to year in growth of all the vegetation, the sum of varying growth responses of individual species to specific conditions of different years (Blaisdell and Holmgren 1984). Desert plants grow when temperature is satisfactory, but only if soil moisture is available at the same time. Because amount of moisture is variable from year to year and because different species flourish under different seasons of soil moisture, seldom do all components of the vegetation thrive in the same year (Blaisdell and Holmgren 1984).

SOURCES

References: Barbour and Major 1988, Blaisdell and Holmgren 1984, Branson et al. 1967, Branson et al. 1976, Brown 1982, Campbell 1977, Comer et al. 2003, Francis 1986, Holland and Keil 1995, Reid et al. 1999, Shiflet 1994, West 1979, West 1982, West 1983b, West and Ibrahim 1968

Version: 23 Jan 2006 **Stakeholders:** Midwest, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES204.854 NORTH PACIFIC AVALANCHE CHUTE SHRUBLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Montane]; Shrubland (Shrub-dominated); Avalanche
Concept Summary: This tall shrubland system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north to south-central Alaska. This system occurs on sideslopes of mountains on glacial till or colluvium. These habitats range from moderately xeric to wet and occur on snow avalanche chutes at montane elevations. In the mountains of Washington, talus sites and snow avalanche chutes very often coincide spatially. On the west side of the Cascades, the major dominant species are *Acer circinatum, Alnus viridis ssp. sinuata, Rubus parviflorus*, and small trees, especially *Chamaecyparis nootkatensis*. Forbs, grasses, or other shrubs can also be locally dominant. *Prunus virginiana, Amelanchier alnifolia, Vaccinium membranaceum* or *Vaccinium scoparium*, and *Fragaria* spp. are common species on drier avalanche tracks on the east side of the Cascades (Ecosystems Working Group 1998). The main feature of this system is that it occurs on steep, frequently disturbed (snow avalanches) slopes. Avalanche chutes can be quite long, extending from the subalpine into the montane and foothill toeslopes.

DISTRIBUTION

Range: This system occurs throughout mountainous regions of the Pacific Northwest, from the southern Cascades and Coast Ranges north to south-central Alaska.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 4:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Boggs 2000, Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Viereck et al. 1992
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: K. Boggs and G. Kittel **LeadResp:** West

CES204.862 North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Shrubland (Shrub-dominated)
Concept Summary: This system occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest Coast. It is confined to the coldest, wind-blown areas above treeline and above the subalpine parkland. This system is found at elevations above 2350 m (7200 feet) in the Klamath Mountains and Cascades north into the Cascade and Coastal mountains of British Columbia. It is commonly comprised of a mosaic of plant communities with characteristic species including *Cassiope mertensiana, Phyllodoce empetriformis, Phyllodoce glanduliflora, Luetkea pectinata, Saxifraga tolmiei*, and *Carex* spp. It occurs on slopes and depressions where snow lingers, the soil has become relatively stabilized, and the water supply is more or less constant. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This system includes all vegetated areas in the alpine zone of the North Pacific. Typically it is a mosaic of dwarf-shrublands, fell-fields, tundra (sedge turfs), and sparsely vegetated snowbed communities. Small patches of krummholz (shrub-form trees) are also part of this system and occur at the lower elevations. Communities are dominated by graminoids, foliose lichens, dwarf-shrubs, and/or forbs. Vegetation cover ranges from about 5 or 10% (snowbeds) to nearly 100%. The alpine tundra of the northern Cascades has floristic affinities with many mountain regions in western North America. The strongest relationships are with the Arctic and Cordilleran regions to the north and east.

DISTRIBUTION

Range: This system occurs above the environmental limit of trees, at the highest elevations of the mountain regions of the Pacific Northwest Coast.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Dynamics: Landfire VDDT models: #RALME includes this and Rocky Mountain alpine systems.

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Holland and Keil 1995, Shiflet 1994, Viereck et al. 1992
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: K. Boggs, C. Chappell, R. Crawford **LeadResp:** West

CES306.994 Northern Rocky Mountain Montane-Foothill Deciduous Shrubland

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Broad-Leaved Deciduous Shrub; Moderate (100-500 yrs) Persistence
Concept Summary: This shrubland ecological system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies. These shrublands typically occur below treeline, within the matrix of surrounding low-elevation grasslands and sagebrush shrublands. They also occur in the ponderosa pine and Douglas-fir zones, but rarely up into the subalpine zone (on dry sites). The shrublands are usually found on steep slopes of canyons and in areas with some soil development, either loess deposits or volcanic clays; they occur on all aspects. Fire, flooding and erosion all impact these shrublands, but they typically will persist on sites for long periods. These communities develop near talus slopes as garlands, at the heads of dry drainages, and toeslopes in the moist shrub-steppe and steppe zones. *Physocarpus malvaceus, Prunus emarginata, Prunus virginiana, Rosa* spp., *Rhus glabra, Acer glabrum, Amelanchier alnifolia, Symphoricarpos albus*, and *Holodiscus discolor* are the most common dominant shrubs, occurring alone or any combination. *Rubus parviflorus* and *Ceanothus velutinus* are other important shrubs in this system, being more common in montane occurrences than in subalpine situations. In moist areas *Crataegus douglasii* can be common. *Shepherdia canadensis* and *Spiraea betulifolia* can be abundant in some cases, but also occur in ~Northern Rocky Mountain Subalpine Deciduous Shrubland (CES306.961)$$. *Festuca idahoensis, Festuca campestris, Calamagrostis rubescens, Carex geyeri, Koeleria macrantha, Pseudoroegneria spicata*, and *Poa secunda* are the most important grasses. *Achnatherum thurberianum* and *Leymus cinereus* can be locally important. *Poa pratensis* and *Phleum pratense* are common introduced grasses. *Geum triflorum, Potentilla gracilis, Lomatium triternatum, Balsamorhiza sagittata*, and species of *Eriogonum, Phlox*, and *Erigeron* are important forbs. These occur in the zone of "rattlesnakes not grizzly bears."
Comments: Seral shrub fields of comparable composition that typically will develop into a seral stage with trees (within 50 years) are excluded from this shrub system and are included in their appropriate forest system.

DISTRIBUTION

Range: This system is found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies, including east into central Montana around the "Sky Island" ranges.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 7:C, 8:C, 26:C, 68:C
Subnations: AB, BC, ID, MT, OR, WA

CONCEPT

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Franklin and Dyrness 1973, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Poulton 1955, Shiflet 1994, Tisdale 1986
Version: 23 Jan 2006 **Stakeholders:** Canada, West
Concept Author: M. Reid, J. Kagan **LeadResp:** West

CES206.931 NORTHERN AND CENTRAL CALIFORNIA DRY-MESIC CHAPARRAL

Primary Division: Mediterranean California (206)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Mediterranean [Mediterranean Xeric-Oceanic]; Sand Soil Texture; Ustic; Intermediate Disturbance Interval; F-Landscape/High Intensity; Ceanothus cuneatus, Adenostoma fasciculatum
Concept Summary: This ecological system includes chaparral typically located inland from maritime chaparral up to 1500 m (4550 feet) elevation in central and northern California through the northern end of the Central Valley and north into Oregon. This system includes extensive areas on coarse-grained soils with annual precipitation up to 75 cm (winter rain but not snow). Adjacent fine-textured soils support savanna under similar climatic regimes. These areas have supported extensive stand-replacing wildfires. This system is made up of a mixture of mostly obligate seeders. Characteristic species include *Adenostoma fasciculatum, Ceanothus cuneatus, Arctostaphylos viscida, Arctostaphylos manzanita, Arctostaphylos glauca, Arctostaphylos glandulosa, Arctostaphylos stanfordiana,*

Fremontodendron californicum, Malacothamnus fasciculatus, Dendromecon rigida, and *Pickeringia montana*. Common shrubs in Oregon include *Arctostaphylos viscida, Cercocarpus montanus var. glaber*, and *Ceanothus cordulatus*. Fire regimes are intense, stand-replacing crownfires.

DISTRIBUTION

Range: This system is located inland from maritime chaparral up to 1500 m (4550 feet) elevation in central and northern California, and southwestern Oregon, through the north end of the California Central Valley.
Divisions: 206:C
TNC Ecoregions: 5:P, 12:C, 13:C, 14:C, 15:P
Subnations: CA, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 23 Jan 2006 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES306.810 ROCKY MOUNTAIN ALPINE DWARF-SHRUBLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Shrubland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Patterned ground (undifferentiated); Glaciated; Acidic Soil; Udic; Very Long Disturbance Interval; Dwarf-Shrub; Alpine Slopes
Concept Summary: This widespread ecological system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana and in the mountains of Alberta. This system occurs in areas of level or concave glacial topography, with late-lying snow and subirrigation from surrounding slopes. Soils have become relatively stabilized in these sites, are moist but well-drained, strongly acid, and often with substantial peat layers. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season. This ecological system is characterized by a semi-continuous layer of ericaceous dwarf-shrubs or dwarf willows which form a heath type ground cover less than 0.5 m in height. Dense tuffs of graminoids and scattered forbs occur. *Dryas octopetala* or *Dryas integrifolia* communities are not included here, except for one very moist association, because they occur on more windswept and drier sites than the heath communities. Within these communities *Cassiope mertensiana, Salix arctica, Salix reticulata, Salix vestita*, or *Phyllodoce empetriformis* can be dominant shrubs. *Vaccinium* spp., *Ledum glandulosum, Phyllodoce glanduliflora*, and *Kalmia microphylla* may also be shrub associates. The herbaceous layer is a mixture of forbs and graminoids, especially sedges, including, *Erigeron* spp., *Luetkea pectinata, Antennaria lanata, Oreostemma alpigenum (= Aster alpigenus), Pedicularis* spp., *Castilleja* spp., *Deschampsia caespitosa, Caltha leptosepala, Erythronium* spp., *Juncus parryi, Luzula piperi, Carex spectabilis, Carex nigricans*, and *Polygonum bistortoides*. Fell-fields often intermingle with the alpine dwarf-shrubland.

DISTRIBUTION

Range: This system occurs above upper timberline throughout the Rocky Mountain cordillera, including alpine areas of ranges in Utah and Nevada, and north into Canada. Elevations are above 3360 m in the Colorado Rockies but drop to less than 2100 m in northwestern Montana.
Divisions: 304:C, 306:C
TNC Ecoregions: 4:P, 7:C, 8:C, 9:C, 11:C, 19:C, 20:C, 21:C, 68:P
Subnations: AB, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

SOURCES

References: Anderson 1999a, Bamberg 1961, Bamberg and Major 1968, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1997, Douglas and Bliss 1977, Ecosystems Working Group 1998, Komarkova 1976, Komarkova 1980, Meidinger and Pojar 1991, Neely et al. 2001, Schwan and Costello 1951, Shiflet 1994, Thilenius 1975, Willard 1963

Version: 01 Sep 2005 **Stakeholders:** Canada, West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

Steppe/Savanna

CES206.935 CALIFORNIA CENTRAL VALLEY MIXED OAK SAVANNA

Primary Division: Mediterranean California (206)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Lowland]; Woody-Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Deep Soil; Xeric; F-Landscape/Low Intensity; Quercus lobata, Quercus douglasii

Concept Summary: Historically, these savannas occurred on alluvial terraces and flat plains, often with deep, fertile soils, throughout the California Central Valley from Lake Shasta south to Los Angeles County. This system is found from 10-1200 m (30-3600 feet) elevation; receiving on average 50 cm (range 25-100 cm) of precipitation per year, mainly as winter rain. Variable canopy densities in existing occurrences are likely due to variation in soil moisture regime, natural patch dynamics of fire, and land use (fire suppression, livestock grazing, herbivory, etc.). *Quercus lobata* was the characteristic oak species of these savannas, though other species were present, including *Quercus wislizeni, Quercus agrifolia, Quercus douglasii, Aesculus californica, Cercis canadensis var. texensis (= Cercis occidentalis), Juniperus californica*, and *Nassella pulchra*. There is some evidence that much of the understory prior to the invasion by non-native annual grasses and forbs was composed of native annual herbs such as *Hemizonia, Eriogonum, Trifolium, Gilia, Navarretia, Lupinus, Calycadenia, Lessingia, Lotus, Daucus*, and *Holocarpha* spp. There is considerable seasonal and annual variation in cover of understory species due to phenology and intra-annual precipitation and temperature variation.

DISTRIBUTION

Range: Historically, this system was found throughout the California Central Valley from Lake Shasta south to Los Angeles County.

Divisions: 206:C

TNC Ecoregions: 13:C, 15:P, 16:P

Subnations: CA

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994

Version: 07 Oct 2005 **Stakeholders:** West

Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES206.936 CALIFORNIA LOWER MONTANE BLUE OAK-FOOTHILL PINE WOODLAND AND SAVANNA

Primary Division: Mediterranean California (206)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Mediterranean [Mediterranean Xeric-Oceanic]; Ustic; F-Patch/Low Intensity; Needle-Leaved Tree; Graminoid; Pinus sabiniana, Quercus douglasii; Savanna-Woodland Mosaic

Concept Summary: This ecological system is primarily found in the valley margins and foothills of the Sierra Nevada and Coast Ranges of California from approximately 120-1200 m (360-3600 feet) elevation on rolling plains or dry slopes. Over a century of anthropogenic changes (especially cutting of oak) have altered the density and distribution of woody vegetation. A high-quality occurrence often consists of open park-like stands of *Pinus sabiniana*, with oaks and other various broadleaf tree and shrub species, including *Quercus douglasii, Quercus wislizeni, Quercus agrifolia* (primarily central and southern Coast Ranges), *Quercus lobata, Aesculus californica, Arctostaphylos* spp., *Cercis canadensis var. texensis (= Cercis occidentalis), Ceanothus cuneatus, Frangula californica (= Rhamnus californica), Ribes quercetorum, Juniperus californica*, and *Pinus coulteri* (central and southern Coast Ranges). *Pinus sabiniana* tends to drop out all together in the driest and more southerly sites, which are often dominated by *Quercus douglasii*. Northern extensions of this system include *Quercus garryana* as the dominant oak, where it becomes successional to ~Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland (CES206.923)$$. *Pinus sabiniana* density also varies based on intensity or frequency of fire, being less abundant in areas of higher intensity or frequency fires, hence it is often more abundant on steep, rocky or more mesic north-facing slope exposures. Historically, understory vegetation included mixed chaparral to perennial bunchgrass. Currently, most occurrences have understories dominated by dense cover of annual species, both native and non-native. Variable canopy densities in existing occurrences are likely due to variation in soil moisture regime, natural patch dynamics of fire, and land use (fire suppression, livestock grazing, herbivory, etc.).

DISTRIBUTION

Range: This system occurs primarily in the valley margins and foothills of the Sierra Nevada and Coast Ranges from approximately 120-1200 m (360-3600 feet) elevation, from Shasta County to Kern and northern Los Angeles counties, California. It is unlikely to occur in the southern portion of zone 7 (Modoc Plateau), but this needs to be confirmed with California ecologists.
Divisions: 206:C
TNC Ecoregions: 5:C, 12:C, 13:C, 14:C, 15:C
Subnations: CA

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Eyre 1980, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 07 Oct 2005 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES304.080 COLUMBIA PLATEAU LOW SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Sideslope; Shallow Soil; Silt Soil Texture; Clay Soil Texture; Aridic; W-Landscape/High Intensity; Low Artemisia spp.
Concept Summary: This matrix ecological system is composed of sagebrush dwarf-shrub-steppe that occurs in a variety of shallow-soil habitats throughout eastern Oregon, northern Nevada and southern Idaho. *Artemisia arbuscula ssp. arbuscula* and close relatives (*Artemisia arbuscula ssp. longiloba* and occasionally *Artemisia nova*) form stands that typically occur on mountain ridges and flanks and broad terraces, ranging from 1000 to 3000 m in elevation. Substrates are shallow, fine-textured soils, poorly drained clays, shallow-soiled areas, almost always very stony, characterized by recent rhyolite or basalt. Other shrubs and dwarf-shrubs present may include *Purshia tridentata, Eriogonum* spp., and other species of *Artemisia*. Common graminoids include *Festuca idahoensis, Koeleria macrantha, Pseudoroegneria spicata*, and *Poa secunda*. Many forbs also occur and may dominate the herbaceous vegetation, especially at the higher elevations. Isolated individuals of *Juniperus occidentalis* (western juniper) and *Cercocarpus ledifolius* (mountain-mahogany) can often be found in this system.

DISTRIBUTION

Range: This system is found throughout the basins of eastern Oregon and southern Idaho, south into northern Nevada and northeastern California.
Divisions: 304:C
TNC Ecoregions: 6:C, 11:C

Subnations: CA, ID, MT?, NV, OR, WY?

CONCEPT

SOURCES

References: Shiflet 1994, West 1983a, Western Ecology Working Group n.d.
Version: 08 Sep 2004 **Stakeholders:** West
Concept Author: J. Kagan **LeadResp:** West

CES304.083 COLUMBIA PLATEAU STEPPE AND GRASSLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Sideslope; Very Shallow Soil; Landslide; Xeromorphic Shrub; Graminoid
Concept Summary: These grasslands are similar floristically to ~Inter-Mountain Basins Big Sagebrush Steppe (CES304.778)$$ but are defined by a more frequent fire regime and the absence or low cover of shrubs over large areas, occasionally entire landforms. These are extensive grasslands, not grass-dominated patches within the sagebrush shrub-steppe ecological system. This system occurs throughout much of the Columbia Plateau and is found at slightly higher elevations farther south. Soils are variable, ranging from relatively deep, fine-textured often with coarse fragments, and non-saline often with a microphytic crust, to stony volcanic-derived clays to alluvial sands. This grassland is dominated by perennial bunch grasses and forbs (>25% cover), sometimes with a sparse (<10% cover) shrub layer; *Chrysothamnus viscidiflorus, Ericameria nauseosa, Tetradymia* spp., or *Artemisia* spp. may be present in disturbed stands. Associated graminoids include *Achnatherum hymenoides, Elymus elymoides, Elymus lanceolatus ssp. lanceolatus, Hesperostipa comata, Festuca idahoensis, Koeleria macrantha, Poa secunda*, and *Pseudoroegneria spicata*. Common forbs are *Phlox hoodii, Arenaria* spp., and *Astragalus* spp. Areas with deeper soils are rare because of conversion to other land uses. The rapid fire-return regime of this ecological system maintains a grassland by retarding shrub invasion, and landscape isolation and fragmentation limit seed dispersal of native shrub species. Fire frequency is presumed to be less than 20 years. Through isolation from a seed source, combined with repeated burning, these are "permanently" (more than 50 years) converted to grassland.
Comments: How this differs from ~Columbia Basin Palouse Prairie (CES304.792)$$ is unclear.

DISTRIBUTION

Range: This system occurs throughout the Columbia Plateau region, from north-central Idaho, south and west into Washington, Oregon, southern Idaho, and northern Nevada. Whether it also occurs in northeastern California, in the western ranges of Wyoming, or the central Wyoming Basins is unclear.
Divisions: 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:P, 11:C
Subnations: CA?, ID, MT?, NV, OR, UT?, WA, WY?

CONCEPT

Dynamics: The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions in the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Microphytic crust is very important in this ecological system.

SOURCES

References: Daubenmire 1970, Shiflet 1994, Western Ecology Working Group n.d.
Version: 23 Jan 2006 **Stakeholders:** West
Concept Author: R. Crawford **LeadResp:** West

CES304.778 INTER-MOUNTAIN BASINS BIG SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Deep Soil; Aridic; Xeromorphic Shrub; Bunch grasses; Artemisia tridentata ssp. tridentata
Concept Summary: This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming and north and east onto the western fringe of the Great Plains in Montana and South Dakota. It is found at slightly higher elevations farther south. In central Montana, this system differs slightly with more summer rain than winter precipitation, more precipitation annually, and it occurs on glaciated landscapes. Soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with *Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. xericensis, Artemisia tridentata ssp. wyomingensis, Artemisia tripartita ssp. tripartita, Artemisia cana ssp cana*, and/or *Purshia tridentata* dominating or codominating the open to moderately dense (10-40% cover) shrub layer. *Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, Sarcobatus vermiculatus, Tetradymia* spp., or *Artemisia frigida* may be common especially in disturbed stands. In Montana and Wyoming, stands are more mesic, with more biomass of grass, have less shrub diversity than stands farther west, and 50 to 90% of the occurrences are dominated by *Artemisia tridentata ssp. wyomingensis* with *Pascopyrum smithii*. In addition, *Bromus japonicus* and *Bromus tectorum* are indicators of disturbance, and *Bromus tectorum* is never as abundant as in the Intermountain West, primarily due to a colder climate. Associated graminoids include *Achnatherum hymenoides, Calamagrostis montanensis, Elymus lanceolatus ssp. lanceolatus, Festuca idahoensis, Festuca campestris* (in Montana there is an absence of *Festuca*, except *Vulpia octoflora*), *Koeleria macrantha, Poa secunda, Pascopyrum smithii, Hesperostipa comata, Nassella viridula, Bouteloua gracilis*, and *Pseudoroegneria spicata*. Common forbs are *Phlox hoodii, Arenaria* spp., *Opuntia* spp., *Sphaeralcea coccinea, Dalea purpurea, Liatris punctata*, and *Astragalus* spp. Areas with deeper soils more commonly support *Artemisia tridentata ssp. tridentata* but have largely been converted for other land uses. The natural fire regime of this ecological system likely maintains a patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Where fire frequency has allowed for shifts to a native grassland condition, maintained without significant shrub invasion over a 50- to 70-year interval, the area would be considered ~Columbia Basin Foothill and Canyon Dry Grassland (CES304.993)$$.

DISTRIBUTION

Range: This system occurs throughout much of the Columbia Plateau, the northern Great Basin and Wyoming, and is found at slightly higher elevations farther south.
Divisions: 304:C, 306:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 20:C, 26:C
Subnations: BC, CA, CO, ID, MT, NV, OR, UT, WA, WY

CONCEPT

Dynamics: The natural fire regime of this ecological system likely maintains patchy distribution of shrubs, so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions of the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands. Response to grazing can be variable depending on the type of grazer and the season in which grazing occurs. *Hesperostipa comata* can increase in abundance in response to either grazing or fire. In central and eastern Montana (and possibly elsewhere), complexes of prairie dog towns are common in this ecological system. Microphytic crust is very important in this ecological system.

SOURCES

References: Barbour and Major 1977, Barbour and Major 1988, Comer et al. 2003, Daubenmire 1970, Ecosystems Working Group 1998, Knight 1994, Mueggler and Stewart 1980, Shiflet 1994, West 1983c
Version: 20 Apr 2006 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES304.785 INTER-MOUNTAIN BASINS MONTANE SAGEBRUSH STEPPE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane, Montane, Lower Montane]; Woody-Herbaceous
Concept Summary: This ecological system includes sagebrush communities occurring at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In Montana, it occurs on mountain "islands" in the north-central portion of the state and possibly along the Boulder River south of Absarokee and at higher elevations. In British Columbia, it occurs between 450 and 1650 m in the southern Fraser Plateau and the Thompson and Okanagan basins. Climate is cool, semi-arid to subhumid. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Across its range of distribution, this is a compositionally diverse system. It is composed primarily of *Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula*, and related taxa such as *Artemisia tridentata ssp. spiciformis (= Artemisia spiciformis)*. *Purshia tridentata* may codominate or even dominate some stands. *Artemisia arbuscula ssp. arbuscula*-dominated shrublands commonly occur within this system. Other common shrubs include *Symphoricarpos* spp., *Amelanchier* spp., *Ericameria nauseosa, Peraphyllum ramosissimum, Ribes cereum*, and *Chrysothamnus viscidiflorus*. Most stands have an abundant perennial herbaceous layer (over 25% cover), but this system also includes *Artemisia tridentata ssp. vaseyana* shrublands. Common graminoids include *Festuca arizonica, Festuca idahoensis, Hesperostipa comata, Poa fendleriana, Elymus trachycaulus, Bromus carinatus, Poa secunda, Leucopoa kingii, Deschampsia caespitosa, Calamagrostis rubescens*, and *Pseudoroegneria spicata*. In many areas, frequent wildfires maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (>40%), with the moisture providing equally high grass and forb cover.

DISTRIBUTION

Range: This system is found at montane and subalpine elevations across the western U.S. from 1000 m in eastern Oregon and Washington to over 3000 m in the southern Rockies. In British Columbia, it occurs in the southern Fraser Plateau and the Thompson and Okanagan basins. This system occurs in mapzone 20 on the Rocky Mountain island ranges and on the western edge with mapzone 19.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 7:C, 8:C, 9:C, 12:C, 18:C, 19:C, 20:C, 26:C, 68:C
Subnations: AZ?, BC, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

Environment: This ecological system occurs in many of the western United States, usually at middle elevations (1000-2500 m). The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25 to 90 cm/year. Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general this system shows an affinity for mild topography, fine soils, and some source of subsurface moisture. Soils generally are moderately deep to deep, well-drained, and of loam, sandy loam, clay loam, or gravelly loam textural classes; soils often have a substantial volume of coarse fragments, and are derived from a variety of parent materials. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. All aspects are represented, but the higher elevation occurrences may be restricted to south- or west-facing slopes.
Vegetation: Vegetation types within this ecological system are usually less than 1.5 m tall and dominated by *Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula*, or *Artemisia tridentata ssp. spiciformis*. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include *Artemisia rigida, Artemisia arbuscula, Ericameria nauseosa, Chrysothamnus viscidiflorus, Symphoricarpos oreophilus, Purshia tridentata, Peraphyllum ramosissimum, Ribes cereum, Rosa woodsii, Ceanothus velutinus*, and *Amelanchier alnifolia*. The canopy cover is usually between 20-80%. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include *Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Danthonia intermedia, Danthonia parryi, Stipa* spp., *Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Pseudoroegneria spicata, Poa fendleriana*, or *Poa secunda*, and *Carex* spp. Forbs are often numerous and an important indicator of health. Forb species may include *Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus*, and *Eriogonum, Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea*, and *Eriogonum umbellatum, Fragaria virginiana, Artemisia ludoviciana, Hymenoxys hoopesii (= Helenium hoopesii)*, etc.

Dynamics: Healthy sagebrush shrublands are very productive, are often grazed by domestic livestock, and are strongly preferred during the growing season (Padgett et al. 1989). Prolonged livestock use can cause a decrease in the abundance of native bunch grasses and increase in the cover of shrubs and non-native grass species, such as *Poa pratensis*. *Artemisia cana* resprouts vigorously following spring fire, and prescribed burning may increase shrub cover. Conversely, fire in the fall may decrease shrub abundance (Hansen et al. 1995). *Artemisia tridentata* is generally killed by fires and may take over ten years to form occurrences of some 20% cover or more. The condition of most sagebrush steppe has been degraded due to fire suppression and heavy livestock grazing. It is unclear how long restoration will take to restore degraded occurrences.

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Hansen et al. 1995, Hironaka et al. 1983, Johnston 2001, Mueggler and Stewart 1980, Neely et al. 2001, Padgett et al. 1989, Shiflet 1994, West 1983c
Version: 25 Apr 2006 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES304.788 INTER-MOUNTAIN BASINS SEMI-DESERT SHRUB-STEPPE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Steppe/Savanna
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Woody-Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Very Short Disturbance Interval; G-Landscape/High Intensity; Graminoid
Concept Summary: This ecological system occurs throughout the intermountain western U.S., typically at lower elevations on alluvial fans and flats with moderate to deep soils, and extends into south-central Montana between the Pryor and Beartooth ranges where a distinct rainshadow effect occurs. This semi-arid shrub-steppe is typically dominated by graminoids (>25% cover) with an open shrub layer. The most widespread (but not dominant) species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the northern Rockies. Characteristic grasses include *Achnatherum hymenoides, Bouteloua gracilis, Distichlis spicata, Poa secunda, Poa fendleriana, Sporobolus airoides , Hesperostipa comata, Pleuraphis jamesii*, and *Leymus salinus*. The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include *Atriplex canescens, Artemisia tridentata, Chrysothamnus greenei Chrysothamnus viscidiflorus, Ephedra* spp., *Ericameria nauseosa, Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. *Artemisia tridentata* may be present but does not dominate. Annual grasses, especially the exotics *Bromus japonicus* and *Bromus tectorum*, may be present to abundant. Forbs are generally of low importance and are highly variable across the range but may be diverse in some occurrences. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layer. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some stands.

DISTRIBUTION

Range: This system occurs throughout the intermountain western U.S., typically at lower elevations, and extends into Wyoming and Montana across the Great Divide Basin. It barely gets as far north into north-central Montana (mapzone 20) but is unlikely to be mapped.
Divisions: 304:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WY

CONCEPT

Environment: This ecological system occurs throughout the Intermountain West from the western Great Basin to the northern Rocky Mountains and Colorado Plateau at elevations ranging from 300 m up to 2500 m. The climate where this system occurs is generally hot in summers and cold in winters with low annual precipitation, ranging from 18-40 cm and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variations. Sites are generally alluvial fans and flats with moderate to deep soils. Some sites can be flat, poorly drained and intermittently flooded with a shallow or perched water table often within 1 m depth (West 1983). Substrates are generally shallow, calcareous, fine-textured soils (clays to silt-loams), derived from alluvium; or deep, fine to medium-textured alluvial soils with

some source of subirrigation during the summer season. Soils may be alkaline and typically moderately saline (West 1983). Some occurrences occur on deep, sandy soils, or soils that are highly calcareous (Hironaka et al. 1983).
Vegetation: The plant associations in this system are characterized by a somewhat sparse to moderately dense (10-70% cover) shrub layer of *Artemisia filifolia, Ephedra cutleri, Ephedra nevadensis, Ephedra torreyana, Ephedra viridis, Ericameria nauseosa, Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Sarcobatus vermiculatus*, or *Atriplex canescens*. Other shrubs occasionally present include *Purshia tridentata* and *Tetradymia canescens*. *Artemisia tridentata* may be present but does not dominate. Trees are very rarely present in this system, but some individuals of *Pinus ponderosa, Juniperus scopulorum, Juniperus occidentalis*, or *Cercocarpus ledifolius* may occur. The herbaceous layer is dominated by bunch grasses which occupy patches in the shrub matrix. The most widespread species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the northern Rockies. Other locally dominant or important species include *Sporobolus airoides, Leymus cinereus, Festuca idahoensis, Pascopyrum smithii, Bouteloua gracilis, Distichlis spicata, Pleuraphis jamesii, Elymus lanceolatus, Elymus elymoides, Koeleria macrantha, Muhlenbergia richardsonis, Hesperostipa comata*, and *Poa secunda*. Annual grasses, especially the exotics *Bromus japonicus* and *Bromus tectorum*, may be present to abundant. Forbs are generally of low importance and are highly variable across the range, but may be diverse in some occurrences. Species that often occur are *Symphyotrichum ascendens (= Aster adscendens), Collinsia parviflora, Penstemon caespitosus, Achillea millefolium, Erigeron compositus, Senecio* spp, and *Taraxacum officinale*. Other important genera include *Astragalus, Oenothera, Eriogonum*, and *Balsamorhiza*. Mosses and lichens may be important ground cover. Forbs are common on disturbed weedy sites. Weedy annual forbs may include the exotics *Descurainia* spp., *Helianthus annuus, Halogeton glomeratus, Lactuca serriola*, and *Lepidium perfoliatum*.

SOURCES

References: Branson et al. 1976, Comer et al. 2003, Hanson 1929, Hironaka et al. 1983, Shiflet 1994, Tuhy et al. 2002, West 1983e
Version: 20 Apr 2006 **Stakeholders:** West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

Herbaceous

CES304.993 COLUMBIA BASIN FOOTHILL AND CANYON DRY GRASSLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill, Lowland]; Sideslope; Very Shallow Soil; Landslide; Graminoid
Concept Summary: These grasslands are similar floristically to ~Columbia Basin Palouse Prairie (CES304.792)$$ but are distinguished by landform, soil, and process characteristics. They occur in the canyons and valleys of the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington. Occurrences are found on steep open slopes, from 90 to 1525 m (300-5000 feet) elevation. Annual precipitation is low, ranging from 4 to 10 cm. Settings are primarily long, steep slopes of 100 m to well over 400 m, with soils derived from residuum and having patchy, thin, wind-blown surface deposits. Slope failures are a common process. Fire frequency is presumed to be less than 20 years. The vegetation is dominated by patchy graminoid cover, cacti, and some forbs. *Pseudoroegneria spicata, Festuca idahoensis*, and *Opuntia polyacantha* are common species. Deciduous shrubs *Symphoricarpos* spp., *Physocarpus malvaceus, Holodiscus discolor*, and *Ribes* spp. are infrequent native species that may increase with fire exclusion.

DISTRIBUTION

Range: Occurs in the canyons and valleys of the Columbia Basin, particularly along the Snake River canyon, the lower foothill slopes of the Blue Mountains, and along the main stem of the Columbia River in eastern Washington, on steep open slopes, from 90 to 1525 m (300-5000 feet) elevation.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 8:C, 68:P
Subnations: ID, OR, WA

CONCEPT

SOURCES

References: Comer et al. 2003, Hall 1973, Johnson and Clausnitzer 1992, Johnson and Simon 1985, Shiflet 1994, Tisdale 1986, Tisdale and Bramble-Brodahl 1983

Version: 08 Sep 2004 **Stakeholders:** West

Concept Author: R. Crawford, J. Kagan, M. Reid **LeadResp:** West

CES304.787 INTER-MOUNTAIN BASINS SEMI-DESERT GRASSLAND

Primary Division: Inter-Mountain Basins (304)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill, Lowland]; Herbaceous; Temperate [Temperate Xeric]; Alkaline Soil; Aridic; Graminoid

Concept Summary: This widespread ecological system occurs throughout the Intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, and plains, but sites are typically xeric. Substrates are often well-drained sandy or loamy-textured soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. When they occur near foothill grasslands they will be at lower elevations. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. These grasslands are typically dominated or codominated by *Achnatherum hymenoides, Aristida* spp., *Bouteloua gracilis, Hesperostipa comata, Muhlenbergia* spp., or *Pleuraphis jamesii* and may include scattered shrubs and dwarf-shrubs of species of *Artemisia, Atriplex, Coleogyne, Ephedra, Gutierrezia*, or *Krascheninnikovia lanata*.

DISTRIBUTION

Range: This system occurs throughout the Intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) in elevation.

Divisions: 304:C, 306:C

TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C

Subnations: AZ, CA, CO, ID, MT?, NM, NV, OR, UT, WA, WY

CONCEPT

Environment: Low-elevation grasslands in the Intermountain West region occur in semi-arid to arid climates at approximately 1450 to 2320 m (4750-7610 feet) in elevation. Grasslands within this system are typically characterized by a sparse to moderately dense herbaceous layer dominated by medium-tall and short bunch grasses, often in a sod-forming growth. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesa tops, plateau parks, alluvial flats, and plains. These grasslands typically occur on xeric sites. This system experiences cold temperate conditions. Hot summers and cold winters with freezing temperatures and snow are common. Annual precipitation is usually from 20-40 cm (7.9-15.7 inches). A significant portion of the precipitation falls in July through October during the summer monsoon storms, with the rest falling as snow during the winter and early spring months.

These grasslands occur on a variety of aspects and slopes. Sites may range from flat to moderately steep. Soils supporting this system also vary from deep to shallow, and from sandy to finer-textured. The substrate is typically sand- or shale-derived. Some sandy soil occurrences have a high cover of cryptogams on the soil. These cryptogamic species would tend to increase the stability of the highly erodible sandy soils of these grasslands during torrential summer rains and heavy wind storms (Kleiner and Harper 1977). *Muhlenbergia*-dominated grasslands which flood temporarily, combined with high evaporation rates in this dry system, can have accumulations of soluble salts in the soil. Soil salinity depends on the amount and timing of precipitation and flooding.

Dynamics: This system is maintained by frequent fires and sometimes associated with specific soils, often well-drained clay soils. A combination of precipitation, temperature, and soils limits this system to the lower elevations within the region. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. Grasses that dominate semi-arid grasslands develop a dense network of roots concentrated in the upper parts of the soil where rainfall penetrates most frequently (Blydenstein 1966, Cable 1969, Sala and Lauenroth 1985, as cited by McClaran and Van Devender 1995). *Bouteloua gracilis* is also very grazing-tolerant and generally forms a short sod. *Pleuraphis jamesii* is only moderately palatable to livestock, but decreases when heavily grazed during drought and in the more arid portions of its range where it is the dominant grass (West 1972). This grass reproduces extensively from scaly rhizomes. These rhizomes make the plant resistant to trampling by livestock and have good soil-binding properties (Weaver and Albertson 1956, West 1972). *Achnatherum hymenoides* is one of the most drought-tolerant grasses in the western U.S. (USDA 1937). It is also a valuable forage grass in arid and semi-arid regions. Improperly managed livestock grazing could increase soil erosion, decrease cover of this palatable plant species and increase weedy species (USDA 1937). *Muhlenbergia asperifolia* with its flooding regime combined with high evaporation rate in these dry climates causes accumulations of soluble salts in the soil. Total vegetation cover (density and height), species composition and soil salinity depend on the amount and timing of precipitation and flooding. Growth-inhibiting salt concentrations are diluted when the soil is saturated allowing the growth of less salt-tolerant species. As the saturated soils dry, the salt concentrates until it precipitates out on the soil surface (Dodd and Coupland 1966, Ungar 1968). *Hesperostipa comata* is a deep-rooted grass that uses soil moisture below 0.5 m during the dry summers.

SOURCES

References: Cable 1967, Cable 1969, Cable 1975, Comer et al. 2003, Dodd and Coupland 1966, Kleiner and Harper 1977, Mast et al. 1997, Mast et al. 1998, McClaran and Van Devender 1995, Shiflet 1994, Tuhy et al. 2002, Ungar 1968, Weaver and Albertson 1956, West 1983e

Version: 20 Feb 2003 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES206.939 MEDITERRANEAN CALIFORNIA ALPINE DRY TUNDRA

Primary Division: Mediterranean California (206)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Herbaceous; Temperate [Temperate Oceanic]; Udic; W-Landscape/High Intensity; Graminoid; Alpine Mosaic

Concept Summary: These dry meadows typically occur between 3200 and 4500 m (9700-13,600 feet) elevation in the northern Sierra Nevada, Klamath Mountains and Cascade Mountains. They are typically found on gentle to steep slopes, flat ridges and upper basins where the soil is thin and the water supply is constant and strongly regulated by snowpatch patterns. These sites are generally very well-drained and xeric once the snow melts. The system is commonly comprised of a mosaic of small-patch plant communities that are dominated by sedges, grasses and forbs. Characteristic species include *Phlox diffusa, Phlox covillei, Erigeron pygmaeus, Podistera nevadensis, Carex congdonii, Calamagrostis purpurascens, Eriogonum incanum, Raillardiopsis muirii (= Raillardella muirii), Castilleja nana, Erigeron compositus, Eriogonum ovalifolium, Eriogonum gracilipes*, etc. There is a rocky mesic version of this system with *Hulsea algida, Saxifraga tolmiei, Carex helleri, Ranunculus eschscholtzii, Polemonium eximium, Salix reticulata* (rarely), *Oxyria digyna, Sibbaldia procumbens*, etc. that could be found near snowmelt patches generally on sheltered, steep, rocky slopes. Alpine dry tundra typically intermingles with alpine bedrock and scree, ice field, fell-field, alpine dwarf-shrubland, and alpine/subalpine wet meadows.

DISTRIBUTION

Range: This system occurs between 3200 and 4500 m (9700-13,600 feet) elevation in the northern Sierra Nevada, Klamath Mountains, and Cascade Mountains of California, Nevada and Oregon.

Divisions: 206:C

TNC Ecoregions: 4:C, 5:C, 12:C

Subnations: CA, NV, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994

Version: 07 Oct 2005 **Stakeholders:** West

Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES206.940 MEDITERRANEAN CALIFORNIA SUBALPINE MEADOW

Primary Division: Mediterranean California (206)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Ustic; W-Landscape/High Intensity; Late-lying snowpack
Concept Summary: This ecological system occurs at subalpine elevations where finely textured soils, snow deposition, or windswept dry conditions limit tree establishment. It is typically found above 3000 m (9100 feet) elevation in California, Nevada and Oregon. The soils in these sites can be seasonally moist to saturated in the spring but, if so, will dry out later in the growing season. Characteristic plant species include *Achillea millefolium var. occidentalis (= Achillea lanulosa), Artemisia rothrockii, Oreostemma alpigenum (= Aster alpigenus), Calamagrostis breweri, Cistanthe umbellata (= Calyptridium umbellatum), Carex exserta, Eriogonum incanum, Horkeliella purpurascens (= Ivesia purpurascens)*, and *Trisetum spicatum*. Burrowing mammals can increase the forb diversity. Herbs can include *Carex subnigricans, Carex vernacula, Calamagrostis breweri, Antennaria media, Potentilla drummondii, Lewisia pygmaea, Erigeron algidus, Lupinus lepidus, Dodecatheon alpinum*, and *Solidago multiradiata*. Wet meadows of *Carex, Calamagrostis, Camassia, Eleocharis, Juncus, Veratrum*, etc. from montane to subalpine are treated in ~Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)$$.

DISTRIBUTION

Range: This system occurs at subalpine elevations where finely textured soils, snow deposition, or windswept dry conditions limit tree establishment, typically above 3000 m (9100 feet) in elevation in California, Nevada and Oregon.
Divisions: 206:C
TNC Ecoregions: 4:P, 5:P, 12:C
Subnations: CA, NV, OR

CONCEPT

SOURCES

References: Barbour and Billings 2000, Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 23 Jan 2006 **Stakeholders:** West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES204.088 NORTH PACIFIC HYPERMARITIME SHRUB AND HERBACEOUS HEADLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Herbaceous; Bluff; Ridge/Summit/Upper Slope
Concept Summary: This system consists of herbaceous- and shrub-dominated areas directly adjacent to the outer Pacific Coast from central Oregon north to Vancouver Island. These are very windy sites where wind and salt spray combine to limit tree growth. The climate is very wet, relatively warm in winter, and cool and foggy. In Oregon, fires apparently set by Native Americans also contributed to the open character of many of these sites. The relative prevalence of grasslands versus shrublands increases to the south. Steep slopes on coastal bluffs, headlands, or small islands are typical, though sometimes this system occurs on relatively level tops of headlands or islands. Soils can be shallow to bedrock or of glacial or marine sediment origin. Vegetation is dominated by perennial bunch grasses or shrubs. Dominant species include *Vaccinium ovatum, Gaultheria shallon, Rubus spectabilis, Calamagrostis nutkaensis*, and *Festuca rubra*. Scattered stunted trees, especially *Picea sitchensis*, are often present.
Comments: ~California Northern Coastal Grassland (CES206.941)$$ is somewhat similar to the grassland part of this but is more extensive (larger patches) and extends further inland and higher in elevation. In southern Oregon, the climate gets warmer and drier and the grasslands start climbing well up into the hills, picking up some southern

elements of vegetation. Probably corresponds with where ~Northern California Coastal Scrub (CES206.932)$$ starts also, somewhere south of Coos Bay.

DISTRIBUTION

Range: This system occurs from the southern Oregon coast north to Vancouver Island.
Divisions: 204:C
TNC Ecoregions: 1:C
Subnations: BC, OR, WA

CONCEPT

SOURCES

References: Chappell and Christy 2004, Franklin and Dyrness 1973, Shiflet 1994, Western Ecology Working Group n.d.
Version: 04 Apr 2005 **Stakeholders:** Canada, West
Concept Author: C. Chappell and K. Boggs **LeadResp:** West

CES204.100 NORTH PACIFIC MONTANE GRASSLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Herbaceous; Temperate [Temperate Oceanic]; Mesotrophic Soil; Shallow Soil; Intermediate Disturbance Interval; F-Patch/Low Intensity
Concept Summary: This system includes open dry meadows and grasslands on the west side of the Cascades Mountains and northern Sierra Nevada. They occur in montane elevations up to 3500 m (10,600 feet). Soils tend to be deeper and more well-drained than the surrounding forest soils. Soils can resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acid, and usually well-drained. Dominant species include *Elymus* spp., *Festuca idahoensis*, and *Nassella cernua*. These large-patch grasslands are intermixed with matrix stands of red fir, lodgepole pine, and dry-mesic mixed conifer forests and woodlands.
Comments: Upon review, Washington Heritage ecologists determined this system does not occur in Washington.

DISTRIBUTION

Range: West side of the Cascades Mountains and northern Sierra Nevada, in montane elevations up to 3500 m (10,600 feet).
Divisions: 204:C, 206:C
TNC Ecoregions: 5:P, 12:C, 81:C
Subnations: CA, NV, OR

CONCEPT

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 24 Mar 2003 **Stakeholders:** West
Concept Author: P. Comer, G. Kittel **LeadResp:** West

CES306.806 NORTHERN ROCKY MOUNTAIN SUBALPINE-UPPER MONTANE GRASSLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Herbaceous
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Herbaceous; Deep Soil; Ustic; Intermediate Disturbance Interval; Graminoid; Tussock-forming grasses
Concept Summary: This is an upper montane to subalpine, high-elevation, lush grassland system dominated by perennial grasses and forbs on dry sites, particularly south-facing slopes. It is most extensive in the Canadian

Rockies portion of the Rocky Mountain cordillera, extending south into western Montana, eastern Oregon, eastern Washington and Idaho. Subalpine dry grasslands are small meadows to large open parks surrounded by conifer trees but lack tree cover within them. In general, soil textures are much finer, and soils are often deeper under grasslands than in the neighboring forests. Grasslands, although composed primarily of tussock-forming species, do exhibit a dense sod that makes root penetration difficult for tree species. Disturbance such as fire also plays a role in maintaining these open grassy areas. Typical dominant species include *Leymus innovatus (= Elymus innovatus), Koeleria macrantha, Festuca campestris, Festuca idahoensis, Festuca viridula, Achnatherum occidentale (= Stipa occidentalis), Achnatherum richardsonii (= Stipa richardsonii), Bromus inermis ssp. pumpellianus (= Bromus pumpellianus), Elymus trachycaulus, Phleum alpinum, Trisetum spicatum*, and a variety of Carices, such as *Carex hoodii, Carex obtusata*, and *Carex scirpoidea*. Important forbs include *Lupinus argenteus var. laxiflorus, Potentilla diversifolia, Potentilla flabellifolia, Fragaria virginiana*, and *Chamerion angustifolium (= Epilobium angustifolium)*. This system is similar to ~Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040)$$ but is found at higher elevations and is more often composed of *Festuca* spp. and *Achnatherum* and/or *Hesperostipa* spp. (= *Stipa* spp.) with additional floristic components of more subalpine taxa.

DISTRIBUTION

Range: It is most extensive in the Canadian Rockies portion of the Rocky Mountain cordillera, extending south into western Montana, central and eastern Oregon, eastern Washington and Idaho. It also occurs in the "island Ranges" of central Montana, though it is not common.
Divisions: 306:C
TNC Ecoregions: 4:P, 7:C, 8:C, 9:P, 26:C, 68:C
Subnations: AB, BC, ID, MT, OR, WA, WY

CONCEPT

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, Cooper et al. 1995, Johnson 2004, Shiflet 1994
Version: 07 Sep 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

Woody Wetland

CES304.768 COLUMBIA BASIN FOOTHILL RIPARIAN WOODLAND AND SHRUBLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Riverine / Alluvial; Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence
Concept Summary: This is a low-elevation riparian system found on the periphery of the mountains surrounding the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations. This is the riparian system associated with all streams at and below lower treeline, including permanent, intermittent and ephemeral streams with woody riparian vegetation. These forests and woodlands require flooding and some gravels for reestablishment. They are found in low-elevation canyons and draws, on floodplains, or in steep-sided canyons, or narrow V-shaped valleys with rocky substrates. Sites are subject to temporary flooding during spring runoff. Underlying gravels may keep the water table just below the ground surface and are favored substrates for cottonwood. Large bottomlands may have large occurrences, but most have been cut over or cleared for agriculture. Rafted ice and logs in freshets may cause considerable damage to tree boles. Beavers crop younger cottonwood and willows and frequently dam side channels occurring in these stands. In steep-sided canyons, streams typically have perennial flow on mid to high gradients. Important and diagnostic trees include *Populus balsamifera ssp. trichocarpa, Alnus rhombifolia, Populus tremuloides, Celtis laevigata var. reticulata, Betula occidentalis*, or *Pinus ponderosa*. Important shrubs include *Crataegus douglasii, Philadelphus lewisii, Cornus sericea, Salix lucida ssp. lasiandra, Salix eriocephala, Rosa nutkana, Rosa woodsii, Amelanchier alnifolia, Prunus virginiana*, and

Symphoricarpos albus. Grazing is a major influence in altering structure, composition, and function of the community.

DISTRIBUTION

Range: Found on the periphery of the northern Rockies in the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 7:C, 68:C
Subnations: BC, CA, ID, MT?, NV, OR, UT, WA

CONCEPT

SOURCES

References: Comer et al. 2003, Ecosystems Working Group 1998, Eyre 1980, Johnson and Simon 1985
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES206.947 MEDITERRANEAN CALIFORNIA ALKALI MARSH

Primary Division: Mediterranean California (206)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Mediterranean [Mediterranean Xeric-Oceanic]; Depressional; Alkaline Water; Saline Water Chemistry; Shallow (<15 cm) Water; Caliche Layer
Concept Summary: These highly variable systems occur in scattered locations throughout the California Central Valley and along California's south coast extending into Baja Norte, all at elevations below 300 m (1000 feet). They are found in old lake beds or in floodplains of major river systems where seasonal water inputs are limited, and often include some groundwater seepage. High rates of evaporation lead to alkaline water and soil conditions, with layers of salt encrusted soils often accumulating near seeps. These are highly variable in plant composition, but often include *Distichlis spicata, Juncus balticus, Anemopsis californica, Schoenoplectus americanus (= Scirpus americanus), Atriplex* spp., *Triglochin maritima*, and *Cirsium* spp. Endemic plant species include *Puccinellia howellii*.

DISTRIBUTION

Range: Scattered locations throughout the California Central Valley and along California's south coast extending into Baja Norte, all at elevations below 300 m (1000 feet).
Divisions: 206:C
TNC Ecoregions: 13:C, 16:C
Subnations: CA, MXBC

CONCEPT

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 17 Mar 2003 **Stakeholders:** Latin America, West
Concept Author: P. Comer, T. Keeler-Wolf **LeadResp:** West

CES204.063 NORTH PACIFIC BOG AND FEN

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Lowland [Foothill]; Shrubland (Shrub-dominated); Temperate [Temperate Oceanic]; Depressional; Organic Peat (>40 cm); Sphagnum spp.

Concept Summary: This wetland system occurs in peatlands along the Pacific coast from southeastern Alaska to northern California, in and west of the coastal mountain summits but including the Puget Sound lowlands. Elevations are mostly under 457 m (1500 feet), and annual precipitation ranges from 890-3050 mm (35-120 inches). These wetlands are relatively abundant in Alaska and British Columbia but diminish rapidly in size and number farther south. They occur in river valleys, around lakes and marshes, or on slopes. In Alaska , they occur within ponded basins or low-gradient (<3%) slopes with an elevated water table on glacial drift, moraines, distal glacial outwash plains, and uplifted tidal marshes. Organic soils are characterized by an abundance of sodium cations from oceanic precipitation. Poor fens and bogs are often intermixed except in a few calcareous areas in Alaska and British Columbia where rich fen vegetation may dominate. *Sphagnum* characterizes poor fens and bogs (pH <5.5), and the two are lumped here, while "brown mosses" and sedges characterize rich fens (pH >5.5). Mire profiles in Alaska and British Columbia may be flat, raised (domed), or sloping, but most occurrences in Washington and Oregon are flat with only localized hummock development. Vegetation is usually a mix of conifer-dominated swamp, shrub swamp, and open sphagnum or sedge mire, often with small lakes and ponds interspersed. Vegetation includes many species common to boreal continental bogs and fens, such as *Ledum groenlandicum, Vaccinium uliginosum, Myrica gale, Andromeda polifolia, Vaccinium oxycoccos, Equisetum fluviatile, Comarum palustre*, and *Drosera rotundifolia*. However, it is also distinguished from boreal continental bogs and fens by the presence of Pacific coastal species, including *Chamaecyparis nootkatensis, Pinus contorta var. contorta, Picea sitchensis, Tsuga heterophylla, Ledum glandulosum, Thuja plicata, Gaultheria shallon, Spiraea douglasii, Carex aquatilis var. dives, Carex lyngbyei, Carex obnupta, Carex pluriflora, Darlingtonia californica, Sphagnum pacificum, Sphagnum henryense*, and *Sphagnum mendocinum*.
Comments: This system is distinguished and split from ~Boreal Depressional Bog (CES103.871)$$ and ~Boreal Fen (CES103.872)$$. The communities comprising this system are not well-described or classified. It looks like the "muskeg" of southeastern Alaska and northern British Columbia are included here. We had talked about separating that out because it is so extensive in the hypermaritime there, covering large areas of landscape. How distinct is the hypermaritime muskeg of that area from bogs and fens from central Vancouver Island south?

DISTRIBUTION

Range: This system occurs along the Pacific Coast from southeastern Alaska to northern California, west of the coastal mountain summits but including the Puget Sound lowlands. Occurrences diminish rapidly in size and number south of British Columbia.
Divisions: 204:C, 206:P
TNC Ecoregions: 1:C, 2:C, 3:C, 69:C, 70:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

Dynamics: In Alaska, species that dominate the early stages of succession in newly formed ponded basins include *Equisetum variegatum, Equisetum fluviatile* (swamp horsetail), and *Comarum palustre* (marsh fivefinger). *Sphagnum* species (peatmoss) invade the surface and help in forming peat. Acidic and nutrient-poor-tolerant vascular species eventually dominate the sites, such as *Myrica gale* (sweet gale), *Empetrum nigrum* (crowberry), *Vaccinium uliginosum* (bog blueberry), *Andromeda polifolia* (bog-rosemary), and *Vaccinium oxycoccos (= Oxycoccus microcarpus)* (cranberry). The late-successional stage of a peatland supports various community types, depending on the pH, waterflow, and nutrient status of a site such as the *Myrica gale / Empetrum nigrum* (sweet gale / crowberry) and *Picea sitchensis / Sphagnum* plant associations. Peat buildup, patterned ground, and changes in water table are recurrent aspects of peatland development rather than unidirectional successional events. It is unlikely that any of the late-seral peatland communities are stable in the sense of climax vegetation.

SOURCES

References: Comer et al. 2003, Eyre 1980
Version: 26 May 2005 **Stakeholders:** Canada, West
Concept Author: J.C. Christy **LeadResp:** West

CES204.090 NORTH PACIFIC HARDWOOD-CONIFER SWAMP

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Lowland [Lowland]; Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Depressional [Lakeshore]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Pinus contorta; Sphagnum spp.; Eutrophic Water
Concept Summary: This wetland system occurs from southern coastal Alaska to coastal Washington and Oregon, west of the coastal mountain summits (not interior). It is quite abundant in southeastern Alaska, less so farther south. Forested swamps are mostly small-patch size, occurring sporadically in glacial depressions, in river valleys, around the edges of lakes and marshes, or on slopes with seeps that form subirrigated soils. These are primarily on flat to gently sloping lowlands up to 457 m (1500 feet) elevation but also occur up to near the lower limits of continuous forest (below the subalpine parkland). It can occur on steeper slopes where soils are shallow over unfractured bedrock. This system is indicative of poorly drained, mucky areas, and areas are often a mosaic of moving water and stagnant water. Soils can be woody peat, muck, or mineral. It can be dominated by any one or a number of conifer and hardwood species (*Tsuga heterophylla, Picea sitchensis, Tsuga mertensiana, Chamaecyparis nootkatensis, Pinus contorta var. contorta, Alnus rubra, Fraxinus latifolia, Betula papyrifera*) that are capable of growing on saturated or seasonally flooded soils. Overstory is often less than 50% cover, but shrub understory can have high cover. In the southern end of the range of this type, e.g., the Willamette Valley, tends to have more hardwood-dominated stands (especially *Fraxinus latifolia*) and very little in the way of conifer-dominated stands. While the typical landscape context for the type is extensive upland forests, for the *Fraxinus latifolia* stands, landscapes were very often formerly dominated by prairies and now by agriculture. Many conifer-dominated stands have been converted to dominance by *Alnus rubra* due to timber harvest.
Comments: Shrub swamps are usually not intermixed with the forested swamps and tend to be more wet. Deciduous and conifer forested swamps are often intermixed and more similar to each other in hydrology, and so are combined here in this system.

DISTRIBUTION

Range: This system occurs from south coastal Alaska south to northwestern Oregon, including the Willamette Valley, west of the Cascade Crest.
Divisions: 204:C
TNC Ecoregions: 1:C, 2:C, 3:C, 69:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Banner et al. 1993, Chappell 1999, Chappell and Christy 2004, Chappell et al. 2001, DeMeo et al. 1992, DeVelice et al. 1999, Eyre 1980, Green and Klinka 1994, Martin et al. 1995, Shephard 1995, Western Ecology Working Group n.d.
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: K. Boggs, G. Kittel, C. Chappell **LeadResp:** West

CES204.869 NORTH PACIFIC LOWLAND RIPARIAN FOREST AND SHRUBLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Lowland [Lowland]; Forest and Woodland (Treed); Riverine / Alluvial
Concept Summary: Lowland riparian systems occur throughout the Pacific Northwest. They are the low-elevation, alluvial floodplains that are confined by valleys and inlets and are more abundant in the central and southern portions of the Pacific Northwest Coast. These forests and tall shrublands are linear in character, occurring on floodplains or lower terraces of rivers and streams. Major broadleaf dominant species are *Acer macrophyllum, Alnus rubra, Populus balsamifera ssp. trichocarpa, Salix sitchensis, Salix lucida ssp. lasiandra, Cornus sericea*, and *Fraxinus latifolia*. Conifers tend to increase with succession in the absence of major disturbance. Conifer-dominated types are relatively uncommon and not well-described; *Abies grandis, Picea sitchensis*, and *Thuja plicata* are important. Riverine flooding and the succession that occurs after major flooding events are the major

natural processes that drive this system. Very early-successional stages can be sparsely vegetated or dominated by herbaceous vegetation.

DISTRIBUTION

Range: This system occurs throughout the Pacific Northwest elevationally below the Silver Fir Zone.
Divisions: 204:C
TNC Ecoregions: 1:C, 69:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Eyre 1980, Franklin and Dyrness 1973
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: G. Kittel and C. Chappell **LeadResp:** West

CES204.866 NORTH PACIFIC MONTANE RIPARIAN WOODLAND AND SHRUBLAND

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Forest and Woodland (Treed); Temperate [Temperate Oceanic]; Riverine / Alluvial
Concept Summary: This system occurs throughout mountainous areas of the Pacific Northwest coast, both on the mainland and on larger islands. It occurs on steep streams and narrow floodplains above foothills but below the alpine environments, e.g., above 1500 m (4550 feet) elevation in the Klamath Mountains and western Cascades of Oregon, up as high as 3300 m (10,000 feet) in the southern Cascades, and above 610 m (2000 feet) in northern Washington. Surrounding habitats include subalpine parklands and montane forests. In Washington they are defined as occurring primarily above the *Tsuga heterophylla* zone, i.e., beginning at or near the lower boundary of the *Abies amabilis* zone. Dominant species include *Pinus contorta var. murrayana, Populus balsamifera ssp. trichocarpa, Abies concolor, Abies magnifica, Populus tremuloides, Alnus incana ssp. tenuifolia (= Alnus tenuifolia), Alnus viridis ssp. crispa (= Alnus crispa), Alnus viridis ssp. sinuata (= Alnus sinuata), Alnus rubra, Rubus spectabilis, Ribes bracteosum, Oplopanax horridus, Acer circinatum*, and several *Salix* species. In Western Washington, major species are *Alnus viridis ssp. sinuata, Acer circinatum, Salix, Oplopanax horridus, Alnus rubra, Petasites frigidus, Rubus spectabilis*, and *Ribes bracteosum*. These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. They occur on streambanks where the vegetation is significantly different than surrounding forests, usually because of its shrubby or deciduous character.

DISTRIBUTION

Range: This system occurs throughout mountainous areas of the Pacific Northwest Coast, both on the mainland and on larger islands, above 1500 m (4550 feet) elevation in the Klamath Mountains and western Cascades, up as high as 3300 m (10,000 feet) in the southern Cascades, and above 610 m (2000 feet) in northern Washington.
Divisions: 204:C
TNC Ecoregions: 1:C, 3:C, 4:C, 69:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Comer et al. 2003, Eyre 1980, Franklin and Dyrness 1973, Holland and Keil 1995
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: G. Kittel **LeadResp:** West

CES204.865 NORTH PACIFIC SHRUB SWAMP

Primary Division: North American Pacific Maritime (204)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Forest and Woodland (Treed); Depressional [Lakeshore]; Broad-Leaved Deciduous Tree; Broad-Leaved Deciduous Shrub; Eutrophic Water
Concept Summary: Swamps vegetated by shrublands occur throughout the Pacific Northwest coast, from Cook Inlet and Prince William Sound, Alaska, to the southern coast of Oregon. These are deciduous broadleaf tall shrublands that are located in depressions, around lakes or ponds, or river terraces where water tables fluctuate seasonally (mostly seasonally flooded regime), in areas that receive nutrient-rich waters. These are nutrient-rich systems with muck or mineral soils. Various species of *Salix, Spiraea douglasii, Malus fusca, Cornus sericea, Alnus incana ssp. tenuifolia (= Alnus tenuifolia), Alnus viridis ssp. crispa (= Alnus crispa)*, and *Alnus viridis ssp. sinuata (= Alnus sinuata)* are the major dominants. They may occur in mosaics with marshes or forested swamps, being on average more wet than forested swamps and more dry than marshes. However, it is also frequent for them to dominate entire wetland systems. Hardwood-dominated stands (especially *Fraxinus latifolia*) may be considered a shrub swamp when they are not surrounded by conifer forests. Typical landscape for the *Fraxinus latifolia* stands were very often formerly dominated by prairies and now by agriculture.
Comments: Shrub swamps are usually not intermixed with the forested swamps and tend to be more wet. Deciduous and conifer forested swamps are often intermixed and more similar to each other in hydrology, and so are combined into ~North Pacific Hardwood-Conifer Swamp (CES204.090)$$.

DISTRIBUTION

Range: This system occurs throughout the Pacific Northwest Coast, from Cook Inlet Basin and Prince William Sound, Alaska, to the southern coast of Oregon.
Divisions: 204:C
TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 69:C, 70:C, 71:C, 81:C
Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Boggs 2002, Chappell and Christy 2004, Comer et al. 2003, Franklin and Dyrness 1973, Viereck et al. 1992
Version: 25 Apr 2006 **Stakeholders:** Canada, West
Concept Author: G. Kittel, P. Comer, K. Boggs, C. Chappell **LeadResp:** West

CES306.833 ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN WOODLAND

Primary Division: Rocky Mountain (306)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Montane [Upper Montane, Montane]; Forest and Woodland (Treed); Riverine / Alluvial; Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Shrubland
Concept Summary: This riparian woodland system is comprised of seasonally flooded forests and woodlands found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Mountains. This system contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture in this system may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet), farther north elevation ranges between 900 and 2000 m. This is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderate-wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins. Dominant tree species vary across the latitudinal range, although it usually includes *Abies lasiocarpa* and/or *Picea engelmannii*; other important species include *Pseudotsuga menziesii, Picea pungens, Picea engelmannii X glauca, Populus tremuloides*, and *Juniperus scopulorum*. Other trees possibly present but not usually dominant include *Alnus incana, Abies concolor, Abies grandis, Pinus contorta, Populus angustifolia, Populus balsamifera ssp. trichocarpa*, and *Juniperus osteosperma*.

DISTRIBUTION

Range: This system is found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Alberta and British Columbia, and west into the Intermountain region and the Colorado Plateau.
Divisions: 204:P, 304:C, 306:C
TNC Ecoregions: 4:P, 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 68:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CONCEPT

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Ecosystems Working Group 1998, Eyre 1980, Kittel 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Rondeau 2001, Shiflet 1994, Tuhy et al. 2002
Version: 09 Feb 2005 **Stakeholders:** Canada, Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

Herbaceous Wetland

CES304.057 COLUMBIA PLATEAU VERNAL POOL

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Depressional [Vernal Pool]; Impermeable Layer; 1-29-day hydroperiod; Vernal Pool Mosaic
Concept Summary: This system includes shallow ephemeral water bodies found in very small (3 square meters to 1 acre) to large depressions (1500 square meters to a square mile, average size of vernal pools are 1600 square meters, while average size on non-alkaline playa lakes are 5-10 acres) throughout the exposed volcanic scablands of the Columbia Plateau in Washington, Oregon, and northern Nevada. Most of these pools and lakes are located on massive basalt flows exposed by Pleistocene floods; southward they also occur on andesite or rhyodacite caprock. Inundation is highly irregular, sometimes not occurring for several years. Depressions usually (but not always) fill with water during winter and spring. They are generally dry again within 9 months, though in exceptional times they can remain inundated for two years in a row. Water is from rainfall and snowmelt in relatively small closed basins, on average probably no more than 5-15 times the area of the ponds themselves. Because these pools and playas are perched above the general surrounding landscape, they are not generally subject to runoff from major stream systems. They typically have silty clay soils, sometimes with sandy margins. Pools are often found within a mounded or biscuit-swale topography with *Artemisia* shrub-steppe or rarely *Pinus ponderosa* savanna. In the northern Columbia Plateau, characteristic species are predominantly annual and diverse. Floristically akin to California vernal pool flora (one-third), however, many of the most abundant species are not reported in Californian pools. Characteristic species include *Callitriche marginata, Camissonia tanacetifolia, Elatine* spp., *Epilobium densiflorum (= Boisduvalia densiflora), Eryngium vaseyi, Juncus uncialis, Myosurus X clavicaulis, Plagiobothrys* spp., *Polygonum polygaloides ssp. confertiflorum, Polygonum polygaloides ssp. polygaloides, Psilocarphus brevissimus, Psilocarphus elatior, Psilocarphus oregonus*, and *Trifolium cyathiferum*. *Artemisia ludoviciana ssp. ludoviciana* can occur on better developed soils. In northern Nevada, most of the species by biomass are perennials and include *Polygonum, Rumex, Juncus balticus, Eleocharis, Carex douglasii, Muhlenbergia richardsonis*, and *Polyctenium* species, in addition to *Camissonia tanacetifolia* and *Psilocarphus brevissimus*. Endemic plant species *Navarretia leucocephala ssp. diffusa* and *Polyctenium williamsiae* may occur.
Comments: This includes Bjork (1997) vernal pool annual-dominated, vernal pool perennial-dominated and rain pools.

DISTRIBUTION

Range: This system is restricted to the northern Columbia Plateau ecoregion commonly called the Columbia Basin and perhaps the Okanagan Valley in British Columbia, and to the western Great Basin.
Divisions: 304:C
TNC Ecoregions: 6:C, 68:P
Subnations: BC?, NV, OR, WA

CONCEPT

Environment: Winters are colder (coldest average median temperature month in the high 20 degrees F) than California vernal pools and are climatically defined by wet winters (November through January, sporadically so southward) and severe summer drought (July-September), although May or June can be wet. The northernmost vernal pools are adapted to cold spring and long summer days (18 hours).

SOURCES

References: Bjork 1997, Bjork and Dunwiddie n.d., Comer et al. 2003
Version: 27 Jun 2005 **Stakeholders:** Canada, West
Concept Author: R. Crawford **LeadResp:** West

CES200.876 TEMPERATE PACIFIC FRESHWATER AQUATIC BED

Primary Division:
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Herbaceous; Temperate [Temperate Continental]; Depressional [Pond]; Aquatic Herb
Concept Summary: Freshwater aquatic beds are found throughout the humid temperate regions of the Pacific Coast of North America. They are small patch in size, confined to lakes, ponds, and slow-moving portions of rivers and streams. In large bodies of water, they are usually restricted to the littoral region where penetration of light is the limiting factor for growth. A variety of rooted or floating aquatic herbaceous species may dominate, including *Azolla* spp., *Nuphar lutea, Polygonum* spp., *Potamogeton* spp., *Ranunculus* spp., and *Wolffia* spp. Submerged vegetation, such as *Myriophyllum* spp., *Ceratophyllum* spp., and *Elodea* spp., is often present. These communities occur in water too deep for emergent vegetation.

DISTRIBUTION

Range: Throughout the humid temperate regions of Pacific Coast of North America.
Divisions: 204:C, 206:C
TNC Ecoregions: 1:C, 14:C, 15:C, 69:C, 70:C, 71:C, 74:C
Subnations: AK, BC, CA, OR, WA

CONCEPT

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995, Shiflet 1994, Viereck et al. 1992
Version: 21 Nov 2003 **Stakeholders:** Canada, West
Concept Author: G. Kittel, P. Comer, C. Chappell, K. Boggs **LeadResp:** West

CES200.877 TEMPERATE PACIFIC FRESHWATER EMERGENT MARSH

Primary Division:
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Herbaceous; Temperate [Temperate Continental]; Depressional [Pond]
Concept Summary: Freshwater marshes are found at all elevations below timberline throughout the temperate Pacific Coast and mountains of western North America. In the Pacific Northwest, they are mostly small patch, confined to limited areas in suitable floodplain or basin topography. They are mostly semipermanently flooded, but some marshes have seasonal hydrologic flooding. Water is at or above the surface for most of the growing season.

Soils are muck or mineral, and water is high-nutrient. By definition, freshwater marshes are dominated by emergent herbaceous species, mostly graminoids (*Carex, Scirpus* and/or *Schoenoplectus, Eleocharis, Juncus, Typha latifolia*) but also some forbs. Occurrences of this system typically are found in a mosaic with other wetland systems. It is often found along the borders of ponds, lakes or reservoirs that have more open basins and a permanent water source throughout all or most of the year. Some of the specific communities will also be found in the floodplain systems where more extensive bottomlands remain. Common emergent and floating vegetation includes species of *Scirpus* and/or *Schoenoplectus, Typha, Eleocharis, Sparganium, Sagittaria, Bidens, Cicuta, Rorippa, Mimulus*, and *Phalaris*. In relatively deep water, there may be occurrences of the freshwater aquatic bed system, where there are floating-leaved genera such as *Lemna, Potamogeton, Polygonum, Nuphar, Hydrocotyle*, and *Brasenia*. A consistent source of freshwater is essential to the function of these systems.

DISTRIBUTION

Range: This system occurs throughout the temperate Pacific Coast and coastal mountains of western North America, from southern coastal California north into coastal areas of British Columbia and Alaska.
Divisions: 204:C, 206:C
TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 12:P, 13:C, 14:C, 15:C, 16:C, 69:C, 70:C, 81:C
Subnations: AK, BC, CA, OR, WA

CONCEPT

SOURCES

References: Chappell and Christy 2004, Comer et al. 2003, Holland and Keil 1995, Shiflet 1994, Viereck et al. 1992
Version: 09 Feb 2005 **Stakeholders:** Canada, West
Concept Author: C. Chappell and G. Kittel **LeadResp:** West

CES200.998 TEMPERATE PACIFIC SUBALPINE-MONTANE WET MEADOW

Primary Division:
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Herbaceous; Muck; Graminoid; 30-180-day hydroperiod
Concept Summary: Montane and subalpine wet meadows occur in open wet depressions, basins and flats among montane and subalpine forests from California's Transverse and Peninsular ranges north to the Alaskan coastal forests at varying elevations depending on latitude. Sites are usually seasonally wet, often drying by late summer, and many occur in a tension zone between perennial wetlands and uplands, where water tables fluctuate in response to long-term climatic cycles. They may have surface water for part of the year, but depths rarely exceed a few centimeters. Soils are mostly mineral and may show typical hydric soil characteristics, and shallow organic soils may occur as inclusions. This system often occurs as a mosaic of several plant associations with varying dominant herbaceous species that may include *Camassia quamash, Carex bolanderi, Carex utriculata, Carex exsiccata, Dodecatheon jeffreyi, Glyceria striata (= Glyceria elata), Carex nigricans, Calamagrostis canadensis, Juncus nevadensis, Caltha leptosepala ssp. howellii, Veratrum californicum*, and *Scirpus* and/or *Schoenoplectus* spp. Trees occur peripherally or on elevated microsites and include *Picea engelmannii, Abies lasiocarpa, Abies amabilis, Tsuga mertensiana*, and *Chamaecyparis nootkatensis*. Common shrubs may include *Salix* spp., *Vaccinium uliginosum, Betula nana*, and *Vaccinium macrocarpon*. Wet meadows are tightly associated with snowmelt and typically are not subjected to high disturbance events such as flooding.
Comments: ~Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)$$ occurs to the east of the coastal and Sierran mountains, in the semi-arid interior regions of western North America. Boreal wet meadow systems occur further north and east in boreal regions where the climatic regime is generally colder than that of the Rockies or Pacific Northwest regions. Floristics of these three systems are somewhat similar, but there are differences related to biogeographic affinities of the species composing the vegetation.

DISTRIBUTION

Range: This system is found from California's Transverse and Peninsular ranges north to the Alaskan coastal forests at varying elevations depending on latitude.
Divisions: 204:C, 206:C

TNC Ecoregions: 3:C, 4:C, 5:C, 12:C, 16:C, 69:C, 81:C
Subnations: AK, BC, CA, NV, OR, WA

CONCEPT

SOURCES

References: Barbour and Major 1988, Comer et al. 2003, Holland and Keil 1995, Sawyer and Keeler-Wolf 1995, Shiflet 1994
Version: 31 Mar 2005 **Stakeholders:** Canada, West
Concept Author: P. Comer **LeadResp:** West

Mixed Upland and Wetland

CES304.780 INTER-MOUNTAIN BASINS GREASEWOOD FLAT

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Mixed Upland and Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland
Diagnostic Classifiers: Lowland [Lowland]; Shrubland (Shrub-dominated); Toeslope/Valley Bottom; Alkaline Soil; Deep Soil; Xeromorphic Shrub
Concept Summary: This ecological system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains and into central Montana. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*. Other shrubs that may be present to codominant in some occurrences include *Atriplex canescens, Atriplex confertifolia, Atriplex gardneri, Artemisia cana ssp. cana*, or *Krascheninnikovia lanata*. Occurrences are often surrounded by mixed salt desert scrub or big sagebrush shrublands. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Sporobolus airoides, Pascopyrum smithii, Distichlis spicata* (where water remains ponded the longest), *Calamovilfa longifolia, Poa pratensis*, or *Eleocharis palustris* herbaceous types.

DISTRIBUTION

Range: This system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains.
Divisions: 303:C, 304:C
TNC Ecoregions: 4:C, 6:C, 8:C, 9:C, 10:C, 11:C, 19:C, 20:C, 26:C
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

SOURCES

References: Comer et al. 2003, Knight 1994, Shiflet 1994, West 1983b
Version: 23 Jan 2006 **Stakeholders:** Midwest, West
Concept Author: NatureServe Western Ecology Team **LeadResp:** West

Barren

CES304.081 COLUMBIA PLATEAU ASH AND TUFF BADLAND

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Lowland [Lowland]; Badlands; Alkaline Soil; Silt Soil Texture; Clay Soil Texture
Concept Summary: This ecological system of the Columbia Plateau region is composed of barren and sparsely vegetated substrates (<10% plant cover) typically derived from highly eroded volcanic ash and tuff. Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs and forbs. Characteristic species include *Grayia spinosa, Artemisia tridentata, Salvia dorrii, Achnatherum* sp., *Eriogonum* sp., *Sarcobatus vermiculatus, Purshia tridentata*, and *Atriplex confertifolia*. Characteristic forbs are short-lived annuals, including *Cleome, Mentzelia, Camissonia*, and *Mimulus* species, although these habitats often support endemic perennial forbs.
Comments: Associations assigned to this system are not well-classified, but as many support G1 and G2 plant taxa, they are well sampled.

DISTRIBUTION

Range: This system is found on the Columbia Plateau of southern Idaho west into southern Oregon, northern Nevada, and extreme northeastern California.
Divisions: 304:C
TNC Ecoregions: 4:P, 6:C
Subnations: CA, ID, NV, OR, WA?

CONCEPT

SOURCES

References: Western Ecology Working Group n.d.
Version: 08 Sep 2004 **Stakeholders:** West
Concept Author: J. Kagan **LeadResp:** West

CES304.775 INTER-MOUNTAIN BASINS ACTIVE AND STABILIZED DUNE

Primary Division: Inter-Mountain Basins (304)
Land Cover Class: Barren
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Dune (Landform); Dune field; Dune (Substrate); Temperate [Temperate Continental]; Sand Soil Texture; Aridic; W-Landscape/High Intensity
Concept Summary: This ecological system occurs in Intermountain West basins and is composed of unvegetated to moderately vegetated (<10-30% plant cover), active and stabilized dunes and sandsheets. Species occupying these environments are often adapted to shifting, coarse-textured substrates (usually quartz sand) and form patchy or open grasslands, shrublands or steppe, and occasionally woodlands. Vegetation varies and may be composed of *Achnatherum hymenoides, Artemisia filifolia, Artemisia tridentata ssp. tridentata, Atriplex canescens, Ephedra* spp., *Coleogyne ramosissima, Ericameria nauseosa, Leymus flavescens, Psoralidium lanceolatum, Purshia tridentata, Redfieldia flexuosa, Sporobolus airoides, Sarcobatus vermiculatus, Tetradymia tetrameres*, or *Tiquilia* spp. In the Centennial Valley of southwestern Montana, where the dunes are more stable, *Artemisia tridentata ssp. tridentata* and *Artemisia tripartita ssp. tripartita* can have moderate cover and are associated with *Hesperostipa comata* or *Festuca idahoensis* (in more mesic settings). Early-seral communities in these dunes are dominated by *Ericameria nauseosa* and *Hesperostipa comata*. Several rare plant species occur in the Centennial Valley dunes, and are associated with early-successional stages. These dunes are very similar to the St. Anthony dunes in Idaho.

DISTRIBUTION

Range: This system occurs in intermountain basins of the western U.S. including southwestern Montana in the Centennial Valley.
Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 8:C, 10:C, 11:C, 19:C
Subnations: AZ, CO, ID, MT, NM, NV, OR, UT, WA, WY

CONCEPT

SOURCES

References: Anderson 1999a, Bowers 1982, Caicco and Wellner 1983e, Comer et al. 2003, Fryberger et al. 1990, Knight 1994, Pineada et al. 1999

Version: 20 Apr 2006 **Stakeholders:** West

Concept Author: NatureServe Western Ecology Team **LeadResp:** West

CES204.093 NORTH PACIFIC MONTANE MASSIVE BEDROCK, CLIFF AND TALUS

Primary Division: North American Pacific Maritime (204)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch, Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Canyon; Cliff (Substrate); Talus (Substrate); Rock Outcrops/Barrens/Glades; Temperate [Temperate Oceanic]

Concept Summary: This ecological system is found from foothill to subalpine elevations and includes barren and sparsely vegetated landscapes (generally <10% plant cover) of steep cliff faces, narrow canyons, and larger rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus that typically occur below cliff faces. The dominant process is drought and other extreme growing conditions created by exposed rock or unstable slopes typically associated with steep slopes. Fractures in the rock surface and less steep or more stable slopes may be occupied by small patches of dense vegetation, typically scattered trees and/or shrubs. Characteristic trees includes *Chamaecyparis nootkatensis, Tsuga* spp., *Thuja plicata, Pseudotsuga menziesii*, or *Abies* spp. There may be scattered shrubs present, such as *Acer circinatum, Alnus* spp., and *Ribes* spp. Soil development is limited as is herbaceous cover. Mosses or lichens may be very dense, well-developed and display cover well over 10%.

Comments: This system was distinguished from montane cliffs and barrens in the Rockies based on a change in floristic division and the apparent abundance of nonvascular cover on rocks compared to drier divisions.

DISTRIBUTION

Range: This system occurs from northern California (north of ~Sierra Nevada Cliff and Canyon (CES206.901)$$) to southeastern Alaska.

Divisions: 204:C

TNC Ecoregions: 1:C, 2:C, 3:C, 4:C, 5:P, 69:C, 81:C

Subnations: AK, BC, OR, WA

CONCEPT

SOURCES

References: Western Ecology Working Group n.d.

Version: 30 Mar 2005 **Stakeholders:** Canada, West

Concept Author: R. Crawford **LeadResp:** West

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Appendix 4C – Terrestrial Ecological Systems Methodology

Technical Team

The terrestrial plant communities and ecological systems team was composed of experts from The Nature Conservancy (TNC), the Washington Natural Heritage Program (WNHP) and Oregon Natural Heritage Program and independent consultants. The team consisted of the following people:

Rex Crawford	WA NHP, Olympia, WA
Chris Chappell	WA NHP, Olympia, WA
Jimmy Kagan	OR NHP, Portland, Oregon
Gwen Kittel	NatureServe, Boulder, CO
Michael Schindel	OR TNC, Portland, Oregon
Dick Vander Schaaf	OR TNC, Portland, Oregon

Selecting Coarse Filter Targets

The technical team chose to use ecological systems, as developed by NatureServe, to represent the vegetation and habitat types at the coarsest scale in the ecoregional assessment. A brief conceptual definition of ecological systems follows. More detailed information can found in Comer et al. (2003), which is available from NatureServe's web site, http://natureserve.org/publications/usEcologicalsystems.jsp

A terrestrial ecological system is defined as a group of plant community types (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients (Comer et al 2003, O'Neill 2001). Ecological processes include natural disturbances such as fire and flooding. Substrates may include a variety of soil surface and bedrock features, such as shallow soils, alkaline parent materials, sandy/gravelling soils, or peatlands (as described and classified by NRCS 1998). Finally, environmental gradients include local climates, hydrologically defined patterns in coastal zones, arid grassland or desert areas, or montane, alpine or subalpine zones (e.g. Bailey 1995, 1998, and Takhtajan 1986). A given terrestrial ecological system will typically manifest itself in a landscape at intermediate geographic scales of 10s to 1,000s of hectares and persist for 50 or more years. Selecting this temporal scale shares some aspects with the "habitat type" approach to describe potential vegetation (Daubenmire 1952, Pfister and Arno 1980), but differs in that no "climax" vegetation is implied, and all seral components are explicitly included in the systems concept. Ecological system units are intended to provide "meso-scale" classification units for applications to resource management and conservation (Walter 1985). They may serve as practical units on their own or in combination with classification units defined at different spatial scales.

Upland and wetland ecological system units are defined to emphasize the natural or semi-natural portions of the landscape. Areas with very little natural vegetation, such as agricultural row crops and urban landscapes, are excluded from ecological systems. The temporal scale or bounds chosen also integrate successional dynamics into the concept of each unit. The spatial characteristics of ecological systems vary on the ground, but all fall into several recognizable and repeatable categories. With these temporal and spatial scales bounding the concept of ecological systems, we may then integrate multiple ecological factors – or *diagnostic classifiers* - to define each classification unit, not unlike the approach of Di Gregorio and Jansen (2000).

Multiple environmental factors are evaluated and combined in different ways to explain the spatial occurrence of vegetation associations. Continental-scale climate as well as broad patterns in phytogeography, are reflected in ecological division units that spatially frame the classification at subcontinental scales (e.g. Bailey 1998, Takhtajan 1986). We integrated bioclimatic categories to consistently characterize life zone concepts (e.g. maritime, lowland, montane, subalpine, alpine). Within the context of biogeographic and bioclimatic factors, ecological composition, structure, and function are strongly influenced by factors determined by local physiography, landform, and surface substrate. Some environmental variables are described through existing, standard classifications (e.g. soil and hydrogeomorphology) and serve as excellent diagnostic classifiers for ecological systems (NRCS 1998, Cowardin et al.1979, Brinson 1993). Many dynamic processes are also sufficiently understood and described to serve as diagnostic classifiers (Anderson 1999). The recurrent juxtaposition of recognizable vegetation communities provides an additional criterion for multi-factor classification (Austin and Heyligers 1989).

Ecological classification ideally proceeds through several phases, including qualitative description, quantitative data gathering, analysis, and field-testing. Our approach presented here is qualitative and rule-based, setting the stage for subsequent quantitative work. We relied on available interpretations of vegetation and ecosystem patterns across the study area and we reviewed associations of the International Vegetation Classification/National Vegetation Classification (IVC/NVC) in order to help define the limits of systems concepts (NatureServe 2005). In recent years we have also tested how well a systems approach could facilitate mapping of ecological patterns at intermediate-scales across the landscape (Marshall et al 2000, Moore et al 2001, Hall et al 2001, Nachlinger et al. 2001, Neely et al. 2001, Menard and Lauver 2002, Tuhy et al 2002, Comer et al 2002).

Minimum Dynamic Area (MDA) and Aggregated Systems

We wanted to select areas that are large enough to sustain frequent low-intensity fires and occasional intense, stand-replacement fires. Fire history and reconstruction literature were consulted. We needed to develop a “minimum area” that could potentially sustain natural (or near-natural) fire regime (Anderson 1999). In studies that compared many sites, from Desolation Peak in Northern WA to Oregon Caves in southern OR most fires burned 20-30% of a study area, and several studies had fires that burned more than 50% of the study area (Berkley et al 2002, Weisberg and Swanson 2003). Size of these study areas varied widely, from 200 ha to 137,500 ha. The average area burned in a 25 year period is about 30,000 ha, based fire history from 1400-2000 AD (Berkley et al 2002, Weisberg and Swanson 2002) and this size seemed to sustain 20-50% of the area under study being burned in any one year. An area of 30,000 ha should be able to support healthy forests with frequent low intensity fires and occasional high intensity fires, for at least 100 years. Ideally, forested protected areas could be as large as 55,000 to 125,000 ha to survive really big fires, but the *minimum* dynamic area, based on the literature, averages out to about 30,000 ha. Therefore the minimum dynamic area (MDA) of any forest preserve was selected only if it could encompass watersheds (or adjacent watersheds) that are at least 30,000 ha in size.

As we cannot limit this “minimal area” to be confined to mapped boundaries (a particular forest ecological system), because fire responds to climate, fuel loading and local topography, not forest type. However, fire frequency does changes with elevation and latitude (moisture and climate). In general, from the literature, we can say that in the Pacific Northwest historically, lower elevation forests (Dry Doug fir, Ponderosa Pine) burn most frequently (every 7-15 years) (Agee 1993, Everett et al. 2000); slightly more mesic, Mixed Conifer Forests burn slightly more often, every 8 yrs in CA, 30 yrs in OR and 50 yrs in WA (Beaty and Taylor 2001, Agee 1993), higher in elevation montane forests (Cedar/Hemlock, Douglas-Fir) burned less frequently (every 150-937 years) (Agee 1993), and subalpine forests (Mt Hemlock, subalpine parklands) burned even less frequently (500-800 years) (Agee 1993).

We aggregated mapped polygons of ecological systems into lower elevation forests and higher elevation forests, and set a goal of 30% of each of these aggregated systems, in areas with at least 30,000 ha of continuous forest. We customized which ecosystems were aggregated by section, as each section had a different suite of forested ecosystems: West Cascade forests appear on the landscape in lower and upper elevational bands, while the East Cascade and

Modoc Plateau, being such a narrow and steep gradient, were not separated by elevation. Details of which ecological systems were included in each aggregated set are available in Table 4C.1

West Cascade Aggregated Systems by Section

- Mount Rainer Lower Montane Forest and Woodland
- Mount Rainer Upper Montane Forest and Woodland
- Columbian Cascade Upper Montane Forest and Woodland
- Columbian Cascade Lower Montane Forest and Woodland
- Middle Oregon Cascade Upper Montane Forest and Woodland
- Middle Oregon Cascade Lower Montane Forest and Woodland
- Umpqua Cascades Upper Montane Forest and Woodland
- Umpqua Cascades Lower Montane Forest and Woodland

East Cascade and Modoc Plateau Aggregated Systems by Section

- Wenatchee Shrub Steppe and Montane Forest and Woodland
- Yakima Shrub Steppe and Montane Forest and Woodland
- Pumice and Pine Shrub Steppe and Montane Forest and Woodland
- Upper Klamath Basin Forest and Woodland
- Modoc Montane Forest and Woodland
- Modoc Shrub Steppe and Juniper Woodland

Tables

Table 1. West Cascade Aggregated Systems

Grouped System Code and Grouped System Name	Elevation Band	Elcode	Ecosystem Name
EWCASCADE_001: Mount Rainer Lower Montane Forest and Woodland	Montane	CES204.086	East Cascades Mesic Montane Conifer Forest
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
	Montane	CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
EWCASCADE_002: Mount Rainer Upper Montane Forest and Woodland	Upper Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Upper Montane	CES204.839	North Pacific Western Hemlock-Silver Fir Forest
	Upper Montane	CES206.911	Northern California Mesic Subalpine Woodland
	Upper Montane	CES306.807	Northern Rocky Mountain Subalpine Dry Parkland
	Upper Montane	CES306.820	Rocky Mountain Lodgepole Pine Forest
	Upper Montane	CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

Table 1. West Cascade Aggregated Systems con't

Grouped System Code and Grouped System Name	Elevation Band	Elcode	Ecosystem Name
EWCASCADE_003: Columbian Cascade Lower Montane Forest and Woodland	Montane	CES204.086	East Cascades Mesic Montane Conifer Forest
	Montane	CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
	Montane	CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
EWCASCADE_004: Columbian Cascade Upper Montane Forest and Woodland	Upper Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Upper Montane	CES204.839	North Pacific Western Hemlock-Silver Fir Forest
	Upper Montane	CES206.911	Northern California Mesic Subalpine Woodland
	Upper Montane	CES306.807	Northern Rocky Mountain Subalpine Dry Parkland
	Upper Montane	CES306.820	Rocky Mountain Lodgepole Pine Forest
	Upper Montane	CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
EWCASCADE_005: Middle Oregon Cascade Lower Montane Forest and Woodland	Montane	CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland
	Montane	CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
EWCASCADE_006: Middle Oregon Cascade Upper Montane Forest and Woodland	Upper Montane	CES206.913	Mediterranean California Red Fir Forest and Woodland
	Upper Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Upper Montane	CES204.839	North Pacific Western Hemlock-Silver Fir Forest
	Upper Montane	CES206.911	Northern California Mesic Subalpine Woodland
	Upper Montane	CES306.820	Rocky Mountain Lodgepole Pine Forest

Table 1. West Cascade Aggregated Systems con't.

Grouped System Code and Grouped System Name	Elevation Band	Elcode	Ecosystem Name
EWCASCADE_007: Umpqua Cascades Lower Montane Forest and Woodland	Montane	CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland
	Montane	CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
EWCASCADE_008: Umpqua Cascades Upper Montane Forest and Woodland	Upper Montane	CES206.913	Mediterranean California Red Fir Forest and Woodland
	Upper Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Upper Montane	CES204.839	North Pacific Western Hemlock-Silver Fir Forest
	Upper Montane	CES306.820	Rocky Mountain Lodgepole Pine Forest
	Upper Montane	CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

Table 2. East Cascade Aggregated Systems

Grouped System Code and Grouped System Name	Elevation Band	Elcode	Ecosystem Name
EWCASCADE_009: Wenatchee Shrub Steppe and Montane Forest and Woodland	Montane	CES204.086	East Cascades Mesic Montane Conifer Forest
	Montane	CES304.778	Inter-Mountain Basins Big Sagebrush Steppe
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
	Montane	CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
EWCASCADE_010 : Yakima Shrub Steppe and Montane Forest and Woodland	Montane	CES204.086	East Cascades Mesic Montane Conifer Forest
	Montane	CES304.778	Inter-Mountain Basins Big Sagebrush Steppe
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
	Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Montane	CES204.839	North Pacific Western Hemlock-Silver Fir Forest
	Montane	CES206.911	Northern California Mesic Subalpine Woodland
	Montane	CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.807	Northern Rocky Mountain Subalpine Dry Parkland
	Montane	CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

Table 2. East Cascade Aggregated Systems con't.

Grouped System Code and Grouped System Name	Elevation Band	Elcode	Ecosystem Name
EWCASCADE_011: Eastside Oak Forest and Woodland	Montane	CES204.086	East Cascades Mesic Montane Conifer Forest
	Montane	CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
	Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Montane	CES204.839	North Pacific Western Hemlock-Silver Fir Forest
	Montane	CES206.911	Northern California Mesic Subalpine Woodland
	Montane	CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.807	Northern Rocky Mountain Subalpine Dry Parkland
	Montane	CES306.820	Rocky Mountain Lodgepole Pine Forest
	Montane	CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

Table 2. East Cascade Aggregated Systems con't.

Grouped System Code and Grouped System Name	Elevation Band	Elcode	Ecosystem Name
EWCASCADE_012: Pumice and Pine Shrub Steppe and Montane Forest and Woodland	Montane	CES304.080	Columbia Plateau Low Sagebrush Steppe
	Montane	CES304.082	Columbia Plateau Western Juniper Woodland and Savanna
	Montane	CES204.086	East Cascades Mesic Montane Conifer Forest
	Montane	CES304.778	Inter-Mountain Basins Big Sagebrush Steppe
	Montane	CES304.780	Inter-Mountain Basins Greasewood Flat
	Montane	CES304.788	Inter-Mountain Basins Semi-Desert Shrub-Steppe
	Montane	CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland
	Montane	CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland
	Montane	CES206.913	Mediterranean California Red Fir Forest and Woodland
	Montane	CES204.001	North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest
	Montane	CES204.002	North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest
	Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Montane	CES204.839	North Pacific Western Hemlock-Silver Fir Forest
	Montane	CES206.911	Northern California Mesic Subalpine Woodland
	Montane	CES306.805	Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.805	Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland
	Montane	CES306.820	Rocky Mountain Lodgepole Pine Forest
	Montane	CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
	Montane	CES206.912	Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland

Table 2. East Cascade Aggregated Systems con't.

Grouped System Code and Grouped System Name	Elevation Band	Elcode	Ecosystem Name
EWCASCADE_013: Upper Klamath Basin Forest and Woodland	Montane	CES304.082	Columbia Plateau Western Juniper Woodland and Savanna
	Montane	CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland
	Montane	CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland
	Montane	CES206.918	Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland
	Montane	CES206.913	Mediterranean California Red Fir Forest and Woodland
	Montane	CES206.910	Mediterranean California Subalpine Woodland
	Montane	CES204.838	North Pacific Mountain Hemlock Forest
	Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
	Montane	CES306.820	Rocky Mountain Lodgepole Pine Forest
	Montane	CES306.830	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
	Montane	CES206.912	Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland
EWCASCADE_014: Modoc Shrub and Juniper Woodland	Foothill/ Plateau	CES304.080	Columbia Plateau Low Sagebrush Steppe
	Foothill/ Plateau	CES304.082	Columbia Plateau Western Juniper Woodland and Savanna
	Foothill/ Plateau	CES304.778	Inter-Mountain Basins Big Sagebrush Steppe
	Foothill/ Plateau	CES304.787	Inter-Mountain Basins Semi-Desert Grassland
	Foothill/ Plateau	CES304.788	Inter-Mountain Basins Semi-Desert Shrub-Steppe
EWCASCADE_015: Modoc Montane Forest and Woodland	Low Montane	CES206.916	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland
	Low Montane	CES206.915	Mediterranean California Mesic Mixed Conifer Forest and Woodland
	Low Montane	CES206.918	Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland
	Low Montane	CES306.030	Northern Rocky Mountain Ponderosa Pine Woodland and Savanna

Suggested Goals

Goals for ecological systems in the West and East Cascade Ecoregion were set at 30% in the analysis. However, the team recommends that in the future goals be set as in Table 3.

Table 3. Suggested Terrestrial Ecosystem Goals for East and West Cascades Ecoregions

Ecosystem	Goal (% of Historic Acreage)	Reasons
North Pacific Bog and Fen	100%	Rare Wetland
North Pacific Wooded Lava Flows	100%	Known only from this Ecoregion
Columbia Plateau Vernal Pool	100%	Very rare endangered Wetland
East Cascades Oak-Pine Forest and Woodland	50%	Rare Endangered type
Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland	20%	Peripheral Type
All Remaining Ecosystems	30%	Representative of Biodiversity in these Ecoregions

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Appendix 4D -- Target List for Plants

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Vascular Plants									
Agrostis howellii	Howell's bentgrass	PMPOA040N0	G2	No	-	-	Yes	25	limited
Allium douglasii var nevii	Nevius' onion	PMLIL020E0	G4G5T3T4	Yes	50	endemic	No	-	-
Anemone nuttalliana	Pasqueflower	PDRAN040U0	G4	Yes	13	disjunct	No	-	-
Arabis furcata	Cascade rockcress	PDBRA060M0	G4	Yes	25	limited	Yes	25	limited
Arabis hastatula	Hells canyon rockcress	PDBRA060T0	G1	No	-	-	Yes	25	limited
Arabis platysperma var platysperma	Broad-seeded rockcress	PDBRA061J2	G5T?	Yes	25	limited	Yes	25	limited
Arabis sparsiflora var atrorubens	Sickle-pod rockcress	PDBRA061X2	G5T3	Yes	25	limited	Yes	25	limited
Arabis suffrutescens var horizontalis	Crater lake rockcress	PDBRA061Z1	G5T1	No	25	endemic	Yes	25	endemic
Arnica viscosa	Shasta arnica	PDAST0Q0R0	G4	No	-	-	Yes	25	limited
Artemisia ludoviciana ssp estesii	Estes' artemisia	PDAST0S0Y8	G5T2	Yes	50	endemic	No	-	-
Asplenium septentrionale	Grass-fern	PPASP021F0	G4G5	Yes	13	disjunct	Yes	13	disjunct
Aster gormanii	Gorman's aster	PDAST0T1B0	G3	No	-	-	Yes	50	endemic
Aster vialis	Wayside aster	PDAST0T3K0	G2	No	-	-	Yes	25	limited
Astragalus anxius	Ash valley milk-vetch	PDFAB0FBD0	G1	Yes	50	endemic	No	-	-
Astragalus applegatei	Applegate's milk-vetch	PDFAB0F0P0	G1	Yes	50	endemic	No	-	-
Astragalus hoodianus	Hood river milk-vetch	PDFAB0F410	G4	Yes	25	limited	No	-	-
Astragalus howellii	Howell milk-vetch	PDFAB0F430	G3	Yes	25	limited	No	-	-
Astragalus lemmonii	Lemmon's milk-vetch	PDFAB0F4N0	G3?	Yes	7	peripheral	No	-	-

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Astragalus peckii	Peck's milk-vetch	PDFAB0F6Q0	G3	Yes	25	limited	Yes	25	limited
Astragalus pulsiferae var suksdorfii	Suksdorf's milk-vetch	PDFAB0F782	G4T3	Yes	13	disjunct	No	-	-
Bolandra oregana	Oregon bolandra	PDSAX03020	G3	Yes	13	widespread	Yes	13	widespread
Botrychium montanum	Mountain grapefern	PPOPH010K0	G3	Yes	13	widespread	Yes	13	widespread
Botrychium paradoxum	Peculiar moonwort	PPOPH010J0	G2	Yes	13	widespread	No	-	-
Botrychium pumicola	Pumice grape-fern	PPOPH010D0	G3	Yes	50	endemic	No	-	-
Calamagrostis breweri	Brewer reedgrass	PMPOA17020	G4	No	-	-	Yes	25	limited
Calochortus longebarbatus var longebarbatus	Long-bearded mariposa-lily	PMLIL0D0R1	G4T3	Yes	50	endemic	No	-	-
Calochortus monophyllus	One-leaved calochortus	PMLIL0D0X0	G3G4	No	-	-	Yes	7	peripheral
Calochortus nitidus	Broad-fruit mariposa	PMLIL0D0Y0	G3	No	-	-	Yes	25	limited
Calochortus umpquaensis	Umpqua mariposa-lily	PMLIL0D1P0	G1	No	-	-	Yes	50	endemic
Carex diandra	Lesser panicled sedge	PMCYP033R0	G5	Yes	13	disjunct	No	-	-
Carex eleocharis	Sedge	PMCYP03GJ0	G5	Yes	13	widespread	No	-	-
Carex halliana	Hall's sedge	PMCYP035M0	G4G5	Yes	50	endemic	No	-	-
Carex lasiocarpa var americana	Slender sedge	PMCYP03721	G5T5	Yes	25	limited	Yes	25	limited
Carex macrochaeta	Alaska long-awned sedge	PMCYP03820	G5	No	-	-	Yes	7	peripheral
Carex petasata	Liddon's sedge	PMCYP03AE0	G5	Yes	7	peripheral	No	-	-
Carex proposita	Smoky mountain sedge	PMCYP03B60	G4	Yes	13	disjunct	No	-	-
Castilleja chlorotica	Green-tinged paintbrush	PDSCR0D0C0	G3	Yes	50	endemic	No	-	-

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Castilleja cryptantha	Obscure indian-paintbrush	PDSCR0D0N0	G2G3	Yes	25	endemic	Yes	25	endemic
Castilleja rupicola	Cliff paintbrush	PDSCR0D2U0	G2G3	No	-	-	Yes	50	endemic
Chaenactis thompsonii	Thompson's pincushion	PDAST200J0	G2G3	Yes	50	endemic	No	-	-
Cimicifuga elata	Tall bugbane	PDRAN07030	G3	No	-	-	Yes	25	limited
Claytonia megarhiza var nivalis	Wenatchee springbeauty	PDPOR030A3	G4?T3	Yes	50	endemic	No	-	-
Collinsia sparsiflora var bruceae	Few-flowered collinsia	PDSCR0H0F2	G4T4	Yes	50	endemic	No	-	-
Collomia debilis var larsenii	Talus collomia	PDPLM02014	G5T4	Yes	25	endemic	Yes	25	endemic
Collomia mazama	Mt. Mazama collomia	PDPLM02070	G3	Yes	25	endemic	Yes	25	endemic
Coptis trifolia	Three-leaf gold thread	PDRAN0A040	G5	No	-	-	Yes	13	disjunct
Corydalis caseana ssp aquae-gelidae	Cold-water corydalis	PDFUM03046	G3	No	-	-	Yes	50	endemic
Cryptantha thompsonii	Thompson's cat's-eye	PDBOR0A340	G2G3	Yes	25	limited	No	-	-
Delphinium multiplex	Kittitas larkspur	PDRAN0B130	G3Q	Yes	50	endemic	No	-	-
Delphinium oreganum	Willamette valley larkspur	PDRAN0B220	G1Q	No	-	-	Yes	7	peripheral
Delphinium viridescens	Wenatchee larkspur	PDRAN0B200	G2	Yes	50	endemic	No	-	-
Delphinium xantholeucum	Northwestern larkspur	PDRAN0B210	G3	Yes	50	endemic	No	-	-
Douglasia laevigata	Smooth-leaved douglasia	PDPRI04030	G3	No	-	-	Yes	25	limited
Douglasia nivalis var dentata	Snow buckwheat	PDPRI04053	G3T2?	Yes	50	endemic	No	-	-
Draba aureola	Golden alpine draba	PDBRA110F0	G4	No	-	-	Yes	50	endemic
Erigeron cascadensis	Cascade daisy	PDAST3M0T0	G4	No	-	-	Yes	50	endemic
Erigeron howellii	Howell's daisy	PDAST3M1U0	G2	No	-	-	Yes	50	endemic

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Erigeron leibergii	Leiberg's fleabane	PDAST3M280	G3?	Yes	50	endemic	No	-	-
Erigeron oreganus	Oregon daisy	PDAST3M2W0	G3	Yes	25	endemic	Yes	25	endemic
Erigeron salishii	Salish daisy	PDAST3M4U0	G2G3	No	-	-	Yes	25	limited
Eriogonum prociduum	Prostrate buckwheat	PDPGN084W0	G3	Yes	25	limited	No	-	-
Eriogonum pyrolifolium var	Shasta buckwheat	PDPGN084Z2	G4T4	Yes	13	widespread	Yes	13	widespread
Eriogonum umbellatum var	Green buckwheat	PDPGN086U2	G5T2?	Yes	50	endemic	No	-	-
Eritrichium nanum var elongatum	Pale alpine-forget-me-not	PDBOR0F033	G4G5T4	Yes	13	Disjunct	No	-	-
Eryngium petiolatum	Coyote thistle	PDAPI0Z0M0	G4	Yes	25	limited	Yes	25	limited
Fauria crista-galli	Deer-cabbage	PDMNY01010	G5	No	-	-	Yes	13	widespread
Frasera umpquaensis	Umpqua swertia	PDGEN050F0	G3Q	No	-	-	Yes	25	limited
Fritillaria camschatcensis	Indian rice	PMLIL0V050	G5	No	-	-	Yes	13	disjunct
Galium glabrescens ssp modocense	Modoc bedstraw	PDRUB0N0T2	G4?T2	Yes	50	endemic	No	-	-
Galium serpenticum ssp warnerense	Warner mt. Bedstraw	PDRUB0N1Y8	G4G5T2	Yes	50	endemic	No	-	-
Gentiana douglasiana	Swamp gentian	PDGEN060D0	G4	Yes	13	disjunct	No	-	-
Gentiana newberryi	Moss gentian	PDGEN060G0	G4	Yes	25	endemic	Yes	25	endemic
Geum aleppicum	Aleppo avens	PDROS0S010	G5	Yes	13	disjunct	No	-	-
Geum rossii var depressum	Ross' avens	PDROS0S0E1	G5T1	Yes	50	endemic	No	-	-
Gratiola heterosepala	Boggs lake hedge-hyssop	PDSCR0R060	G3	Yes	25	limited	No	-	-
Hackelia diffusa var diffusa	Diffuse stickseed	PDBOR0G0C3	G4T3	Yes	13	disjunct	Yes	13	disjunct
Hackelia venusta	Showy stickseed	PDBOR0G0T0	G1	Yes	50	endemic	No	-	-
Haplopappus whitneyi ssp discoideus	Whitney's haplopappus	PDAST4H061	G4G5T4	No	-	-	Yes	25	limited
Heuchera grossulariifolia var tenuifolia	Gooseberry-leaved alumroot	PDSAX0E0G2	G4T3T4	Yes	13	disjunct	No	-	-
Heuchera merriamii	Merriam alumroot	PDSAX0E0N0	G2?	No	-	-	Yes	25	limited

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Hieracium greenei	Greene's hawkweed	PDAST4W1Z0	G3G4	No	-	-	Yes	25	limited
Hieracium longiberbe	Long-bearded hawkweed	PDAST4W0W0	G4G5	No	-	-	Yes	50	Endemic
Iliamna bakeri	Baker's globe-mallow	PDMAL0K010	G4	Yes	25	limited	Yes	25	limited
Iliamna latibracteata	California globe-mallow	PDMAL0K040	G3	No	-	-	Yes	25	limited
Iliamna longisepala	Long-sepal globemallow	PDMAL0K050	G3	Yes	50	endemic	No	-	-
Ivesia paniculata	Ash creek ivesia	PDROS0X0S0	G2	Yes	50	endemic	No	-	-
Ivesia shockleyi	Shockley's ivesia	PDROS0X0L0	G3G4	Yes	7	peripheral	No	-	-
Kalmiopsis fragrans	North umpqua kalmiopsis	PDERI0L020	G1	No	-	-	Yes	50	endemic
Lathyrus rigidus	Rigid pea	PDFAB250W0	G5	Yes	7	peripheral	No	-	-
Lewisia columbiana var columbiana	Rosy lewisia	PDPOR04031	G4T4	No	-	-	Yes	50	endemic
Lewisia tweedii	Tweedy's bitteroot	PDPOR090A0	G2G3	Yes	50	endemic	No	-	-
Limnanthes floccosa ssp bellingeriana	Bellinger's meadow-foam	PDLIM02041	G4T2	Yes	25	endemic	Yes	25	endemic
Liparis loeselii	Loesel's twayblade	PMORC1M040	G5	Yes	13	disjunct	No	-	-
Lipocarpha occidentalis	Western lipocarpha	PMCYP0H070	G5	Yes	13	disjunct	No	-	-
Lobelia dortmanna	Water lobelia	PDCAM0E0C0	G4	Yes	13	widespread	Yes	13	widespread
Lomatium columbianum	Columbia desert-parsley	PDAPI1B090	G4	Yes	25	limited	No	-	-
Lomatium suksdorfii	Suksdorf's lomatium	PDAPI1B1W0	G3	Yes	50	endemic	No	-	-
Lomatium thompsonii	Thompson desert-parsley	PDAPI1B0E0	G3	Yes	50	endemic	No	-	-

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Lomatium tuberosum	Hoover's desert-parsley	PDAPI1B200	G2G3	Yes	7	peripheral	No	-	-
Lomatium watsonii	Watson desert-parsley	PDAPI1B230	G4	Yes	25	limited	No	-	-
Meconella oregana	White meconella	PDPAP0G030	G2	Yes	13	disjunct	No	-	-
Mimulus evanescens	Disappearing monkeyflower	PDSCR1B370	G2	Yes	13	widespread	No	-	-
Mimulus tricolor	Three-colored monkeyflower	PDSCR1B2Q0	G4	Yes	50	endemic	No	-	-
Navarretia tagetina	Marigold navarretia	PDPLM0C0V0	G5	Yes	13	disjunct	No	-	-
Nemacladus capillaris	Slender nemacladus	PDCAM0F010	G4	No	-	-	Yes	25	limited
Ophioglossum pusillum	Adder's-tongue	PPOPH020F0	G5	Yes	13	widespread	Yes	13	widespread
Orcuttia tenuis	Slender orcutt grass	PMPOA4G050	G3	Yes	25	limited	No	-	-
Parnassia fimbriata var hoodiana	Fringed grass-of-parnassus	PDSAX0P042	G4T3	No	-	-	Yes	50	endemic
Parnassia kotzebuei	Kotzebue's grass-of-parnassus	PDSAX0P070	G4	Yes	-	-	No	-	-
Pedicularis rainierensis	Mount rainier lousewort	PDSCR1K0Z0	G2G3	Yes	25	endemic	Yes	25	endemic
Pellaea brachyptera	Sierra cliff-brake	PPADI0H030	G4G5	Yes	13	disjunct	No	-	-
Pellaea breweri	Brewer's cliff-brake	PPADI0H040	G5	Yes	13	disjunct	No	-	-
Penstemon barrettiae	Barrett's penstemon	PDSCR1L0R0	G2	Yes	25	endemic	Yes	25	endemic
Penstemon deustus var variabilis	Hot-rock penstemon	PDSCR1L1Y3	G5T1T2	Yes	7	peripheral	No	-	-
Penstemon eriantherus var whitedii	Crested-tongue Beardtongue	PDSCR1L274	G4T2?	Yes	7	peripheral	No	-	-

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Penstemon glaucinus	Blue-leaved penstemon	PDSCR1L2M0	G3	Yes	50	endemic	No	-	-
Penstemon peckii	Peck's penstemon	PDSCR1L4V0	G3	Yes	50	endemic	Yes	7	peripheral
Perideridia erythrorhiza	Red-root yampah	PDAPI1N050	G1	Yes	50	endemic	No	-	-
Petrophyton cinerascens	Chelan rockmat	PDROS18030	G1	Yes	50	endemic	No	-	-
Phacelia inundata	Playa phacelia	PDHYD0C2E0	G2	Yes	25	limited	No	-	-
Phacelia minutissima	Tiny-flower phacelia	PDHYD0C300	G3	Yes	13	disjunct	No	-	-
Phacelia sericea var ciliosa	Blue alpine phacelia	PDHYD0C4A1	G5T5	Yes	13	disjunct	No	-	-
Phacelia verna	Spring phacelia	PDHYD0C4R0	G3	No	-	-	Yes	25	limited
Phlox hendersonii	Henderson phlox	PDPLM0D0Z0	G4	No	-	-	Yes	50	endemic
Plagiobothrys salsus	Desert allocarya	PDBOR0V0X0	G3	Yes	13	disjunct	No	-	-
Pleuropogon oregonus	Oregon semaphore grass	PMPOA7Y020	G1	Yes	25	limited	No	-	-
Poa curtifolia	Little mountain bluegrass	PMPOA4Z0N0	G3?	Yes	50	endemic	No	-	-
Poa laxiflora	Loose-flowered bluegrass	PMPOA4Z1E0	G3	No	-	-	Yes	25	limited
Poa marcida	Weak bluegrass	PMPOA4Z1N0	G4G5	No	-	-	Yes	25	limited
Pogogyne floribunda	Profuse-flowered pogogyne	PDLAM1K070	G3	Yes	50	endemic	No	-	-
Potentilla basaltica	Black rock potentilla	PDROS1B270	G1	Yes	50	endemic	No	-	-
Potentilla newberryi	Newberry's cinquefoil	PDROS1B130	G3G4	Yes	25	limited	No	-	-
Potentilla villosa	Villous cinquefoil	PDROS1B250	G4	No	-	-	Yes	13	widespread
Ranunculus glaberrimus var reconditus	Obscure buttercup	PDRAN0L0Z3	G2	Yes	13	disjunct	No	-	-

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Ribes inerme var klamathense	Klamath gooseberry	PDGRO020R1	G5T3?	Yes	25	endemic	Yes	25	endemic
Romanzoffia thompsonii	Thompson mistmaiden	PDHYD0E050	G3	No	-	-	Yes	50	endemic
Saxifragopsis fragarioides	Strawberry saxifrage	PDSAX17010	G3?	Yes	13	disjunct	No	-	-
Schizachyrium scoparium ssp scoparium	Little bluestem	PMPOA5D096	G5T5	Yes	13	disjunct	No	-	-
Scribneria bolanderi	Scribner's grass	PMPOA5J010	G3G4	Yes	25	limited	No	-	-
Sidalcea cusickii	Cusick's mallow	PDMAL11050	G4	No	-	-	Yes	25	limited
Sidalcea hirtipes	Bristly-stemmed sidalcea	PDMAL110C0	G2	No	-	-	Yes	25	limited
Sidalcea oregana var calva	Oregon checker-mallow	PDMAL110K4	G5T1	Yes	50	endemic	No	-	-
Silene nuda ssp insectivora	Fringed campion	PDCAR0U141	G4G5T4	Yes	25	limited	No	-	-
Silene seelyi	Seely's silene	PDCAR0U1N0	G2G3	Yes	50	endemic	No	-	-
Sisyrinchium montanum	Strict blue-eyed-grass	PMIRI0D110	G5	Yes	13	disjunct	No	-	-
Sisyrinchium sarmentosum	Pale blue-eyed grass	PMIRI0D170	G1G2	Yes	25	endemic	Yes	25	endemic
Spiranthes diluvialis	Ute ladies' tresses	PMORC2B100	G2	Yes	13	disjunct	No	-	-
Streptopus streptopoides	Kruhsea	PMLIL1X030	G5	No	-	-	Yes	25	limited
Suksdorfia violacea	Violet suksdorfia	PDSAX0W020	G4	Yes	25	limited	Yes	25	limited
Sullivantia oregana	Oregon sullivantia	PDSAX0X020	G2	Yes	25	endemic	Yes	25	endemic
Swertia perennis	Felwort	PDGEN0H010	G5	Yes	13	disjunct	No	-	-
Synthyris missurica ssp. Stellata	Columbia kittentails	PDSCR1W043	G4T4	Yes	7	peripheral	Yes	50	Endemic
Tauschia hooveri	Hoover's tauschia	PDAPI27040	G2	Yes	13	disjunct	No	-	-
Tauschia stricklandii	Strickland's tauschia	PDAPI27080	G4	No	-	-	Yes	50	Endemic

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Thelypodium brachycarpum	Short-podded thelypody	PDBRA2N010	G3	Yes	25	limited	No	-	-
Thelypodium howellii ssp howellii	Howell's thelypody	PDBRA2N051	G2T2	Yes	25	limited	No	-	-
Trifolium thompsonii	Thompson's clover	PDFAB40280	G2	Yes	13	disjunct?	No	-	-
Trimorpha acris var debilis	Northern daisy	PDASTE1012	G5T4	Yes	25	limited	No	-	-
Triteleia grandiflora var howellii	Howell's triteleia	PMLIL21061	G5T4?	Yes	13	widespread	No	-	-
Utricularia ochroleuca	Northern bladderwort	PDLNT020E0	G4?	No	-	-	Yes	13	widespread
Valeriana columbiana	Wenatchee valerian	PDVAL03050	G2G3	Yes	50	endemic	No	-	-
Veratrum insolitum	Siskiyou false hellebore	PMLIL25040	G3G4	Yes	13	disjunct	No	-	-
Non-vascular Plants									
Brachydontium olympicum	Moss	NBMUS0X020	G2	No	-	-	Yes	13	disjunct
Bridgeoporus nobilissimus	Giant polypore fungus	NFFUN0F010	G2	Yes	7	peripheral	Yes	25	limited
Bruchia bolanderi	Moss	NBMUS13010	G2	No	-	-	Yes	13	disjunct
Calliergon trifarium	Moss	NBMUS1F0A0	G4	Yes	7	peripheral	Yes	7	peripheral
Chiloscyphus gemmiparus	Liverwort	NBHEP0U010	G1	No	-	-	Yes	13	disjunct
Jamesoniella autumnalis var	Liverwort	NBHEP1M012	G5T1	No	-	-	Yes	13	disjunct
Lecanora pringlei		NLLEC923A0	G?	Yes	7	peripheral	Yes	50	endemic
Lobaria linita		NLTEST7930	G4	Yes	7	peripheral	Yes	7	peripheral
Marsupella emarginata var aquatica	Liverwort	NBHEP22083	G5T4?	No	-	-	Yes	25	limited
Nardia japonica	Liverwort	NBHEP2A070	G5	No	13	disjunct	Yes	13	disjunct
Nephroma occultum	Lichen	NLLEC1C050	G2G3	No	-	-	Yes	25	limited
Pilophorus nigricaulis		NLLEC2M050	G4	No	-	-	Yes	7	peripheral
Pseudocyphellaria rainierensis		NLLEC3B060	G1G3	No	-	-	Yes	25	limited
Scapania gymnostomophila	Liverwort	NBHEP330E0	G3G4	No	-	-	Yes	7	peripheral
Scapania obscura	Liverwort	NBHEP330R0	G3Q	No	-	-	Yes	7	peripheral
Schofieldia monticola	Liverwort	NBHEP34010	G3	No	-	-	Yes	13	disjunct

Scientific Name	Common Name	EL Code	G Rank	East Cascades Target	Goals East Cascades	Distribution East Cascades	West Cascades Target	Goals West Cascades	Distribution West Cascades
Stereocaulon spathuliferum	Lichen	NLTES10830	G4G5	No	-	-	Yes	13	disjunct
Tholurna dissimilis		NLCAL5E010	G3G5	Yes	7	peripheral	Yes	7	peripheral
Trematodon boasii		NBMUS7M020	G1	No	-	-	Yes	13	disjunct
Umbilicaria lambii		NLLEC5N110	G2G4	No	-	-	Yes	13?	disjunct?

Appendix 4E – Wildlife Targets Methodology

4E.1 Wildlife Sub Team

The wildlife team primarily dealt with selecting terrestrial vertebrate and invertebrate targets. The team also handled the selection and gathering of data for freshwater invertebrates. Aquatic vertebrates (primarily fish) were the responsibility of the freshwater team.

Table 1. Wildlife team structure and participants with contact information.

Last Name	First Name	Affiliation	Team	Mailing Address	Phone Number	Email Address
Azerrad	Jeffrey	Washington Department of Fish and Wildlife	Wildlife co-lead	2108 Grand Blvd, Vancouver, WA 98661	360-906-6754	azerrjma@dfw.wa.gov
Popper	Ken	The Nature Conservancy – Oregon Field Office	Wildlife co-lead	821 SE 14th Ave., Portland OR 97214	503-802-8116	kpopper@tnc.org
Carey	Chris	Oregon Department of Fish and Wildlife	Wildlife	61374 Parrell Rd., Bend, OR. 97702	541-388-6363	chris.g.carey@state.or.us
Fleckenstein	John	Washington Natural Heritage Program	Wildlife	PO Box 47014, Olympia, WA 98504	360-902-1674	john.fleckenstein@wadnr.gov
Green	Mike	U.S. Fish and Wildlife Service	Wildlife	911 NE 11th Ave., Portland, OR 97232	503-872-2707	Michael_Green@fws.gov
Hallock	Lisa	Washington Natural Heritage Program	Wildlife	PO Box 47014, Olympia, WA 98504	360-902-1670	lisa.hallock@wadnr.gov
Krause	Fayette	The Nature Conservancy – Washington Field Office	Wildlife	1917 1st Ave., Seattle, WA 98101	206-343-4344	fkrause@tnc.org
LaBonte	Jim	Oregon Department of Agriculture	Wildlife	635 Capitol St., NE, Salem, OR 97301	503-986-4749	jlabonte@oda.state.or.us
Ormsbee	Pat	U.S. Forest Service	Wildlife	211 E. 7th Ave., Eugene, OR 97401	541-465-6318	pormsbee@fs.fed.us
Teske	Mark	Washington Department of Fish and Wildlife	Wildlife	201 North Pearl St., Ellensburg, WA 98926	509-962-3421	teskemst@dfw.wa.gov

4E.2 Selecting Targets

Establishing clear and objective criteria for identifying target species is important for maintaining the integrity of the fine filter process and for ensuring an efficient and unbiased assessment. Criteria for target species selection are outlined in *Designing a Geography of Hope* (Groves et al. 2000), however individual ecoregional assessment teams have modified these criteria to be more inclusive of species in need of protection or representation. We used the target criteria developed by the Willamette Valley-Puget Trough-Georgia Basin (WPG) assessment team as a starting point. The most notable modifications they made were the addition of criteria that recognized state-listed species and those with S-ranks of 1-3 as possible targets (WDNR 2004). We selected target wildlife species from the following categories:

- **Imperiled species** have a global rank of G1, G2, or G3 as determined by the Natural Heritage Programs in Washington, Oregon and California.
- **Imperiled subspecies** have a global rank of T1, T2, or T3 as determined by the Natural Heritage Program in Washington, Oregon and California.
- **Federally listed species** are classified as endangered, threatened, or proposed for listing by the U.S. Fish and Wildlife Service (USFWS).
- **Species of special concern** include:
    - ♦ **Species of state concern that are**: (1) ranked as S1, S2, or S3 by one of the state natural heritage programs or (2) listed or candidates for listing as endangered or threatened by state government agencies.
    - ♦ **Declining species** that (1) have exhibited a significant, long-term decline in habitat and/or numbers, and (2) are subject to a continuing high degree of threat.
    - ♦ **Endemic species** restricted to the ecoregion or a part of the ecoregion. We defined endemic as one for which at least 90 percent of its geographic range occurs in the ecoregion.
    - ♦ **Disjunct species** are those with populations that are geographically isolated from populations in other ecoregions.
    - ♦ **Vulnerable species** are often abundant and may not be declining, but some aspect of their life history such as winter range, colonial breeding, or hibernacula makes them especially vulnerable.
    - ♦ **Keystone species** are those whose impact on a community or ecological system is disproportionately large for their abundance. They contribute to ecosystem function in a unique and significant manner through their activities. Their removal causes major changes in community composition.
    - ♦ **Wide-ranging species that depend on vast areas.** These species include top-level predators such as the gray wolf and northern goshawk. Wide-ranging species can be especially useful in examining linkages among conservation areas in a true conservation network. Due to their remote and mountainous nature, the West and East Cascades/Modoc Plateau ecoregions provide important habitat for many wide-ranging species.
    - ♦ **Globally significant** examples of species aggregations like migratory stopover sites or over-wintering areas that contain significant numbers of individuals of many species.
    - ♦ **Partners in Flight (PIF) scores** identify species that may be of conservation concern based on a compound score that considers numerous aspects of a species distribution and population status. This guideline applies only to birds. We referred to guidelines developed by Mehlman

and Hanners (1999) to understand how we could properly apply PIF scores to our selection criteria. Some modifications were made to address concerns expressed by our reviewers.

- ♦ **Species Guilds**. Groups of species that share common ecological processes or patterns. It is often more practical to target such groups as opposed to each individual species of concern.

- **Peripheral species** have only a small part of their natural geographic range in the ecoregion or have experienced a significant range contraction due to habitat destruction or modification. Species that were peripheral to part of the ecoregion but well distributed in others were used as targets only in ecosections more central to their distribution. Peripheral species were especially problematic for the East Cascades/Modoc Plateau ecoregion where the variation in habitat type and climate are sufficiently different that many species only occur at the northern or southern ends of the ecoregion. Consequently we chose not to include species that were peripheral to the ecoregion.

Target List Review. Prior to outside review, team members were asked to review and provide recommendations for modifying the vertebrate and invertebrate target lists. We sent the draft vertebrate list along with a list of species we considered but rejected to selected regional experts (Appendix X.2); lists also were redistributed to the wildlife team for review. We asked reviewers to check for omissions and identify errors using the target selection criteria. Requests were delivered by email and included: (1) written instructions, (2) a draft list, (3) an ecoregional map, (4) the target selection criteria, and (5) a table describing major land cover types for each ecoregion. Reviewers were asked to contact a member of the wildlife team with questions. Although only a portion of reviewers responded, there were important recommendations. Responses were received sporadically over several months and the vertebrate target list was revised by considering all responses collectively. Responses varied among reviewers and those with considerable detail were often given more weight when there were conflicting recommendations. Where placement of a species (keep/add vs. remove) was in question, the default choice was to leave the species on the list if it met the target criteria.

We later developed and distributed the invertebrate target list using a selection and review process similar to that used for vertebrates. Similar review materials were sent to invertebrate experts and we had about a 20% rate of response (Appendix X.2). Differing from our vertebrate target review, a "watch list" was added to capture species where knowledge was too limited to establish their status as a target or reject. We added this list to highlight the significant lack of invertebrate data and to illustrate the need for more survey of invertebrates. Watch-listed species will not be included in the analysis.

Target List. The complete list of vertebrate and invertebrate targets is presented in Appendix 4F. A summary of species included on the list by taxa appears in Chapter 4.3 of the main report; most selected vertebrates met several target selection criteria. Most invertebrates, especially mollusks, fit the endemic species criteria only. An additional 47 invertebrates were considered but subsequently excluded from the target list and are listed separately in Appendix 4F in the Watch List.

Of all vertebrate targets, none had a global rank of G1; two were ranked G2; and the remainder was ranked G3 through G5 (Table X.1). Differing significantly from vertebrates, most invertebrate targets were a G1 or G2 rank. Species were listed as targets regardless of whether we had sufficient data to include them in the analysis.

4E.3 Data Sources

Usable data was gathered from a number of sources (Table X.2). Data was excluded if the last observed date was before 1984, locational uncertainty was too imprecise, status of target was historic or extirpated, sighting was not verified by a credible observer, or the type of data was not correct for that species (e.g., most birds required breeding evidence). For all non-heritage data, we compared observations with Heritage datasets to eliminate redundant data. In general, point observations for wide ranging species (e.g., Fisher) were not selected.

Table 2. Data sources for the Cascades ecoregions.

Data Source	State	Primary Target or Taxa
ORNHIC	OR	Vertebrates, Invertebrates
WDFW – Heritage[1]	WA	Vertebrates, Invertebrates
WDFW - PHS	WA	Birds, Mammals
CNDDB	CA	Vertebrates
West Fork Timber	WA	Amphibians, Northern Goshawk
Yakama Nation	WA	Northern Spotted Owl
USFS - ISMS	CA, OR, WA	Amphibian, Mollusks, Great gray owl, Red Tree Vole
USFS - WILDOBS	OR, WA	Amphibians, Birds
ODFW	OR	Greater sandhill crane
USFWS	OR, WA	Band-tailed pigeon

[1] Included as WDFW Heritage data from several related datasets (Northern spotted owl, Marbled murrelet, and amphibians and reptiles databases).

At least one usable Element Occurrence (EO) was available for 97 of 186 fine filter targets. Of those targets, 28 species (all vertebrates) had data enough to meet the default goals for at least one ecoregion (Table X.3).

Data gaps. We encountered a complete lack of data for many fine filter targets. For other targets, data gaps existed only in specific ecosections. Gaps with the invertebrate data set were most striking, especially in Washington. One or more usable EOs were available for 42 of the 101 invertebrate targets. However, not a single invertebrate had enough data to meet default conservation goals (Table X.3). Because most invertebrates were selected because they were endemic, most needed 50 EOs to meet their goal. Few came even close to 50 EOs.

With the exception of woodpeckers and raptors, little data was available for most birds and a number of mammals and reptiles. Little or no data was available for most passerines and waterbirds. No data was available for several small mammals (i.e., primarily voles and shrews) and two reptiles (i.e., striped whipsnake, western rattlesnake).

Several noticeable gaps were the result of differences in survey effort between adjacent states. The most striking difference was seen with western gray squirrel in the Eastside Oak section of the East Cascades. Survey intensity for this target was very high in Washington, while no data existed south of the Columbia River in Oregon. Although not as pronounced, similar issues were found along the boundary of California and Oregon (i.e., white-headed woodpecker, northwestern pond turtle, great gray owl) and Oregon and Washington (i.e., California mountain kingsnake, tailed frog, red-legged frog, cascades frog, harlequin duck, Lewis' woodpecker).

In general, data for California lagged behind Oregon and Washington. Over 6000 EOs were available in Oregon and Washington, while fewer than 1000 represented California's total.

4E.4 Target Representation

Most wildlife data for Oregon and California came from ORNHIC and CNDDB. These two data sets followed Natureserve methodologies and were usable in their existing form. Other data sets were not already in appropriate form and had to be transformed into EOs. Generally fine filter data was transformed from point data to polygonal EOs by first delineating the locational uncertainty distance away from each point. Polygonal data was then generally grouped using a species-specific separation distance that aggregated multiple observations that likely represent individual EOs. This approach, originally developed for the Okanogan Ecoregional Assessment, accurately reflects the likely extent of target habitats within our portfolio. Each EO is labeled with a unique identification number.

Some specific datasets were handled differently. For instance, multiple points representing unique raptor territories were already reliably grouped in WDFW's Heritage database. We therefore did not need to create EOs for northern goshawk, golden eagle, or peregrine falcon. For marbled murrelets we derived an alternative separation distance using the diameter of the mean size for nest stands in Washington; this modification increased the number of EOs and made them more spatially distinct.

4E.5 Setting Goals

Default conservation goals were set for the ecoregion following those recommended by Comer (2001, see Table X.3). Species distributions were defined as following:

Endemic = >90% of global distribution in ecoregion,
Limited = global distribution in 2-3 ecoregions,
Disjunct = distribution in ecoregion quite likely reflects significant genetic differentiation from main range due to historic isolation; roughly >2 ecoregions separate this ecoregion from central parts of it's range
Widespread = global distribution >3 ecoregions,
Peripheral = <10% of global distribution in ecoregion

Table 3. Default Ecoregional Goals for targets based on distribution, spatial pattern, and risk scenario. (Based on Comer 2003) P = population EOs; N= nest EOs, based on z = 0.3

<table>
<tr><th rowspan="4">Distribution Relative to Ecoregion</th><th colspan="6">Spatial Pattern of Occurrence</th></tr>
<tr><th colspan="3">Matrix, Large Patch and Linear Ecological Systems</th><th colspan="3">Small Patch Ecological Systems and All Rare Communities Fine Filter Species Targets</th></tr>
<tr><th colspan="3">Default Area or Length, per Section or Ecological Drainage Unit (% of historic)</th><th colspan="3">Default Number of Occurrences</th></tr>
<tr><th>"High Risk" Scenario</th><th>"Moderate Risk" Scenario</th><th>"Low Risk" Scenario</th><th>"Higher Risk" Scenario</th><th>"Middle Risk" Scenario (Default)</th><th>"Lower Risk" Scenario</th></tr>
<tr><td>Endemic</td><td rowspan="4">18%</td><td rowspan="4">30%</td><td rowspan="4">48%</td><td>P: 25
N: 63</td><td>P: 50
N: 125</td><td>P: 75
N: 188</td></tr>
<tr><td>Limited</td><td>P: 13
N: 34</td><td>P: 25
N: 67</td><td>P: 38
N: 101</td></tr>
<tr><td>Widespread/Disjunct</td><td>P: 7
N: 19</td><td>P: 13
N: 38</td><td>P: 20
N: 57</td></tr>
<tr><td>Peripheral</td><td>P: 4
N: 12</td><td>P: 7
N: 23</td><td>P: 11
N: 35</td></tr>
</table>

If there was sufficient reason and agreement among the animal team members, goals were adjusted for individual species. Default goals were increased, but never decreased. Recovery goals under the Endangered Species Act were used for bald eagle and peregrine falcon. For other listed species such as northern spotted owls, we set goals at percentage of occurrence (typically set at 50%). Goals were set both for an ecoregional total and by section. The sectional goals were set based on species' distribution to ensure stratification across its range. For Marxan runs, goals were lowered to 90% of the available amount if there were not enough EOs to meet the Conservation goal.

Table 4. Complete list of those who reviewed the wildlife team draft target list.

Last Name	First Name	Title	Affiliation	Email Address
Adams	Jeff	Aquatic Program Director	The Xerces Society	jadams@xerces.org
Alexander	John	Executive Director	The Klamath Bird Observatory	jda@klamathbird.org
Altman	Bob	Northern Pacific Rainforest Bird Conservation Region Coordinator	American Bird Conservancy	baltman@abcbirds.org
Buchanan	Joe	Wildlife Biologist	Washington Department of Fish and Wildlife	buchajbb@dfw.wa.gov
Burnett	Ryan	Program Leader	Point Reyes Bird Observatory	rburnett@prbo.org
Chappell	Chris	Vegetation Ecologist	Washington Natural Heritage Program	chris.chappell@wadnr.gov
Cope	Mick	Upland Game Section Manager	Washington Department of Fish and Wildlife	copemgc@dfw.wa.gov
Erickson	Janet	Information Specialist	OSU Cooperative Forest Ecosystem Research program	Janet.Erickson@orst.edu
Fleckenstein	John	Zoologist	Washington Natural Heritage Program	john.fleckenstein@wadnr.gov
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Scheuering	Eric	Zoology Data Manager	Oregon Natural Heritage Information Center	eric.scheuering@oregonstate.edu
Simmons-Rigdon	Heather	Wildlife Biologist	Yakama Nation-Wildlife	heathersr@yakama.com
Vaughan	Mace	Conservation Director	The Xerces Society	mace@xerces.org

* Previously with WDFW

Appendix 4F – Target Lists for Wildlife and Invertebrates

Table 1. Wildlife Vertebrate Targets

Common Name	Scientific Name	EL Code	G Rank	Target East Cascades	Distribution East Cascades	Goal East Cascades	Target West Cascades	Distribution West Cascades	Goal West Cascades	EO type*
Amphibians										
Cascade torrent salamander	*Rhyacotriton cascadae*	AAAAJ01030	G3	Yes	Peripheral	7	Yes	Endemic	50	P
Cascades frog	*Rana cascadae*	AAABH01060	G3	Yes	Peripheral	7	Yes	Limited	25	P
Clouded salamander	*Aneides ferreus*	AAAAD01020	G3	Yes	Peripheral	7	Yes	Widespread	13	P
Coastal tailed frog	*Ascaphus truei*	AAABA01010	G4	Yes	Widespread	13	Yes	Widespread	13	P
Columbia spotted frog	*Rana luteiventris*	AAABH01290	G4	Yes	Limited	25	No	-	-	P
Cope's giant salamander	*Dicamptodon copei*	AAAAH01010	G3	Yes	Peripheral	7	Yes	Limited	25	P
Foothill yellow-legged frog	*Rana boylii*	AAABH01050	G3	Yes	Historical	-	Yes	Peripheral	7	P
Larch mountain salamander	*Plethodon larselli*	AAAAD12100	G3	Yes	Peripheral	7	Yes	Endemic	50	P
Northern leopard frog	*Rana pipiens*	AAABH01170	G5	Yes	Historical	-	No	-	-	P
Northern red-legged frog	*Rana aurora aurora*	AAABH01021	G4T4	No	Peripheral	7	Yes	Widespread	13	P
Oregon slender salamander	*Batrachoseps wrighti*	AAAAD02100	G3	Yes	Peripheral	7	Yes	Endemic	50	P
Oregon spotted frog	*Rana pretiosa*	AAABH01180	G2	Yes	Limited	25	Yes	Peripheral	7	P
Southern torrent salamander	*Rhyacotriton variegatus*	AAAAJ01020	G3G4	No	-	-	Yes	Disjunct	13	P
Tiger salamander	*Ambystoma tigrinum*	AAAAA01140	G5	Yes	Disjunct	13	No	-	-	P
Van dyke's salamander	*Plethodon vandykei*	AAAAD12190	G3	No	-	-	Yes	Limited	25	P
Western toad	*Bufo boreas*	AAABB01030	G4	Yes	Widespread	13	Yes	Widespread	13	P
Birds										
American peregrine falcon	*Falco peregrinus anatum*	ABNKD06071	G4T3	Yes	Peripheral	7	Yes	Widespread	13	P

Common Name	Scientific Name	EL Code	G Rank	Target East Cascades	Distribution East Cascades	Goal East Cascades	Target West Cascades	Distribution West Cascades	Goal West Cascades	EO type*
American white pelican	*Pelecanus erythrorhynchos*	ABNFC01010	G3	Yes	Widespread	13	No	-	-	P
Bald eagle	*Haliaeetus leucocephalus*	ABNKC10010	G4	Yes	Widespread	105	Yes	Widespread	37	N
Band-tailed pigeon	*Columba fasciata*	ABNPB01080	G4	Yes	Peripheral	7	Yes	Widespread	13	P
Black swift	*Cypseloides niger*	ABNUA01010	G4	Yes	Widespread	13	Yes	Widespread	13	P
Black-backed woodpecker	*Picoides arcticus*	ABNYF07090	G5	Yes	Widespread	38	Yes	Peripheral	23	N
Black-throated gray warbler	*Dendroica nigrescens*	ABPBX03070	G5	Yes	Widespread	13	Yes	Widespread	13	P
Brown creeper	*Certhia americana*	ABPBA01010		Yes	Widespread	13	Yes	Widespread	13	P
Bufflehead	*Bucephala albeola*	ABNJB18030	G5	Yes	Widespread	13	Yes	Peripheral	7	P
Calliope hummingbird	*Stellula calliope*	ABNUC48010	G5	Yes	Widespread	13	Yes	Widespread	13	P
Clark's grebe	*Aechmophorus clarkii*	ABNCA04020	G5	Yes	Widespread	13	No	-	-	P
Common loon	*Gavia immer*	ABNBA01030	G5	Yes	Peripheral	7	Yes	Widespread	13	P
Flammulated owl	*Otus flammeolus*	ABNSB01020	G4	Yes	Widespread	38	No	-	-	N
Golden eagle	*Aquila chrysaetos*	ABNKC22010	G5	Yes	Widespread	38	Yes	Peripheral	23	N
Gray flycatcher	*Empidonax wrightii*	ABPAE33100	G5	Yes	Widespread	13	No	-	-	P
Great blue heron	*Ardea herodias*	ABNGA04010	G5	Yes	Widespread	13	Yes	Widespread	13	P
Great gray owl	*Strix nebulosa*	ABNSB12040	G5	Yes	Widespread	38	Yes	Widespread	38	N
Greater sandhill crane	*Grus canadensis tabida*	ABNMK01014	G5T4	Yes	Widespread	30%	Yes	Peripheral	30	N
Harlequin duck	*Histrionicus histrionicus*	ABNJB15010	G4	Yes	Widespread	13	Yes	Widespread	13	P
Hermit warbler	*Dendroica occidentalis*	ABPBX03090	G4G5	Yes	Widespread	13	Yes	Widespread	13	P
Horned grebe	*Podiceps auritus*	ABNCA03010	G5	Yes	Disjunct	13	No	-	-	P
Killdeer	*Charadruis vociferus*	ABNNB03090	G5	Yes	Widespread	13	Yes	Widespread	13	P
Lesser snow goose	*Chen caerulescens caerulescens*	ABNJB04010	G5	Yes	Peripheral	7	No	-	-	P
Lewis's woodpecker	*Melanerpes lewis*	ABNYF04010	G4	Yes	Widespread	38	No	Peripheral	23	N
Marbled murrelet	*Brachyramphus marmoratus*	ABNNN06010	G3G4	No	-	-	Yes	Peripheral	23	N
Northern goshawk	*Accipiter gentilis*	ABNKC12060	G5	Yes	Widespread	38	Yes	Widespread	38	N

Common Name	Scientific Name	EL Code	G Rank	Target East Cascades	Distribution East Cascades	Goal East Cascades	Target West Cascades	Distribution West Cascades	Goal West Cascades	EO type*
Northern spotted owl	*Strix occidentalis caurina*	ABNSB12011	G3T3	Yes	Widespread	50%	Yes	Widespread	50	N
Northern waterthrush	*Seiurus noveboracensis*	ABPBX10020	G5	Yes	Disjunct	13	Yes	Disjunct	13	P
Olive-sided flycatcher	*Conropus cooperi*	ABPAE32010	G4	Yes	Widespread	13	Yes	Widespread	13	P
Pileated woodpecker	*Dryocopus pileatus*	ABNYF12020	G5	Yes	Widespread	38	Yes	Widespread	38	N
Red-necked grebe	*Podiceps grisegena*	ABNCA03020	G5	Yes	Disjunct	13	No	-	-	P
Ross's goose	*Chen rossii*	ABNJB04020		Yes	Peripheral	7	No	-	-	P
Rufous hummingbird	*Selasphorus rufus*	ABNUC51020	G5	Yes	Widespread	13	Yes	Widespread	13	P
Townsend's warbler	*Dendroica townsendi*	ABPBX03080	G5	Yes	Widespread	13	Yes	Widespread	13	P
Tricolored blackbird	*Agelaius tricolor*	ABPBXB0020	G3	Yes	Widespread	13	No	-	-	P
Trumpeter swan	*Cygnus buccinator*	ABNJB02030	G4	Yes	Peripheral	7	No	-	-	P
Tule white-fronted goose	*Anser albifrons frontalis*	ABNJB03043		Yes	Peripheral	7	No	-	-	P
Tundra swan	*Cygnus columbianus*	ABNJB02010	G5	Yes	Peripheral	7	No	-	-	P
Vaux's swift	*Chaetura vauxi*	ABNUA03020	G5	Yes	Widespread	13	Yes	Widespread	13	P
Western burrowing owl	*Athene cunicularia hypugaea*	ABNSB10012	G4TU	Yes	Widespread	13	No	-	-	P
Western grebe	*Aechmophorus occidentalis*	ABNCA04010	G5	Yes	Widespread	13	No	-	-	P
Western snowy plover	*Charadrius alexandrinus nivosus*	ABNNB03031	G4T3	Yes	Peripheral	7	No	-	-	P
White-faced ibis	*Plegadis chihi*	ABNGE02020	G5	Yes	Widespread	13	No	-	-	P
White-headed woodpecker	*Picoides albolarvatus*	ABNYF07070	G4	Yes	Widespread	13	No	Peripheral	7	P
Williamson's sapsucker	*Sphyrapicus thyroideus*	ABNYF05030	G5	Yes	Widespread	38	Yes	Peripheral	23	N
Willow flycatcher	*Empidonax traillii*	ABPAE33040	G5	Yes	Widespread	13	Yes	Widespread	13	P
Yellow rail	*Coturnicops noveboracensis*	ABNME01010	G4	Yes	Disjunct	13	No	-	-	P
Yellow-billed cuckoo	*Coccyzus americanus*	ABNRB02020	G5	Yes	Historical		No	-	-	P
Mammals										
American marten	*Martes americana*	AMAJF01010	G5	Yes	Widespread	13	Yes	Widespread	13	P

Common Name	Scientific Name	EL Code	G Rank	Target East Cascades	Distribution East Cascades	Goal East Cascades	Target West Cascades	Distribution West Cascades	Goal West Cascades	EO type*
Baird's shrew	*Sorex bairdii permiliensis*	AMABA01322	G4T3	No	-	-	Yes	Widespread	13	P
California bighorn sheep	*Ovis canadensis californiana*	AMALE04011	G4T1	Yes	Widespread	13	No	-	-	P
California wolverine	*Gulo gulo luteus*	AMAJF03012	G4T3Q	Yes	Widespread	13	Yes	Widespread	13	P
Canada lynx	*Lynx canadensis*	AMAJH03010	G5	Yes	Widespread	13	Yes	Peripheral	7	P
Elk	*Cervus elaphus*	AMALC01010	G5	Yes	Widespread	13	Yes	Widespread	13	P
Fringed bat	*Myotis thysanodes*	AMACC01090	G4G5	Yes	Widespread	13	Yes	Peripheral	7	P
Gray wolf	*Canis lupus*	AMAJA01030	G4	Yes	Historical	-	Yes	Historical	-	P
Grizzly bear	*Ursus arctos horribilis*	AMAJB01021	G4T3T4	Yes	Historical	-	Yes	Historical	-	P
Keen's myotis	*Myotis keenii*	AMACC01060	G2G3	No	-	-	Yes	Peripheral	7	P
Long-legged bat	*Myotis volans*	AMACC01110	G5	Yes	Widespread	13	Yes	Widespread	13	P
Mountain goat	*Oreamos americana*	AMALE02010	G5	Yes	Widespread	13	Yes	Widespread	13	P
Oregon red tree vole	*Arborimus longicaudus*	AMAFF23020	G3G4	No	-	-	Yes	Widespread	13	P
Pacific fisher	*Martes pennanti pacifica*	AMAJF01021	G5T3T4 Q	Yes	Widespread	13	Yes	Widespread	13	P
Pacific shrew	*Sorex pacificus cascadensis*	AMABA01092	G3G4T3	No	-	-	Yes	Widespread	13	P
Pygmy rabbit	*Brachylagus idahoensis*	AMAEB04010	G4	Yes	Disjunct	13	No	-	-	P
Ringtail	*Bassariscus astutus*	AMAJE01010	G5	Yes	Peripheral	7	Yes	Peripheral	7	P
Sierra nevada red fox	*Vulpes vulpes necator*	AMAJA03012	G5T3	Yes	Limited	25	No	-	-	P
Spotted bat	*Euderma maculatum*	AMACC07010	G4	Yes	Peripheral	7	No	-	-	P
Townsend's big-eared bat	*Corynorhinus townsendii*	AMACC08010	G4	Yes	Widespread	13	Yes	Widespread	13	P
Western gray squirrel	*Sciurus griseus*	AMAFB07020	G5	Yes	Widespread	13	Yes	Peripheral	7	P
Western small-footed bat	*Myotis ciliolabrum*	AMACC01140	G5	Yes	Peripheral	7	No	-	-	P
White-footed vole	*Arborimus albipes*	AMAFF23010	G3G4	No	-	-	Yes	Widespread	13	P
Reptiles										
California mountain kingsnake	*Lampropeltis zonata*	ARADB19060	G4G5	Yes	Disjunct	13	Yes	Peripheral	7	P
Northwestern pond turtle	*Clemmys marmorata marmorata*	ARAAD02031	G3G4T3	Yes	Widespread	13	Yes	Widespread	13	P

Common Name	Scientific Name	EL Code	G Rank	Target East Cascades	Distribution East Cascades	Goal East Cascades	Target West Cascades	Distribution West Cascades	Goal West Cascades	EO type*
Sharptail snake	*Contia tenuis*	ARADB09010	G5	Yes	Disjunct	13	Yes	Peripheral	7	P
Striped whipsnake	*Masticophis taeniatus*	ARADB21040	G5	Yes	Peripheral	7	No	-	-	P
Western rattlesnake	*Crotalus viridis*	ARADE02120	G5	Yes	Widespread	13	No	Peripheral	7	P
Bat guild							Yes			
Chamber roosting bats				Yes	Widespread	13	Yes	Widespread	13	P
Cliff/rock feature bats				Yes	Widespread	13	Yes	Widespread	13	P
Forest bats				Yes	Widespread	13	Yes	Widespread	13	P
Forest edge/shrub-steppe bats				Yes	Widespread	13	No	-	-	P
Bird guild										
Shorebird concentrations				Yes	Widespread	13	Yes	Widespread	13	P
Waterfowl concentrations				Yes	Widespread	13	Yes	Widespread	13	P

* P = population or EO N = nest

Table 2. Invertebrate Target List

Scientific Name	Common Name	El Code	G Rank	Target East Cascades	Target West Cascades	Reason for inclusion	Terrestrial or Freshwater
Mollusks							
Amnicola sp 5 (*Lyogyrus* sp 3)	Klamath duskysnail	IMGASF4220		Yes	No	Endemic	FW
Amnicola sp 7 (*Lyogyrus* sp 6)	Mare's egg duskysnail	IMGASF4240	G2T1	Yes	No	Endemic	FW
Amnicola sp 8 (*Lyogyrus* sp 5)	Nodose duskysnail	IMGASF4250	G2	Yes	No	Endemic	FW
Amnicola sp. 2	Washington duskysnail	IMGASF4190	G3T1	Yes	No	likely endemic	FW
Amnicola sp. 4	Columbia duskysnail	IMGASF4210	G2	Yes	Yes	Possible endemic	FW
Anodonta californiensis	California floater	IMBIV04020	G3	Yes	Yes	Declining	FW
Cryptomastix hendersoni	Columbia River Oregonian	IMGAS93030	G1	Yes	Yes	Likely endemic.	Terr
Fisherola nuttalli	Giant Columbia River limpet	IMGASL6010		Yes	Yes	Declining	FW

Scientific Name	Common Name	El Code	G Rank	Target East Cascades	Target West Cascades	Reason for inclusion	Terrestrial or Freshwater
Fluminicola modoci	Modoc pebblesnail	IMGASG3080	G1	Yes	No	Endemic	FW
Fluminicola sp 11 (as in NatureServe)	Nerite pebblesnail	IMGASG3230	G1	Yes	No	Endemic	FW
Fluminicola sp 14 (as in NatureServe)	Tall pebblesnail	IMGASG3260		Yes	No	Endemic	FW
Fluminicola sp 15 (as in NatureServe)	Tiger lily pebblesnail	IMGASG3270		Yes	No	Endemic	FW
Fluminicola sp 16 (as in NatureServe)	Toothed pebblesnail	IMGASG3280		Yes	No	Endemic	FW
Fluminicola sp 18 (as in NatureServe)	Wood River pebblesnail	IMGASG3300	G1QT1	Yes	No	Endemic	FW
Fluminicola sp 19 (as in NatureServe)	Keene Creek pebblesnail	IMGASG3310		Yes	No	Endemic	FW
Fluminicola sp 3 (as in NatureServe)	Diminuitive pebblesnail	IMGASG3150		Yes	No	Endemic	FW
Fluminicola sp 4 (as in NatureServe)	Fall Creek pebblesnail	IMGASG3160		Yes	No	Endemic	FW
Fluminicola sp 5 (as in NatureServe)	Klamath pebblesnail	IMGASG3170	G1	Yes	No	Endemic	FW
Fluminicola sp 6 (as in NatureServe)	Klamath rim pebblesnail	IMGASG3180	G1	Yes	No	Endemic	FW
Fluminicola sp 8 (as in NatureServe)	Lost River pebblesnail	IMGASG3200		Yes	No	Endemic	FW
Fluminicola sp. 13 (as in Frest and Johannes)	topaz pebblesnail	IMGAS		Yes	No	Endemic	FW
Fluminicola sp. 15 (as in Frest and Johannes)	contrary pebblesnail	IMGAS	G2	Yes	No	Endemic	FW
Fluminicola sp. 17 (as in Frest and Johannes)	Fredenburg pebblesnail	IMGAS		Yes	No	Endemic	FW
Fluminicola sp. 18 (as in Frest and Johannes)	Umpqua pebblesnail	IMGAS	G3T1	No	Yes	Endemic	FW
Fluminicola sp. 32 (as in Frest and Johannes)	Rogue pebblesnail	IMGAS		No	Yes	Endemic	FW
Fluminicola sp. 34 (as in Frest and Johannes)	evergreen pebblesnail	IMGAS		No	Yes	Endemic	FW
Fluminicola sp. 35 (as in Frest and Johannes)	Camp Creek pebblesnail	IMGAS	G2	No	Yes	Endemic	FW
Fluminicola sp. 36 (as in Frest and Johannes)	Clarke Creek pebblesnail	IMGAS	G1	No	Yes	Endemic	FW
Fluminicola sp. 37 (as in Frest and Johannes)	beverdam pebblesnail	IMGAS	G1	No	Yes	Endemic	FW
Fluminicola sp. 38 (as in Frest and Johannes)	Little Butte pebblesnail	IMGAS	G1	No	Yes	Endemic	FW
Fluminicola sp. 9 (as in Frest and Johannes)	lunate pebblesnail	IMGAS	G2T1	Yes	No	Endemic	FW

Scientific Name	Common Name	El Code	G Rank	Target East Cascades	Target West Cascades	Reason for inclusion	Terrestrial or Freshwater
Fluminicola sp. nov. 10 (As in Natureserve)	Metolius pebblesnail	IMGAS	G2	Yes	No	Endemic	FW
Fluminicola sp. nov. 12 (As in Natureserve)	Odessa pebblesnail	IMGAS3240	G1	Yes	No	Endemic	FW
Fluminicola sp. nov. 13 (As in Natureserve)	Ouxy Spring pebblesnail	IMGAS3250	G2	Yes	No	Endemic	FW
Fluminicola sp. nov. 2 (As in Natureserve)	Cassebeer pebblesnail	IMGAS3140	G2	Yes	No	Endemic	FW
Fluminicola sp. nov. 20 (As in Natureserve)	Crooked Creek pebblesnail	IMGAS3320	G1	Yes	No	Endemic	FW
Fluminicola sp. nov. 7 (As in Natureserve)	Lake of the Woods pebblesnail	IMGAS3190	G1G2	Yes	No	Endemic	FW
Gonidea angulata	Western ridgemussel	IMBIV19010	G1QT1	Yes	Yes	Declining	FW
Helminthoglypta hertleini	Oregon Shoulderband (snail)	IMGASC2280	G1	Yes	No		
Juga (Juga) sp. 3 (as in NatureServe)	brown juga	IMGASK4120	G2	Yes	Yes	Potential endemic	FW
Juga (Oreobasis) sp. 1?	juga sp	IMGAS		Yes	Yes	Potential endemic	FW
Juga acutifilosa	Scalloped juga (snail)	IMGASK4090	G2	Yes	No		FW
Juga hemphilli dallesensis	Dalles juga	IMGASK4032	G1	Yes	Yes	Potential endemic	FW
Juga hemphilli subsp 1	Indian Ford juga	IMGASK4034		Yes	No	Potential endemic	FW
Juga sp. 1 (as in Natureserve)	Basalt Juga	IMGASK4100	G1	Yes	Yes		FW
Juga sp. 6 (as in Natureserve)	Purple Juga (Oak Springs)	IMGAS	G1	Yes	No	Potential endemic	FW
Lanx klamathensis	Scale lanx	IMGASL7020		Yes	No	Endemic	FW
Lyogyrus sp. 2	Masked duskysnail	IMGASF4270	G1	Yes	No	Potential endemic	FW
Megomphix hemphilli	Oregon megomphid	IMGASB2020	G1	No	Yes	Declining.	Terr
Monadenia fidelis celeuthia	Travelling sideband (snail)	IMGASC7035		No	Yes	Endemic	
Monadenia sp. 1	Modoc Rim sideband	IMGASC7140	G1G2	Yes	No	Endemic	Terr
Oreohelix junii	Grand Coulee mountainsnail	IMGASB5230		Yes	No	Potential endemic	Terr
Oreohelix sp. 1	Chelan mountainsnail	IMGASB5840	G1	Yes	No	Potential endemic	Terr

Scientific Name	Common Name	El Code	G Rank	Target East Cascades	Target West Cascades	Reason for inclusion	Terrestrial or Freshwater
Pisidium ultramontanum	Montane peaclam	IMBIV51220	G2	Yes	No	Potential endemic	FW
Pristiloma arcticum crateris	Crater Lake tightcoil	IMGAS80150	G1	Yes	Yes	Likely endemic	Terr
Prophysaon n sp 1	Klamath tail-dropper	IMGAS62100	G1	Yes	No	Likely endemic	Terr
Pyrgulopsis archimedis	Archimedes springsnail	IMGASJ0010	G1	Yes	No	Endemic	FW
Pyrgulopsis sp 9 (as in NatureServe)	Klamath Lake springsnail	IMGASJ0590	G1	Yes	No	Endemic	FW
Pyrgulopsis sp. nov. 7 (As in Natureserve)	Lost River springsnail	IMGAS0570	G2	Yes	No		FW
Trilobopsis sp. 3	Ashland chaparral	IMGAS	G1	No	Yes	Potential endemic	Terr
Trilobopsis sp. 4	Lost Creek chaparral	IMGAS	G2	No	Yes	Potential endemic	Terr
Valvata mergella	Rams-horn valvata	IMGASE5040	G1	No	Yes	Declining	FW
Vespericola (columbianus) depressa	Dalles hesperian	IMGASA4090	G2	Yes	Yes	Potential endemic.	Terr
Vespericola sp. 10	Rogue hesperian	IMGAS	G1	No	Yes	Potential endemic	Terr
Vespericola sp. 11	Mowich hesperian	IMGAS	G4G5T1	No	Yes	Potential endemic	Terr
Vespericola sp. 23	cocklebur hesperian	IMGAS	G1	No	Yes	Potential endemic	Terr
Vespericola sp. 5	Umpqua hesperian	IMGAS		No	Yes	Potential endemic	Terr
Vespericola sp. 7	Idlewyld hesperian	IMGAS		No	Yes	Potential endemic	Terr
Vespericola sp. 9	cryptic hesperian	IMGAS	G2	No	Yes	Potential endemic	Terr
Vorticifex effusus dalli	Dall's ramshorn	IMGASN2011	G1	Yes	No	Endemic	FW
Vorticifex effusus diagonalis	Lined ramshorn	IMGASN2012	G3	Yes	No	Endemic	FW
Vorticifex klamathensis klamathensis	Klamath ramshorn	IMGASN2041	G1	Yes	No	Endemic	FW
Vorticifex klamathensis sinitsini	Sinitsin ramshorn	IMGASN2042	G2Q	Yes	No	Endemic	FW
Insects							
Agonum belleri	Beller's ground beetle	IICOL4H010	G3	Yes	Yes	Vulnerable	Terr

Scientific Name	Common Name	El Code	G Rank	Target East Cascades	Target West Cascades	Reason for inclusion	Terrestrial or Freshwater
Bombus franklini	Franklin's bumble bee	IIHYM24010	GNR	No	Yes	Possible endemic, declining	Terr
Eanus hatchi	Hatch's click beetle	IICOL4K010	G2?	No	Yes	Vulnerable, possible endemic	Terr
Eobrachycentrus gelidae	Mt Hood Primitive Brachycentrid Caddisfly	IITRI08010	G3	No	Yes	Possible endemic	Larv: aq; Adult: Terr
Erynnis propertius	Propertius duskywing	IILEP37050	G5	Yes	Yes	declining	Terr
Euphydryas editha taylori	Taylor's checkerspot	IILEPK405K	G5T1	Yes	Yes	rare	Terr
Habrodais grunus herri	chinquapin hairstreak	IILEPC8012	G4G5T2 T3	Yes	Yes	Vulnerable, possible endemic	Terr
Hesperia nevada nevada	Nevada skipper	IILEP65180	G5	Yes	No	Possible endemic, vulnerable	Terr
Mitoura johnsoni	Johnson's hairstreak	IILEPE2100	G3G4	Yes	Yes	Vulnerable	Terr
Nebria acuta acuta	a ground beetle	IICOL		Yes	Yes	Possible endemic	Terr
Nebria kincaidi balli	a ground beetle	IICOL		Yes	Yes	Possible endemic	Terr
Nebria meanyi meanyi	a ground beetle	IICOL		Yes	Yes	Possible endemic	Terr
Nebria paradisi	a ground beetle	IICOL		Yes	Yes	Possible endemic	Terr
Nebria vandykei vandykei	a ground beetle	IICOL		No	Yes	Possible endemic	Terr
Nebria vandykei wyeast	a ground beetle	IICOL6L162	GNRT3?	No	Yes	Possible endemic	Terr
Polites mardon klamathensis	mardon skipper	IILEP66032	G2G3T1 T2	Yes	Yes	Possible endemic	Terr
Polites mardon mardon	mardon skipper	IILEP66031	G2G3T2 T3	Yes	Yes	Vulnerable, endemic	Terr
Pterostichus inanis	a ground beetle	IICOL		No	Yes	Possible endemic	Terr

Scientific Name	Common Name	El Code	G Rank	Target East Cascades	Target West Cascades	Reason for inclusion	Terrestrial or Freshwater
Pterostichus johnsoni	Johnsons Waterfall carabid beetle	IICOL6E170	GNR	No	Yes	Vulnerable, possible endemic	Terr
Pterostichus neobrunneus	a ground beetle	IICOL		No	Yes	Possible endemic	Terr
Pterostichus testaceus	a ground beetle	IICOL		Yes	Yes	Possible endemic	Terr
Scaphinotus hatchi	a ground beetle	IICOL4L010	G3	Yes	Yes	Possible endemic	Terr
Soliperla fenderi	Fender's Soliperlan Stonefly	IIPLE1G020	G2	No	Yes	Endemic	Terr
Speyeria cybele pugetensis	great-spangled fritillary	IILEPJ6028	G5TU	No	Yes	vulnerable, declining	Terr
Speyeria egleis moecki	Great Basin fritillary	IILEPJ610?		Yes	No	Possible endemic	Terr
Speyeria egleis oweni	Great Basin fritillary	IILEPJ610?		Yes	Yes	Vulnerable	Terr
Speyeria zerene bremnerii	valley silverspot	IILEPJ608A	G5T3T4	No	Yes	vulnerable, declining	Terr
Crustacean							
Pacifastacus fortis	Shasta crayfish	ICMAL31010	G1	Yes	No	endemic, vulnerable	FW

Table 3. Invertebrate Watch List

					Possible Distribution					
Scientific Name	**Common Name**	**El Code**	**G Rank**	**Terrestrial or Freshwater**	**CA**	**OR-E**	**OR-W**	**WA-E**	**WA-W**	**Reason for Inclusion**
Mollusk										
Monadenia fidelis minor	A snail	IMGASC7031	G4G5T2	Terr	N	Y	N	N	N	Potential endemic
Juga hemphilli hemphilli	Barren juga	IMGASK4033	G2T1	FW	N	N	?	N	Y	Possible endemic
Monadenia chaceana	Chace sideband? (snail)	IMGASC7150	G2	Terr	Y	?	Y	N	N	rare
Hemphillia dromedarius	Dromedary jumping-slug	IMGAS59040	G3G4	Terr	N	?	?	Y	Y	
Deroceras hesperium	Evening fieldslug	IMGAS87020	G1	Terr	?	Y	Y	?	?	rare
Fluminicola fuscus	Giant Columbia River spire snail	IMGASG3040	G3	FW	N	?	Y	Y	Y	Declining
Helisoma newberryi newberryi	Great Basin ramshorn (snail)	IMGASM6021	G1T1	Terr	Y	Y	N	N	N	
Lanx alta	Highcap lanx	IMGASL7010	G1	FW	Y	N	Y	N	N	rare
Hemphillia malonei	Malone jumping-slug	IMGAS59060	G3	Terr	N	Y	Y	?	?	potential endemic
Vorticifex neritoides	Nerite ramshorn	IMGASN2030	G1Q	FW	N	Y	Y	Y	Y	Declining
Fluminicola virens	Olympia pebblesnail	IMGASG3130	G2	FW	N	Y	Y	Y	Y	Possible endemic
Juga plicifera	Pleated Juga	IMGASK4080	G3	FW	?	N	?	N	?	Possible endemic
Cryptomastix devia	Puget oregonian (snail)	IMGAS93010	G2	FW	Y	N	Y	?	?	rare
Physella columbiana	Rotund physa	IMGASM0060	G2	FW	N	N	Y	N	Y	Potential endemic
Gliabates oregonius	Salamander slug	IMGASC1010	G1Q	Terr	?	Y	Y	?	?	rare
Vespericola sierranus	Siskiyou hesperian (snail)	IMGASA4080	G2	Terr	Y	Y	Y	n	n	rare
Hemphillia glandulosa	Warty jumping slug	IMGAS59050	G3	Terr	N	N	Y	N	Y	Potential endemic
Margaritifera falcata	Western pearlshell mussel	IMBIV27020	G4	FW	Y	Y	Y	Y	Y	Declining
Insect										
Cymindis seriata	a beetle	IICOL		Terr	N	N	?	N	?	Possible endemic
Philotiella leona	a blue	IILEPG3020	G1G2	Terr	N	Y	N	N	N	Vulnerable, possible endemic
Himalopsyche phryganea	a caddisfly	IITRIG1010	GNR	Terr	?	?	?	?	?	Rare
Pterostichus craterensis	a ground beetle	IICOL		Terr	N	N	Y	N	N	Possible endemic
Pterostichus lattini sp. nov.	a ground beetle	IICOL		Terr	N	N	Y	N	N	Possible endemic
Pterostichus smetani	a ground beetle	IICOL		Terr	N	N	Y	N	Y	Vulnerable
Pterostichus tuberculofemoratus	a ground beetle	IICOL		Terr	N	?	Y	N	N	Possible endemic
Coryphium vandykei	a rove beetle	IICOL		Terr	N	N	Y	N	Y	Possible endemic

					Possible Distribution					
Scientific Name	**Common Name**	**El Code**	**G Rank**	**Terrestrial or Freshwater**	**CA**	**OR-E**	**OR-W**	**WA-E**	**WA-W**	**Reason for Inclusion**
Gnathoryphium mandibulare	a rove beetle	IICOL		Terr	N	N	N	N	Y	Possible endemic
Quedius bakeri	a rove beetle	IICOL		Terr	N	N	N	N	Y	Possible endemic
Quedius deschutesi	a rove beetle	IICOL		Terr	N	Y	N	N	N	Possible endemic
Quedius narada	a rove beetle	IICOL		Terr	N	N	Y	N	Y	Possible endemic
Quedius paradisi	a rove beetle	IICOL		Terr	N	N	Y	N	Y	Possible endemic
Quedius rainieri	a rove beetle	IICOL		Terr	N	?	?	?	?	Possible endemic
Quedius simplex	a rove beetle	IICOL		Terr	N	?	?	?	?	Possible endemic
Quedius tahomae	a rove beetle	IICOL		Terr	N	N	Y	N	Y	Possible endemic
Subhaida rainieri	a rove beetle	IICOL		Terr	N	N	Y	N	Y	Possible endemic
Tachinus ovalis	a rove beetle	IICOL		Terr	N	N	N	N	Y	Possible endemic
Tachinus rainieri	a rove beetle	IICOL		Terr	N	?	?	?	?	Possible endemic
Grylloblatta chirugica	an ice cricket	IIORT		Terr	N	N	N	Y	N	Possible endemic
Grylloblatta rothi	an ice cricket	IIORT		Terr	N	Y	N	N	N	Possible endemic
Grylloblatta sculleni	an ice cricket	IIORT		Terr	N	Y	N	N	N	Possible endemic
Lednia tumana	Meltwater Lednian Stonefly	IIPLE0K010	G1	Terr	N	N	N	N	Y	Rare, disjunct
Farula jewetti	Mt Hood Farulan Caddisfly	IITRI13020	G3	Larv: aq; Adult:Terr	N	N	Y	N	N	Possible endemic
Farula reapiri	Tombstone Prairie Farulan Caddisfly	IITRI13030	G3	Larv: aq; Adult:Terr	N	N	Y	N	N	Possible endemic
Zapada wahkeena	Wahkeena Falls flightless stonefly	IIPLE0U100	G2	Terr	N	N	Y	N	N	Vulnerable, possible endemic
Crustacean										
Stygonyx courtneyi	A Cave Obligate Amphipod	ICMAL92010	G1G2	FW	N	N	Y	N	?	Possible endemic
Stygobromus lanensis	Lane County amphipod	ICMAL05D40	G1G2	FW	N	N	Y	N	N	Possible endemic
Stygobromus wahkeenensis	Wahkeena Creek amphipod	ICMAL05D30	G1G2	FW	N	?	Y	?	?	Possible endemic

Appendix 4G – Freshwater Systems Classification and Target Selection

The freshwater assessment for the West and East Cascades Ecoregions utilized similar assessment processes and principles as the terrestrial assessment, however, the freshwater assessment was conducted for Ecological Drainage Units (EDUs) which extend beyond the boundaries of the ecoregions. EDUs represent a freshwater stratification of the landscape comparable to terrestrial ecoregions or ecosections, defined by hydrologic landscapes and distribution of freshwater biota. Eleven EDUs intersect the East and West Cascades (Map 4.2). Only a portion of most of these EDUs is contained within either the East or West Cascade ecoregion, and a few have only very small portions. Because these EDUs extend beyond the West and East Cascades ecoregional boundaries, the freshwater analysis was conducted for an area larger than the boundaries of the ecoregions. Freshwater assessments varied among the EDUs. Methodological differences among them are provided in this appendix. The full systems target list is in Appendix 4H. For information on goals, suitability indices, and portfolio construction see Chapters 4, 6 and 8 in the main report and associated appendices.

Freshwater Classification

A general freshwater systems classification framework and methodology was developed by The Nature Conservancy and is well documented and substantiated in other documents (Higgins et al. 1999, Lammert et al. 1997). The classification system for each EDU varies within this framework to account for differences in environmental gradients and the biota within that landscape. The following describes the classification system developed for stream and lake macrohabitats and freshwater systems and generally applied to EDUs in the Pacific Northwest. Exceptions to this for the East and West Cascades Ecoregions include the Great Basin and Honey Lake EDUs, which did not use the freshwater system classification for determining freshwater targets. Specific methods used in the Great Basin and Honey Lake EDUs are documented below. Specific classification attributes varied across EDUs and were developed through research of available literature, analyses of environmental data, and with the guidance of expert advisors.

Macrohabitat Classification

Macrohabitats are units of streams and lakes that are relatively homogeneous with respect to size, thermal, chemical, and hydrologic regimes. Each macrohabitat type represents a different physical setting believed to correlate with patterns in freshwater biodiversity. Macrohabitats form the basis for creating freshwater ecological systems, the coarse-filter targets used in ecoregional assessments. A distinct classification system is applied to both stream and lake macrohabitats and is detailed below.

Stream Macrohabitat Classification

Attributes selected for macrohabitat classification are primary drivers determining aquatic habitat structure, the processes that influence habitat, and aquatic community composition. Attributes were also selected for pragmatic reasons. Only attributes that can be represented comprehensively across the EDU with available data were used. While this precluded the application of strictly biological data, which are sparse and inconsistent, it did not limit the classification system in selected physical attributes.

Each unique combination of attributes represents a single macrohabitat type. Macrohabitat attributes vary across EDUs to reflect differences in the primary drivers of aquatic habitat. Attributes common to all EDUs included watershed area, geology, elevation, and gradient and are generally discussed below. Attributes applied in each EDU classification are summarized in Tables of Attribute Codes (Tables 1 and 2).

Stream macrohabitat reaches within the U.S. are spatially defined as stream reaches derived from the USGS National Hydrography Dataset (NHD) 1:100,000 hydrography, downloaded from http://nhd.usgs.gov.data.html. These data were supplemented with Washington Department of Fish and Wildlife 1:100,000 data to improve connectivity of stream reaches in Washington. Connectivity of data was not improved in Oregon and California EDUs. Processing in a GIS of these reaches for further classification was accomplished using GIS tools developed by TNC's Freshwater Initiative (Fitzhugh 2002).

Watershed Area

Contributing watershed area is considered a primary determinant of, or driver for, hydrologic regime, stream size, and network position (citations to be provided in future roll-up document). Stream size and hydrologic regime are critical factors for determining biological assemblages (Vannote et al. 1980, Mathews 1998, Poff and Ward, 1989, Poff and Alan 1995, and Lyons 1996). Network position has also been shown to correspond to patterns in freshwater community structure (Vannote et al. 1980, Mathews 1998, Lewis and Magnuson 1999, Newall and Magnuson 1999).

While contributing watershed area is an important determinant of stream and habitat character within a region, the classes established are relatively arbitrary, representing orders of magnitude differences that are not substantiated or necessarily justified ecologically. Furthermore, due to climatic differences among and within regions, each watershed size class will likely have varying expression and characteristics across EDUs and potentially regions within an EDU. For example, a 100,000 ha catchment in eastern Washington may produce only a "creek", whereas an equal catchment area in the Cascades may produce a "medium river".

Geology

Geologic character of a contributing basin controls or influences water chemistry, hydrologic regime (groundwater:surface water interaction), channel form and channel substrate.

Spatial geologic data are typically extrapolated from point observations. Thus, the scale at which they are reported can greatly influence their accuracy. The scale of geologic map data applied to this analysis is appropriate for determining basin-scale dominant rock types, but will not necessarily be accurate for reach scale channel classification. Furthermore, data included "unclassified" areas and some rock classes consisted of strata of multiple rock types. These latter were attributed to the dominant or most influential characteristic of the mixed strata. Considering these caveats, geologic attributes should not be construed to be accurate for representing reach-scale habitat, but rather they influence trends in reach-scale channel and water chemistry characteristics from basin to basin.

Geology data are from the Digital Geology of Washington State (Harris, C.F. and Schuster, J.E., 2000) and the Geologic Map of Oregon (Walker and MacLeod, 1991) at a scale of 1: 500,000. In order to reduce the total number of geologic types, the original classes were grouped into categories according to their general chemical makeup and their erodibility.

Elevation

Elevation influences water temperature, vegetation patterns, and hydrologic regime (citations to be provided in future roll-up document). The hydrologic regime is determined by total precipitation, temporal and spatial precipitation patterns, whether precipitation comes in the form of snow or rain, and how long the snow persists. Elevation is the dominant control of most of these factors and has been described as the dominant factor accounting for distribution of biota (Cuffney et. al. 1990, Carter et al. 1996, and Brown, et al. 2003). Elevation classes were generally determined through analysis of vegetation maps or expert knowledge of vegetation gradients, topography and basin drainage characteristics. Vegetation patterns (communities) are greatly influenced by elevation and are thus good indicators for use in determining the elevation breaks for the macrohabitats.

Gradient

Gradient is the slope of each macrohabitat reach measured as the change in elevation divided by the length of the reach. Stream gradient is a principal factor in determining stream velocity and stream power, as well as channel form and related habitat. Stream gradient has been shown to strongly correlate with distribution of aquatic organisms and community structure (Lyons 1996, Hart and Finelli, 1999; Montgomery et al. 1999).

Definition of gradient classes, particularly at low gradient, is limited by the resolution of the base data. 1:100,000 scale hydrography and 30m DEM in Washington and 90m DEM for Oregon and California were used to calculate gradient. Analysis and expert input (J. Davies, NMFS, 2004) suggest that defining classes at a resolution finer than 0.5% is impractical. In some cases the digital elevation model (DEM) produces gradients with negative values due to the scale of the data. In these cases, reaches with negative values were assigned to the lowest gradient class. For size class 2 and 3 systems, gradients were used from the mainstem streams only in the development of aquatic ecological systems.

Hydrology

For the Deschutes, Pit and Upper Klamath EDUs, macrohabitats were also classified based on whether their hydrologic regimes were primarily surface water dominated, or whether there was a significant groundwater component. The hydrologic regimes associated with surface water dominated versus groundwater influenced streams will be different, with varying high and low flow characteristics. Stream temperature and water quality also varies with hydrologic regime. Due to generally constant flow and specific water quality characteristics, groundwater (spring) influenced streams provide unique aquatic habitat for a variety of species. Dominant hydrology was determined through expert knowledge and review, and mapped manually.

Connectivity

Connectivity refers to the type of water or other feature (such as a lake, an ocean, or a glacier) a stream reach is connected to and influences the type of species found within the systems. For the Willamette EDU, upstream/downstream connectivity was included as a classification parameter. Downstream connectivity accounts for local zoogeography by considering the species poll differences in downstream habitats; upstream connectivity accounts for the effects on both hydrologic regime and chemistry from upstream reaches. For the Deschutes EDU, short stream reaches that did not connect with the main stream network were differentiated from connected reaches as the type of species found in these reaches differs from those found within the main stream network.

Table 1. Macrohabitat attribute classes of aquatic systems in the Puget Sound, Lower Columbia, and Yakima/Palouse EDUs.

	Puget Sound	Lower Columbia	Yakima Palouse
Watershed Size	0 – 100 km2 100 – 1000 km2 1000 – 10,000 km2 > 10,000 km2	0 – 100 km2 100 – 1000 km2 1000 – 10,000 km2 > 10,000 km2	0 – 100 km2 100 – 1000 km2 1000 – 10,000 km2 > 10,000 km2
Elevation	<= 100m 100-300m 300-800m	<= 100m 100-300m 300-800m	<= 800m 800-1500m 1500-2000m > 2000m
Gradient	<= 0.005 0.005 - 0.02 0.02 - 0.04 0.04 - 0.1 0.1 – 0.2 >0.2	<= 0.005 0.005 - 0.02 0.02 - 0.04 0.04 - 0.1 0.1 – 0.2 >0.2	<.005 .005 - .02 .02 - .04 .04 - .10 >.10
Geology	granitic-silicic basalt-mafic sandstone ultramafic-serpentine siltstone coarse outwash carbonate-limestone erodable volcanics alluvium-colluvium glacial drift peat Ice (covered by glacier or permanent snow)	Alluvium-colluvium Basalt-mafic-extrusive Coarse outwash Eolian sand Erodable volcanics Glacial drift Granitic-silicic Ice Quaternary lakeplain Sandstone Shale Siltstone Water Undivided sediments	Unconsolidated - fluvial Unconsolidated - lacustrian Unconsolidated - eolian Unconsolidated - undivided Sedimentary - chemical sediments Sedimentary – clastics Sedimentary – undivided Volcanics – intermediate to felsic Volcanics – mafic Volcanics – undivided Intrusives – intermediate to felsic Intrusives – mafic Intrusives – alkalic Intrusives - undivided Metamorphics – undivided Water Ice

Note: The Okanogan macrohabitat classification did not segment attributes into classes. Okanogan systems were classified using principal components analysis with the following variables: drainage area, biogeoclimatic zone, geology, stream gradient, accumulative precipitation yield, air temperature, lake / wetland influence, glacial influence, and watershed ruggedness.

Table 2. Macrohabitat attribute classes of aquatic systems in the Oregon and California EDUs: Deschutes, Pit, Rogue-Umpqua, Upper Klamath and Willamette.

	Deschutes	Pit	Rogue-Umpqua	Upper Klamath	Willamette
Watershed Size	10 – 100 km2 100 – 1000 km2 1000 – 10,000 km2 > 10,000 km2	10 – 100 km2 100 – 1000 km2 1000 – 10,000 km2 > 10,000 km2	10 – 100 km2 100 – 1000 km2 1000 – 10,000 km2 > 10,000 km2	10 – 100 km2 100 – 1500 km2 1500 – 10,000 km2 > 10,000 km2	0 – 100 km2 100 – 1500 km2 1500 – 10,000 km2 > 10,000 km2
Elevation	<=800m 800 – 1200m 1200 – 1800m > 1800m	<=500m 500-1300m 1300-1900m 1900- 2500m >2500m	< =600m 600 – 1220m 1220 – 1825m > 1825m	<=1300m 1300-1700m 1700-2000m 2000-2300m	<=10m 100 – 300m 300 – 1000m >1000m
Gradient	<= 0.005 0.005 – 0.02 0.02 – 0.04 0.04 – 0.10 > 0.10	<= 0.01 0.01 – 0.02 0.02 - 0.05 0.05 – 0.10 > 0.10	<= .005 .005-.01 .01-.03 .03-.06 .06-.10 >.10	<= .01 .01-.02 .02-.05 .05-.10 >.10	<=.005 .005 - .02 .02 - .04 .04 - .10 .10 - .20 >.20
Geology	Volcanics Sediments Alluvium Glacial	Alluvium Ice Intrusive Sedimentary Serpentine Volcanic	Alluvial Basalt Glacial Granitic Sedimentary Serpentine Non-basalt volcanics	Alluvium Basalt Glacial Intrusive (absent) Lacustrine Mazama Rhyolite Sedimentary	Alluvium-colluvium Basalt-mafic-extrusive Glacial drift Granitic-silicic Quaternary lakeplain Sandstone Shale Siltstone Ice Eolian Sand Erodable Volcanics Coarse Outwash Carbonate-Limestone Peat Ultramafic-Serpentine Slate
Hydrology	Groundwater influenced Surface water dominated	Groundwater dominated Surface water dominated		Groundwater influenced Surface water dominated	
Connec-tivity	Unconnected Connected				Unconnected upstream Stream/river upstream Lake upstream Reservoir upstream Wetland upstream Glacier (upstream) or Coastal (downstream)

Freshwater Assessment for the Great Basin and Honey Lake EDUs

Macrohabitats and Aquatic Ecological Systems were not developed for the Great Basin and Honey Lake EDUs given that only a small portion of these EDUs were contained within the East Cascades Ecoregional Assessment. Instead, priority areas for the portions of the Great Basin and Honey Lake EDUs within the Ecoregion were developed through expert interviews. Experts nominated specific streams for inclusion in the aquatic portfolios, and HUC 6s were aggregated to include entire watersheds for those priority streams. Table 3 summarizes information on the selected HUC 6s.

Table 3. Selected HUC 6s for the aquatic portfolio for the Great Basin and Honey Lake EDUs

Watershed Name	Why Selected
Pine Creek	Redband trout, tui chub and Tahoe suckers (all unique populations), Pine creek provides spawning for these species
Thomas Creek	Modoc suckers, redband trout, California Pit roach, Goose Lake lamprey, Pit sculpin, Sacramento sucker, Pit-Klamath lamprey, Goose Lake tui chub
Twelvemile Creek	Warner suckers, redband trout, Speckled dace, Cowhead lakes tui chub, Foskett speckled dace
Summer Lake	Summer Lake basin tui chub, redband trout, muscles
Foster Creek	Summer Lake basin tui chub, redband trout, mussels
Honey Creek	Warner Lake suckers, Warner Lake redband trout, Speckled dace
Bridge, Buck and Silver Creeks	Fort Rock redband trout, Speckled dace, Tui chub (unique), (localized taxa with limited distributions)
Eagle Lake	Redband trout, tui chub and Tahoe suckers (all unique populations)

Lake Classification

In the Yakima and Lower Columbia EDUs, lakes were classified independently of stream macrohabitats and incorporated in the assessment process as separate targets. Lake classification attributes include: 1) elevation, 2) geology, and 3) connectivity.

Elevation influences climatic patterns, hydrologic regime, and temperature. In combination with geology it is assumed to influence, or to be correlated, with water temperature. The same elevation classes applied to stream macrohabitat classification were used for lakes. Geology influences water chemistry, the degree to which a lake is influenced by groundwater or surface water, and physical lake structure. Geology classes and data sources will be the same as those applied to stream macrohabitats, but have been grouped for lakes. Connectivity refers to whether a lake is connected to a stream network or is isolated from a stream network and influences aquatic community composition, water quality and temperature, and turnover rate. Either upstream or downstream connectivity will be considered simply as connectivity. Connectivity classes were limited to *connected* and *unconnected* with a stream network.

Lake size is acknowledged as a variable of primary importance in classifying lakes. However, a variety of statistical and biological methods of developing classes for lake size were tested, and none proved defensible or pragmatic. Large reservoirs were not included in the classification or as targets. The classification proposed here does not necessarily capture or represent the diversity of aquatic system types within and among lakes, nor does this classification adequately represent the importance of lake and wetland systems, particularly in eastern Washington where vernal pools, channeled scablands and other lake and wetland habitat types represent unique and important natural systems.

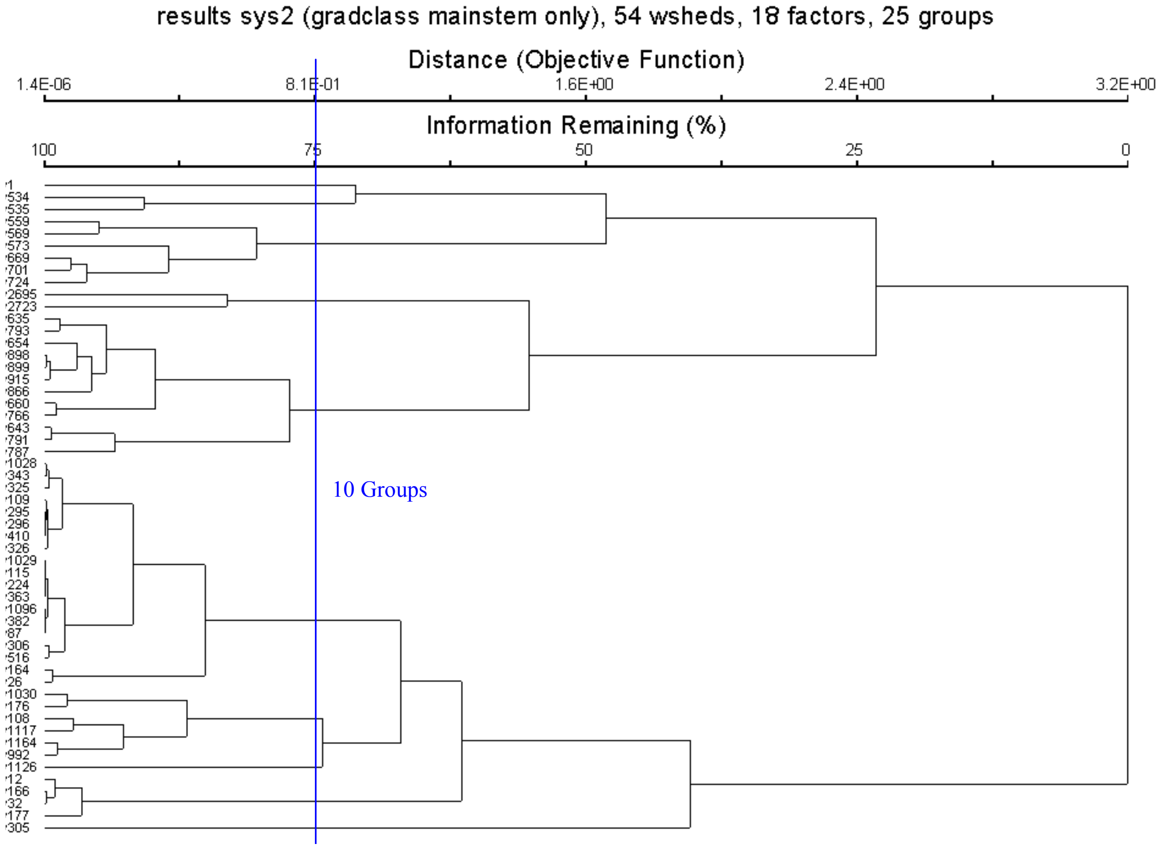
Systems Classification

Freshwater systems are nested watershed polygons classified according to their component stream macrohabitat attributes. Four size classes of systems were classified, using the same contributing watershed area classes as macrohabitats. The Okanogan EDU was an exception to this, as it did not classify watersheds into distinct size class systems. Size classes in the Upper Klamath EDU were also modified from the standard four classes. System classification is conducted using a clustering algorithm in the PC-ORD software package (McCune and Grace, 2002). Clustering is the process of creating groups of similar suites of variables. In this context, it is the process of comparing the stream reach macrohabitat variables of all watersheds of a given size class and creating groups of watersheds whose reach-scale classification attributes are similar. Freshwater system types consist of groups of similar watersheds, where similar watersheds have relatively common assemblages of macrohabitat types.

The ultimate number of systems is determined through an iterative process of clumping and splitting groups until the resulting systems represent relatively distinct and definable groups of watersheds. The test used to decide whether to clump or split groups is whether the occurrences of the system type (member watersheds) can be more clearly defined in terms of classification attributes by clumping or splitting, while always trying to minimize the final number. We ran a number of iterations of the clustering algorithm and performed some manual grouping and splitting of algorithm output groups until the final grouping resulted in systems whose member watersheds (system occurrences) could consistently be described as having the same suite of physical classification attributes and as distinct from another group.

Figure 1 depicts the typical dendrogram output of PC-ORD clustering algorithm. This example from the Yakima/Palouse EDU shows various grouping alternatives, with the number of groups decreasing to the right. As watersheds are grouped into fewer and larger groups, the amount of variation within a group increases. The classification is a balance between grouping watersheds according to similarities and separating them according to differences. The primary metric for determining similarity is the *percent information remaining* value. The percent information remaining values on the X-axis indicate the degree of inter-group variability, where higher percentages represent greater variability and make them more distinct. As a general rule of thumb we sought a minimum of 50% information remaining to ensure that systems were distinct. In the example below, the classification included 10 groups, illustrated by the blue line. At this grouping level, a relatively high degree (75%) of characteristics common to watersheds within a group are distinct from other groups.

Figure 1. Dendrogram of Class 2 systems in the Yakima/Palouse EDU. The blue line shows groupings level for 10 groups.



Experts Consulted – Classification

Consultation with experts in the field of freshwater ecology and experts with regional knowledge were essential to the classification process. Experts consulted for either the classification framework generally or for specific EDU classifications are listed below.

Washington experts

- Bob Bilby, Weyerhaeuser and University of Washington
- Susan Bolton, University of Washington
- Carol Cloen, Washington Department of Natural Resources
- Rex Crawford, replaced Lisa Hallock, Washington Heritage Program
- Peter Kiffney, NOAA Fisheries
- Kirk Krueger, Washington Department of Fish and Wildlife
- Rob Plotnikoff, Washington Department of Ecology
- Ashley Steel, NOAA Fisheries
- Brad Thompson, Washington Department of Fish and Wildlife
- Peter Bisson, U.S. Forest Service , Olympia, WA (October 2003)
- Jeremy Davies, National Marine Fisheries Service, Seattle, WA (February 2004)
- John Emlen, U.S. Geological Survey, Seattle, WA (August 2003)
- Richard Horwitz, National Academy of Sciences, Philadelphia, PA (September 2003)
- Christopher Konrad, USGS, Tacoma, WA (September 2003)
- Bob Naiman, University of Washington, Seattle, WA (August 2003)

- Beth Sanderson, NOAA Fisheries, Seattle, WA (May 2003)
- Gordon Orions, Institute for Environmental Studies, WWF, and UW (April 2004)
- Mark Schuerell, NOAA Fisheries (via Beth Sanderson) (April 2004)

Oregon experts

- Randy Frick, Rogue-Siskiyou National Forest
- Jeff Dose, Umpqua National Forest
- Roger Smith, Oregon Department of Fish and Wildlife
- Bill Tinniswood, Oregon Department of Fish and Wildlife
- Stewart Reid, Western Fishes, Ashland, OR.
- Craig Bienz, The Nature Conservancy, OR
- Mark Bryer, The Nature Conservancy
- Tim Walters
- Al Olsen
- Rich Nawa
- Bill Brock

California experts

- Steve Bachmann, Shasta-Trinity National Forest
- Curtis Knight, CalTrout
- Jeff Cook, Springwaters Consulting, Cassel, CA
- Peter Moyle, UC Davis, CA
- Todd Float

Expert Review of Portfolio

The algorithm-derived freshwater and integrated portfolios were presented to a variety of local and regional experts for review through either individual or group meetings. All expert comments were recorded and subsequently classified into 3 categories by Conservancy staff, as defined below. In some cases, expert input provided sufficient justification for ensuring that certain analysis units were included in the final portfolio. (These are categorized below as "Include".) Following expert review, the portfolio was modified to reflect this input by "locking in" certain analysis units, and running the algorithm again with these in place. Thus, the final algorithm portfolios reflect expert input.

1. *No action* – This category includes expert input that provides specific information that may be of value to future site conservation planning, but which should not influence the site selection process. In some instances, expert input was not specific or certain, or was in direct conflict with other input, and so should not be used to influence the selection process.

2. *Include* – This category includes areas that have been nominated by an expert as being of high value when the expert opinion is consistent with other factors that show the area as important. Typically, this includes areas that had high sum solution scores, were nominated by multiple experts, or had been otherwise identified as important. Areas that were "included" were locked into the site selection algorithm to ensure that they stay in the final iteration of the portfolio.

3. *Exclude* – This category includes areas that have been described by experts as having little value and being unsuitable for conservation. Typically, the Marxan algorithm is very efficient at excluding such areas, and few if any expert comments result in exclusion. Areas were excluded if recommended by experts *and* they also received very low sum solution scores or had otherwise been identified as poor sites.

4. *Gap to address* – Experts provided considerable information about additional data and considerations that will be important to consider and include in future iterations, but are not appropriate or possible for this iteration.

Experts consulted in reviewing EDU portfolios in Washington

- Dan Schindler, University of Washington
- Joel Hubbel, Bureau of Reclamation
- Brent Renfro, Bureau of Reclamation
- Rebecca Wassel, U.S. Forest Service
- Yuki Reiss, U.S. Forest Service
- Scott Nicolai, Yakama Nation
- Tom Ring, Yakama Nation
- Eric Anderson, Washington Department of Fish and Wildlife
- Jeff Thomas, US Fish and Wildlife Service
- Ross Black, Eastern Washington University
- Alan Scholz, Eastern Washington University
- David Fast, Yakama Nation
- Mark Teske, Washington Department of Fish and Wildlife
- Ted Clausing, Washington Department of Fish and Wildlife
- Kelly Clark, Yakama Nation
- William Meyer, Washington Department of Fish and Wildlife
- Walter Larrick, Bureau of Reclamation
- John Easterbrooks, Washington Department of Fish and Wildlife

Experts consulted in reviewing EDU portfolios in Oregon and California are listed in Appendix 8B

Appendix 4H – Target Lists for Freshwater Systems and Communities by Ecological Drainage Unit

EDU	System Type and Name	EL Code
Puget Sound		
	Freshwater Ecological Systems Class 3	
	Cascades medium rivers - mixed watershed geology traversing glacial drift and alluvium, low elevation, low gradient	FSPT3.th4
	Fraser River mainstem - predominantly granite watershed, low elevation, low gradient	FSPT3.th6
	Northern Cascades medium rivers - predominantly granite watershed traversing glacial drift and alluvium, low to mid elevation, low gradient	FSPT3.th1
	South Puget Sound medium rivers - predominantly volcanic watershed traversing glacial drift and alluvium, low to mid elevation, low gradient	FSPT3.th3
	Freshwater Ecological Systems Class 2	
	Cascade foothills headwaters - glacial drift and alluvium , low to mid elevation	FSPT2.1-14
	Cascades middle river systems - predominantly granitic watershed, low to mid elevation, variable gradient	FSPT2.tw3
	Cascades upper river systems - predominantly granite watershed, mid elevation, variable gradient	FSPT2.tw1
	Cascades upper river systems - predominantly volcanic watershed traversing glacial drift, low to mid elevation	FSPT2.tw2b
	East Olympics small rivers - predominantly mafic, low to mid elevation, low to moderate gradient	FSPT2.tw2a
	Fraser/Nooksack coastal plain - sandstone, low elevation, low gradient	FSPT2.1-21
	Fraser/Nooksack coastal plain - sedimentary, low elevation, low gradient	FSPT2.tw31
	Lower Fraser River tributaries headwaters - granitic, low elevation, low to moderate gradient	FSPT2.1-40
	Lower Fraser tributary rivers - granitic watersheds, low to mid elevation, variable gradient	FSPT2.tw21
	North Cascades headwaters - granitic , mid to high elevation, moderate to high gradient	FSPT2.1-2b
	North Cascades tributary rivers - sedimentary and granitic watersheds, moderate to high elevation, mixed gradient	FSPT2.tw50
	Northern Olympics rivers - sandstone, mid to low elevation, mixed gradient	FSPT2.tw8
	Puget Sound tributary rivers - glacial drift, low elevation, low gradient	FSPT2.tw6
	Puget uplands and islands headwaters - glacial drift, low to mid elevation, ow to moderate gradient (one-375d, larger than class 1)	FSPT2.1-37
	South Sound rivers and tributaries - glacial drift, low elevation, low gradient	FSPT2.tw5
	Straight of Juan de Fuca small rivers - predominantly sandstone, low elevation, variable gradient	FSPT2.tw11
	Freshwater Ecological Systems Class 1	
	Cascade foothills headwaters - glacial drift and alluvium , low to mid elevation, mixed gradient	FSPT1.14D
	Cascade foothills headwaters - glacial drift, mid elevations, mixed gradient	FSPT1.14C
	Cascades headwaters - basalt and volcanics, high elevation, moderate to high gradient, glacier influenced	FSPT1.330A
	Cascades headwaters - granitic, high elevation, moderate to high gradient	FSPT1.2C
	Cascades headwaters - mafic, mid elevation, mixed gradient	FSPT1.32B
	Cascades headwaters - sandstone, mid to high elevation, moderate to high gradient	FSPT1.73A
	Cascades headwaters, sedimentary, mid elevation	FSPT1.113

EDU	System Type and Name	EL Code
Puget Sound con't.	Cascades tributary headwaters - granitic, low to mid elevation	FSPT1.17
	Fraser/Nooksack coastal plain - sandstone, low elevation, low gradient	FSPT1.21
	Hood Canal coastal streams	FSPT1.14B
	Juan de Fuca coastal streams - sandstone , low to mid elevation, moderate gradient	FSPT1.300
	Nooksack coastal plain headwaters - glacial drift and outwash, low elevation, low to moderate gradient	FSPT1.375E
	North Cascades - mafic , mid elevation, mixed gradient	FSPT1.32C
	North Cascades headwaters - granitic , mid to high elevation, moderate to high gradient	FSPT1.2B
	North Cascades headwaters - mostly volcanic, mid to high elevation, moderate to high gradient	FSPT1.330B
	Northern Cascades headwaters - sandstone, moderate to high elevation, moderate to high gradient	FSPT1.73B
	Olympics headwaters - sandstone, mid to high elevation, moderate to high gradient	FSPT1.350
	Olympics rainshadow coastal headwaters	FSPT1.14A
	Olympics rainshadow coastal headwaters - mafic, mid elevation, moderate to high gradient	FSPT1.32A
	Puget lowland headwaters north - glacial drift, low elevation, low to moderate gradient	FSPT1.375A
	Puget lowland headwaters south - glacial drift, low elevation, low gradient	FSPT1.375C
	Puget lowland headwaters west - glacial drift, low elevation, low to moderate gradient	FSPT1.375B
	Puget uplands and islands headwaters - glacial drift, low to mid elevation, low to moderate gradient	FSPT1.375D
	Communities	
	North Pacific Bog and Fen Community	CES204.063
	North Pacific Shrub Swamp Community	CES204.865
	Temperate Pacific Freshwater Emergent Marsh Community	CES200.877
Okanagan		
	Freshwater Ecological Systems Class 3	
	FSOK3.188	FSOK3.188
	FSOK3.296	FSOK3.296
	FSOK3.3	FSOK3.3
	FSOK3.40	FSOK3.40
	FSOK3.56	FSOK3.56
	FSOK3.6	FSOK3.6
	FSOK3.80	FSOK3.80
	Freshwater Ecological Systems Class 2	
	FSOK2.1	FSOK2.1
	FSOK2.106	FSOK2.106
	FSOK2.145	FSOK2.145
	FSOK2.188	FSOK2.188
	FSOK2.197	FSOK2.197
	FSOK2.275	FSOK2.275
	FSOK2.280	FSOK2.280
	FSOK2.295	FSOK2.295
	FSOK2.296	FSOK2.296
	FSOK2.3	FSOK2.3
	FSOK2.56	FSOK2.56

EDU	System Type and Name	EL Code
Okanagan con't	FSOK2.6	FSOK2.6
	FSOK2.61	FSOK2.61
	FSOK2.80	FSOK2.80
	FSOK2.84	FSOK2.84
	Freshwater Ecological Systems Class 1	
	FSOK1.1	FSOK1.1
	FSOK1.10	FSOK1.10
	FSOK1.101	FSOK1.101
	FSOK1.106	FSOK1.106
.	FSOK1.107	FSOK1.107
	FSOK1.1305	FSOK1.1305
	FSOK1.145	FSOK1.145
	FSOK1.153	FSOK1.153
	FSOK1.188	FSOK1.188
	FSOK1.197	FSOK1.197
	FSOK1.236	FSOK1.236
	FSOK1.25	FSOK1.25
	FSOK1.275	FSOK1.275
	FSOK1.280	FSOK1.280
	FSOK1.295	FSOK1.295
	FSOK1.296	FSOK1.296
	FSOK1.3	FSOK1.3
	FSOK1.326	FSOK1.326
	FSOK1.4	FSOK1.4
	FSOK1.40	FSOK1.40
	FSOK1.403	FSOK1.403
	FSOK1.56	FSOK1.56
	FSOK1.57	FSOK1.57
	FSOK1.6	FSOK1.6
	FSOK1.61	FSOK1.61
	FSOK1.80	FSOK1.80
	FSOK1.84	FSOK1.84
	FSOK1.99	FSOK1.99
Yakima - Palouse		
	Freshwater Ecological Systems Class 3	
	(1) Channeled Scablands	FSYP3.1
	(4) Yakima River	FSYP3.4
	(5) Mainstem tributaries	FSYP3.5
	Freshwater Ecological Systems Class 2	
	(12) Plateau Tributaries - loess-dominated, mid-gradient	FSYP2.12
	(19) Plateau Tributaries - basalt, mid-gradient	FSYP2.19
	(2) Plateau Tributaries - loess-dominated, low-gradient	FSYP2.2
	(33) Upper Yakima River - mixed-geology, low-gradient	FSYP2.33
	(35) Yakima tributaries - mixed-geology, mid-gradient	FSYP2.35
	(38) Yakima tributaries - volcanic, mid-elevation, mid-gradient	FSYP2.38

EDU	System Type and Name	EL Code
Yakima - Palouse con't.	(903) Palouse hills tributaries - loess-dominated, low-gradient	FSYP2.903
	(904) Channeled Scablands - basalt, low-gradient	FSYP2.904
	(939) Yakima tributaries - volcanic, low-elevation, low-gradient	FSYP2.939
	Freshwater Ecological Systems Class 1	
	(1) Small-order tributaries - alluvial, low-elevation, mixed-gradient	FSYP1.1
	(18) Channeled scablands - unconsolidated, low-elevation, low-gradient	FSYP1.18
	(2) Yakima forested small-order tributaries - sedimentary, mid-elevation, steep gradient	FSYP1.2
	(208) Small-order mainstem tributaries - sedimentary, low-elevation, mod/high gradient	FSYP1.208
	(223) Pasco/Quincy basin small-order tributaries - sedimentary clastics, low-elevation, low-gradient	FSYP1.223
	(24) Channeled scablands - basalt, low-elevation, low-gradient	FSYP1.24
	(489) Small-order mainstem tributaries - loess-dominated, low-elevation, mod/high gradient	FSYP1.489
	(5) Headwaters - basalt, mid-elevation, high-gradient	FSYP1.5
	(6) Yakima forested headwaters - volcanic, mid-elevation, steep-gradient	FSYP1.6
	(72) Yakima forested headwaters - mixed geology, mid/high-elevation, steep-gradient	FSYP1.72
	(725) Small-order tributaries - mixed geology, mixed-elevation, steep-gradient	FSYP1.725
	(901) Yakima forested small-order tributaries - alluvial, low-elevation, mixed gradient	FSYP1.901
	(902) Palouse headwaters - loess-dominated, mid-elevation, mixed-gradient	FSYP1.902
	(921) Yakima small-order tributaries - fine-clastic, low/mid-elevation, mixed gradient	FSYP1.921
	(922) Headwaters - basalt, low/mid-elevation, mixed-gradient	FSYP1.922
	(931) Headwaters - loess-dominated, low-elevation, low-gradient	FSYP1.931
	(932) Palouse hills - loess-dominated, low-elevation, low-gradient	FSYP1.932
	(944) Small-order tributaries - basalt, low-elevation, high-gradient	FSYP1.944
	(949) Palouse forested headwaters - mixed geology, mid-elevation, mixed-gradient	FSYP1.949
	(951) Small-order tributaries - loess-dominated, low-elevation, moderate-gradient	FSYP1.951
	(952) Palouse hills small-order tributaries - loess-dominated, low-elevation, moderate-gradient	FSYP1.952
	(963) Channeled scablands - basalt, low-elevation, moderate-gradient	FSYP1.963
	(981) Small-order tributaries - basalt, low-elevation, high-gradient	FSYP1.981
	(982) Small-order tributaries - basalt, low-elevation, low-mod-gradient	FSYP1.982
Lower Columbia		
	Freshwater Ecological Systems Class 3	
	(10) West-slopeCascades, mid-elevation, low gradient, basalt, Washington	FSLC3.10
	(20) West-slope Cascades, mid elevation, medium gradient, basalt, Oregon	FSLC3.20
	(30) East-slope Cascades, mid/high elevation, low/mid gradient, basalt, Washington	FSLC3.30
	Freshwater Ecological Systems Class 2	
	(1) Cascades rivers, basalt, moderate-gradient	FSLC2.1
	(16) Foothills rivers, shale, moderate-gradient	FSLC2.16
	(2) Foothills rivers, basalt, mixed-gradient	FSLC2.2
	(3) Columbia lowland tributaries, basalt, low/mod-gradient	FSLC2.3
	(4) Columbia lowland tributaries, mixed geology, low-gradient	FSLC2.4
	(7) Foothills rivers, sandstone, low-gradient	FSLC2.7
	(91) Columbia lowland tributaries, outwash, low-gradient	FSLC2.91
	(92) Cascades rivers, volcanics, mixed-gradient	FSLC2.92

EDU	System Type and Name	EL Code
Lower Columbia con't.	(93) Eastside rivers, volcanics, mixed gradient	FSLC2.93
	(94) East Cascades rivers, basalt, mixed gradient	FSLC2.94
	Freshwater Ecological Systems Class 1	
	(109) Headwaters, volcanics, mid/high-elevation, mod/high-gradient	FSLC1.109
	(138) Small tributaries, basalt, low-elevation, mixed-gradient	FSLC1.138
	(192) Estuary tributaries, siltstone, low-elevation, mixed-gradient	FSLC1.192
	(2) Headwaters, basalt, mid-elevation, mod/high-gradient	FSLC1.2
	(21) Small tributaries, outwash, low-elevation, low-gradient	FSLC1.21
	(226) Headwaters, shale, mid-elevation, moderate-gradient	FSLC1.226
	(39) Headwaters, granitic, high-elevation, high-gradient	FSLC1.39
	(55) Headwaters, basalt, mid-elevation, mixed-gradient	FSLC1.55
	(6) Headwaters, basalt, mid-elevation, very high-gradient	FSLC1.6
	(88) Headwaters, volcanics, mid-elevation, varied-gradient	FSLC1.88
	(904) Headwaters, sandstone, low-elevation, varied gradient	FSLC1.904
	(905) Headwaters , basalt, high-elevation, mod/high-gradient	FSLC1.905
	(907) Headwaters, basalt, mid-elevation, high-gradient	FSLC1.907
	(911) Eastside headwaters, basalt, mid-elevation, high-gradient	FSLC1.911
	(920) Small tributaries, alluvial, low-elevation, low/mod-gradient	FSLC1.920
	Communities	
	Columbia Plateau Vernal Pool Community	CES304.057
	North Pacific Bog and Fen Community	CES204.063
	North Pacific Shrub Swamp Community	CES204.865
	Northern Columbia Plateau Basalt Pothole Ponds Community	CES304.058
	Temperate Pacific Freshwater Aquatic Bed Community	CES200.876
	Temperate Pacific Freshwater Emergent Marsh Community	CES200.877
	Temperate Pacific Montane Wet Meadow Community	CES200.998
Deschutes		
	Freshwater Ecological Systems Class 3	
	Groundwater influenced, low-mid elevation, volcanics with alluvial inclusions, low to moderate stream gradient.	FSDES3.160
	Groundwater influenced, mid-elevation, volcanics with sedimentary inclusions, minor glacial influence, low stream gradient.	FSDES3.100
	Surface water dominated, low-mid elevation, volcanics, variable stream gradient	FSDES3.154
	Surface water dominated, mid elevation, volcanics, low stream gradient	FSDES3.103
	Freshwater Ecological Systems Class 2	
	FSDES2.1g	FSDES2.1g
	FSDES2.3g	FSDES2.3g
	Groundwater influenced, low to mid elevation, mixed geology (volcanics with sediment or alluvium) with minor glacial influence, low to med stream gradient	FSDES2.7g
	Groundwater influenced, low to mid elevation, volcanics, low stream gradient	FSDES2.4g
	Groundwater influenced, mid elevation, mixed geology (volcanics and sediments) with minor glacial influence, low stream gradient	FSDES2.2g
	Groundwater influenced, mid to high elevation, volcanics with glacial influence, low to med stream gradient	FSDES2.5g

EDU	System Type and Name	EL Code
Deschutes con't.	Surface water dominated, low to mid elevation, volcanics, low to med low stream gradients	FSDES2.4s
	Surface water dominated, low to mid elevation, volcanics, mixed stream gradients	FSDES2.5s
	Surface water dominated, mid elevation, volcanics, low to med low stream gradient	FSDES2.1s
	Surface water dominated, mid elevation, volcanics, low to med low stream gradient, unconnected	FSDES2.1su
	Surface water dominated, mid elevation, volcanics, low to med stream gradient	FSDES2.3s
	Freshwater Ecological Systems Class 1	
	Groundwater influenced, low to mid elevation, mixed geology (volcanics and sediments or alluvium), variable stream gradient	FSDES1.14g
	Groundwater influenced, low to mid elevation, volcanics with minor glacial influence, variable stream gradient	FSDES1.9g
	Groundwater influenced, low to mid elevation, volcanics, med to high gradient	FSDES1.8g
	Groundwater influenced, mid elevation, glacially dominated geology, variable gradient	FSDES1.11g
	Groundwater influenced, mid elevation, sediments, low stream gradient	FSDES1.12g
	Groundwater influenced, mid elevation, volcanics with minor sediment inclusions, variable stream gradient	FSDES1.7g
	Groundwater influenced, mid elevation, volcanics with minor sediment inclusions, variable stream gradient, unconnected	FSDES1.7gu
	Groundwater influenced, mid elevation, volcanics with significant glacial influence, med to high stream gradient	FSDES1.13g
	Groundwater influenced, mid elevation, volcanics, low stream gradient	FSDES1.10g
	Groundwater influenced, mid to high elevation, volcanics with minor glacial influence, med to high stream gradient	FSDES1.6g
	Groundwater influenced, mid to high elevation, volcanics with minor glacial influence, med to high stream gradient, unconnected	FSDES1.6gu
	Surface water dominated, low elevation, volcanics, variable stream gradient	FSDES1.2s
	Surface water dominated, mid elevation, mixed geology (sediments and volcanics), variable stream gradient	FSDES1.5s
	Surface water dominated, mid elevation, mixed geology (sediments, volcanics and alluvium), mid to high stream gradient	FSDES1.6s
	Surface water dominated, mid elevation, volcanics with minor sediment inclusions, high stream gradient	FSDES1.4s
	Surface water dominated, mid elevation, volcanics with minor sediment inclusions, high stream gradient, unconnected	FSDES1.4su
	Surface water dominated, mid elevation, volcanics, variable stream gradient	FSDES1.1s
	Surface water dominated, mid elevation, volcanics, variable stream gradient, unconnected	FSDES1.1su
	Communities	
	North Pacific Bog and Fen Community	CES204.063
	North Pacific Shrub Swamp Community	CES204.865
	Temperate Pacific Freshwater Emergent Marsh Community	CES200.877
	Temperate Pacific Montane Wet Meadow Community	CES200.998

EDU	System Type and Name	EL Code
Willamette		
	Freshwater Ecological Systems Class 3	
	Cascade medium river - volcanic, low to mid elevation	FSWIL3.th1
	Coast Range medium river - sedimentary, low elevation	FSWIL3.th2
	Coast Range medium river - volcanic, low elevation	FSWIL3.th3
	Valley/foothill medium river - volcanic, low elevation	FSWIL3.th4
	Freshwater Ecological Systems Class 2	
	Cascade headwaters - volcanics, mid elevation, moderate gradient	FSWIL2.31
	Cascade headwaters - volcanics, mid to high elevation	FSWIL2.37
	Cascade small river - volcanic with glacial features, mid to high elevation	FSWIL2.2
	Cascade small river - volcanic, mid elevation	FSWIL2.8
	Cascade/foothill small river - volcanic, low to mid elevation	FSWIL2.7
	Coast Range small river - basalt, low elevation	FSWIL2.34
	Coast Range small rivers - sedimentary, low to mid elevation	FSWIL2.1
	Valley plain tributaries - alluvium and lakeplain, low elevation, low gradient	FSWIL2.15
	Valley small river - alluvium, low elevation	FSWIL2.39
	Valley small river - volcanic, low elevation	FSWIL2.5
	Valley/foothill tributaries - volcanics, mid elevation	FSWIL2.6
	Freshwater Ecological Systems Class 1	
	Cascade headwaters - glacial, high elevation, moderate gradient	FSWIL1.23
	Cascade headwaters - volcanics, high elevation, moderate gradient	FSWIL1.25
	Cascade headwaters - volcanics, high elevation, steep gradient	FSWIL1.19
	Cascade headwaters - volcanics, mid elevation, moderate gradient	FSWIL1.31
	Cascade headwaters - volcanics, mid to high elevation	FSWIL1.37
	Cascade tributaries - sedimentary, mid elevation, steep gradient	FSWIL1.1
	Coast Range headwaters - volcanics, mid elevation	FSWIL1.225
	Coast Range small rivers - sedimentary, low to mid elevation	FSWIL1.2
	Coast Range tributaries - shales, mid elevation, moderate gradient	FSWIL1.12
	Foothills tributaries - basalt, low to mid elevation	FSWIL1.3
	Valley plain tributaries - alluvium and lakeplain, low elevation, low gradient	FSWIL1.15
	Valley/foothill tributaries - volcanics, mid elevation 1.4	FSWIL1.4
	Valley/foothill tributaries - volcanics, mid elevation 1.6	FSWIL1.6
	Communities	
	North Pacific Bog and Fen Community	CES204.063
	North Pacific Hardwood-Conifer Swamp Community	CES204.090
	North Pacific Shrub Swamp Community	CES204.865
	Temperate Pacific Freshwater Emergent Marsh Community	CES200.877
	Temperate Pacific Montane Wet Meadow Community	CES200.998

EDU	System Type and Name	EL Code
Rogue - Umpqua	**Freshwater Ecological Systems Class 3**	
	Low-mid elevation, sediments, non-basalt volcanics and granitics, low stream gradient	FSROU3.60
	Low-mid elevation, serpentine, sediments and granitics, low stream gradient	FSROU3.112
	Variable elevation, mixed geology (sediments, granitics, non-basalt volcanics and basalt), low stream gradient	FSROU3.111
	Freshwater Ecological Systems Class 2	
	Low elevation, basalts and sediments, low stream gradient	FSROU2.3
	Low elevation, sediments, low stream gradient	FSROU2.2
	Low-mid elevation, granitics with sediment, low stream gradient	FSROU2.11
	Low-mid elevation, mixed geology (granitics, sediments and non-basalt volcanics), low-mod stream gradients	FSROU2.6
	Low-mid elevation, sediments, alluvium and granitics, variable stream gradient	FSROU2.7
	Low-mid elevation, sediments, variable stream gradient	FSROU2.13
	Low-mid elevation, serpentine with sediments, low stream gradient	FSROU2.12
	Mid elevation, non-basalt volcanics with sediments and granitics, low stream gradient	FSROU2.10
	Mid-high elevation, Glacially influenced basalt and sediments, low-mod stream gradient	FSROU2.8
	Mid-high elevation, non-basalt volcanics with sediments, basalt and galcial influence, low-mod stream gradients	FSROU2.4
	Mid-high elevation, sediments with non-basalt volcanics, variable stream gradient	FSROU2.5
	Variable elevation, granitics and sediments with serpentine, low-mod stream gradient	FSROU2.1
	Variable elevation, sediments and basalts, low-mod stream gradient	FSROU2.9
	Freshwater Ecological Systems Class 1	
	Low elevation, basalt with non-basalt volcanics and sediments, mod stream gradient	FSROU1.15
	Low elevation, sediments or alluvium, variable stream gradient	FSROU1.9
	Low -mid elevation, serpentine with sediment, mod-high stream gradient	FSROU1.13
	Low-mid elevation, granitics with non-basalt volcanics and sediments, variable stream gradient	FSROU1.8
	Low-mid elevation, granitics with sediments and serpentine, mod-high stream gradient	FSROU1.11
	Low-mid elevation, mixed geology (sediments, granitics, non-basalt volcanics), mod-high stream gradient	FSROU1.5
	Low-mid elevation, sediments, mod-high stream gradients	FSROU1.7
	Low-mid elevation, serpentine with sediment and granitics, mod-high stream gradients	FSROU1.14
	Mid elevation, basalt with sediments, mod-high stream gradient	FSROU1.2
	Mid elevation, non-basalt volcanics, mod-high stream gradients	FSROU1.3
	Mid elevation, sediments, alluvium and serpentine, variable stream gradient	FSROU1.12
	Mid-high elevation, basalts and non-basalt volcanics, non-basalt with significant glacial influence, mod-high stream gradient	FSROU1.1
	Mid-high elevation, non-basalt volcanics with sediments, mod-high stream gradients	FSROU1.6
	Mid-high elevation, sediments, mod-high stream gradients	FSROU1.4
	Mod-high elevation, basalt with non-basalt volcanics, mod stream gradients	FSROU1.10
	Communities	
	North Pacific Bog and Fen Community	CES204.063
	North Pacific Shrub Swamp Community	CES204.865
	Temperate Pacific Freshwater Aquatic Bed Community	CES200.876
	Temperate Pacific Freshwater Emergent Marsh Community	CES200.877

EDU	System Type and Name	EL Code
Upper Klamath		
	Freshwater Ecological Systems Class 3	
	Low-mid elevation, basalts, low stream gradient	FSUK3.63
	Low-mid elevation, basalts, low-mod stream gradient	FSUK3.99
	Mid elevation, basalts with rhyolite, low stream gradient	FSUK3.999
	Mid elevation, mixed geology (basalt, Mazama ash, sediment), low stream gradient	FSUK3.329
	Freshwater Ecological Systems Class 2	
	FSUK2.3s	FSUK2.3s
	Low elevation, lacustrine, low stream gradient	FSUK2.5s
	Low to mid elevation, basalts, variable stream gradient	FSUK2.4s
	Low-mid elevation, basalts, low stream gradient	FSUK2.1s
	Mid elevation, Mazama ash and basalts, low stream gradient	FSUK2.2s
	Mid to high elevation, mixed geology (Mazama ash, basalts and rhyolites), low stream gradient	FSUK2.8s
	Freshwater Ecological Systems Class 1	
	Groundwater dominated, mid elevation, basalts and Mazama ash, low stream gradient	FSUK1.1g
	Low elevation, sediment or lacustrine, low stream gradient	FSUK1.8s
	Low-mid elevation, basalts and lacustrine, variable stream gradient	FSUK1.7s
	Low-mid elevation, basalts and lacustrine, variable stream gradient, unconnected	FSUK1.7su
	Low-mid elevation, basalts, mod-high stream gradient	FSUK1.10s
	Low-mid elevation, sediments and basalts, low-moderate stream gradient	FSUK1.12s
	Mid elevation, basalts, low-mod stream gradient	FSUK1.2s
	Mid elevation, basalts, low-mod stream gradient, unconnected	FSUK1.2su
	Mid elevation, basalts, mod-high stream gradient	FSUK1.1s
	Mid elevation, basalts, mod-high stream gradient, unconnected	FSUK1.1su
	Mid elevation, Mazama ash and rhyolite, variable stream gradient, unconnected	FSUK1.13su
	Mid elevation, Mazama ash, low-mod stream gradient	FSUK1.9s
	Mid elevation, Mazama ash, low-mod stream gradient, unconnected	FSUK1.9su
	Mid elevation, mixed basalts and rhyolites, variable stream gradient	FSUK1.3s
	Mid elevation, mixed geology (rhyolites, basalts, sediments, and lacustrine), low-mod stream gradient	FSUK1.6s
	Mid elevation, mixed Mazama ash and basalts, low stream gradient	FSUK1.4s
	Mid elevation, mixed Mazama ash and basalts, low stream gradient, unconnected	FSUK1.4su
	Mid-high elevation, basalts, mod-high stream gradient	FSUK1.5s
	Mid-high elevation, basalts, mod-high stream gradient, unconnected	FSUK1.5su
	Communities	
	North Pacific Bog and Fen Community	CES204.063
	North Pacific Shrub Swamp Community	CES204.865
	Northern Basalt Flow Vernal Pool Community	CTT44131CA
	Temperate Pacific Freshwater Emergent Marsh Community	CES200.877
	Temperate Pacific Montane Wet Meadow Community	CES200.998

EDU	System Type and Name	EL Code
Pit		
	Freshwater Ecological Systems Class 3	
	Ground water influenced, low to mid elevation, pyroclastic silicic with minor sediments and alluvium, variable stream gradient	FSPIT3.2
	Surface water dominated, low to mid elevation, mixed geology (serpentine, sediments, alluvium, intrusives and pyroclastic silicic), low stream gradient	FSPIT3.3
	Surface water dominated, low to mid elevation, pyroclastic silicic with minor sediments and alluvium, low to moderate stream gradient	FSPIT3.1
	Surface water dominated, mid to high elevation, pyroclastic silicic with minor sediments and alluvium, low stream gradient	FSPIT3.4
	Freshwater Ecological Systems Class 2	
	Ground water influenced, low to mid elevation, pyroclastic silicic with alluvium and sediments, variable stream gradient	FSPIT2.9
	Surface water dominated, low to mid elevation, pyroclastic silicic with sediments and alluvium, low to moderate stream gradient	FSPIT2.3
	Surface water dominated, low to mid elevation, pyroclastic silicic, variable stream gradient	FSPIT2.2
	Surface water dominated, low to mid elevation, sediments with pyroclastic silicic, variable stream gradient	FSPIT2.5
	Surface water dominated, mid elevation, pyroclastic silicic with minor alluvium and sediments, variable stream gradient	FSPIT2.1
	Surface water dominated, mid to high elevation, pyroclastic silicic with minor alluvium, variable stream gradient	FSPIT2.8
	Freshwater Ecological Systems Class 1	
	Surface water dominated, high elevation, alluvium and sediments, high stream gradient, unconnected	FSPIT1.14u
	Surface water dominated, high elevation, pyroclastic silicic, variable stream gradient	FSPIT1.12
	Surface water dominated, high elevation, pyroclastic silicic, variable stream gradient, unconnected	FSPIT1.12u
	Surface water dominated, low elevation, alluvium and pyroclastic silicic, low stream gradient	FSPIT1.8
	Surface water dominated, low elevation, pyroclastic silicic, low to mod stream gradient	FSPIT1.2
	Surface water dominated, low elevation, pyroclastic silicic, low to mod stream gradient, unconnected	FSPIT1.2u
	Surface water dominated, low elevation, sediments, mod to high stream gradient	FSPIT1.9
	Surface water dominated, low to mid elevation, alluvium, variable stream gradient	FSPIT1.10
	Surface water dominated, low to mid elevation, pyroclastic silicic with some alluvium and sediments, variable stream gradient	FSPIT1.6
	Surface water dominated, low to mid elevation, pyroclastic silicic with some alluvium and sediments, variable stream gradient, unconnected	FSPIT1.6u
	Surface water dominated, low to mid elevation, serpentine and intrusives, mod to high stream gradient	FSPIT1.11
	Surface water dominated, mid elevation, alluvium, intrusives and serpentine, mod to high stream gradient	FSPIT1.13
	Surface water dominated, mid elevation, alluvium, intrusives and serpentine, mod to high stream gradient, unconnected	FSPIT1.13u
	Surface water dominated, mid elevation, pyroclastic silicic geology, variable stream gradient	FSPIT1.1

EDU	System Type and Name	EL Code
Pit con't.	Surface water dominated, mid elevation, pyroclastic silicic geology, variable stream gradient, unconnected	FSPIT1.1u
	Surface water dominated, mid elevation, pyroclastic silicic with some alluvium and sediments, low to mod stream gradient	FSPIT1.3
	Surface water dominated, mid elevation, pyroclastic silicic with some alluvium and sediments, low to mod stream gradient, unconnected	FSPIT1.3u
	Surface water dominated, mid to high elevation, mixed pyroclastic silicic, alluvium, and sediments, variable stream gradient	FSPIT1.5
	Surface water dominated, mid to high elevation, pyroclastic silicic, mod to high stream gradient	FSPIT1.4
	Surface water dominated, mid to high elevation, pyroclastic silicic, mod to high stream gradient, unconnected	FSPIT1.4u
	Surface water dominated, mid to high elevation, sediments with some alluvium and pyroclastic silicic, low to mod stream gradient	FSPIT1.7
	Surface water dominated, mid-elevation, sedimentary, low-mod stream gradient	FSPIT1.16
	Surface water dominated, mid-elevation, volcanic, low stream gradient	FSPIT1.17
	Communities	
	Darlingtonia Seep	
	Goose Lake Drainage Redband Trout/Lamprey Spawning Stream Community	CARA2220CA
	Goose Lake Drainage Resident Redband Trout Stream Community	CARA2230CA
	Goose Lake Drainage Speckled Dace/Goose Lake Sucker Stream Community	CARA2240CA
	Goose Lake Drainage Valley Tui Chub Stream Community	CARA2250CA
	McCloud River Redband Trout Stream	
	North Pacific Fen Community	CTT51200CA
	Northern Basalt Flow Vernal Pool Community	CTT44131CA
	Pit R. Drainage Rough Sculpin/Shasta Crayfish Spring Stream Community	CARA2334CA
	Pit River Drainage Modoc Sucker Stream Community	CARA2333CA
	Pit River Drainage Rainbow/Redband Trout Stream	
	Pit River Drainage Speckled Dace/Pit Sculpin Stream Community	CARA2331CA
	Pit River Drainage Squawfish/Sucker Valley Stream Community	CARA2332CA

Appendix 4I – Fish Target Selection Methodology

1. Introduction

Globally, freshwater harbors an amazing amount of biodiversity, as well as some of the most imperiled (Allan and Flecker 1993). In western North America over the past century, diversity of freshwater fauna has undergone a dramatic decline with many species now extinct or severely imperiled (Moyle and Williams 1990; Richter et al 1997). Many freshwaters animals occurring in western North America are endemic to the region, thus their loss represents a serious threat to global biodiversity. Often, the identification of species in need of protection is an important first step in developing an effective regional conservation strategy.

Within the "fine filter-coarse filter" approach to biodiversity conservation, the identification of freshwater animal targets is crucial (Noss 1987). Coarse filters identify an array of critical habitats worthy of protection while, theoretically, incorporating the needs of the species associated with those habitats. Yet, to adequately address the specific needs of species that are associated with a complex of habitats or very specific habitats, fine filter targets are necessary. In practice, the use of fine filter targets is a complementary, and necessary, approach to coarse filter target utilization.

Based on a rigorous selection process, the freshwater fish team compiled a list of aquatic animals (fine filter target species) in need of conservation protection within the waters encompassed by the East and West Cascades Ecoregional Assessments, as well as in the Ecological Drainage Units covered by the assessment. Occurrence data for these species will be incorporated into the planning process and used to assist with the identification of areas that significantly contribute to overall species conservation, thus biodiversity, at the ecoregional scale.

2. Fine filter target species selection

2.1. Background

Establishing clear and objective criteria for fine filter target species selection is necessary to maintain the integrity of the selection process, as well as ensuring an efficient and unbiased assessment. The fish team utilized the fine filter selection criteria outlined in *Designing a Geography of Hope* (Groves et al. 2000), yet also had the ability to expand these criteria to meet any special circumstances of regional species that were deemed in need of protection. Freshwater species targets were limited to those species which spend their entire life history in the aquatic realm, and for which freshwater is essential to their life history. For this effort, taxa considered were only freshwater and anadromous fishes. Target species information for other aquatic animals, such as mollusks, can be found in the wildlife section, while information on freshwater plants can be found in the plant section. It is acknowledged than numerous mammals, birds, amphibians and insects rely on freshwater for all, or portions, of their life history. Yet, in response to similar fine filter selection efforts from other ecoregional assessment efforts, we have chosen to consider these groups of species as terrestrial fine filter targets.

2.2 Target species selection criteria

Species that met one or more of the following criteria were considered as potential "at risk" species and selected as candidates as fine filter freshwater targets:

- **Imperiled species** having a global rank of G1-G3 as determined by the Natural Heritage Programs in Washington, Oregon and California;

- **Endangered and threatened species** that are federally or state listed as endangered or threatened (or proposed for listing);
- **Species of special concern** that were identified by one of the state Natural Heritage Programs or agencies;
- **Declining species** that (1) have exhibited a significant, long-term decline in habitat and/or numbers or (2) are subject to a continuing high degree of threat;
- **Endemic species** occurring entirely within all, or portions of, the East and West Cascades ecoregions or ecological drainage units encompassed by the assessment;
- **Disjunct species** represented by populations that are reproductively and geographically isolated from other populations of the same species;
- **Vulnerable species** are often abundant and may not be declining, but some aspect of their life history, such as spawning or rearing habitat, makes them especially vulnerable;
- **Keystone species** are those whose impact on a community or ecological system is disproportionately large for their abundance. They contribute to ecosystem function in a unique and significant manner through their activities and their removal would represent a major change to community dynamics;
- **Wide-ranging regional species** include anadromous and other long-migrating species.

2.2.1 Selection of salmonid target species

We included all anadromous forms of the family Salmonidae that occurred within the assessment area. In addition to meeting many of the target selection criteria (including endangered, threatened, wide-ranging, keystone and vulnerable) at the ecologically significant unit scale, salmon, steelhead, and searun cutthroat trout are exceptional ecosystem indicator species due to their diverse life history. They are also iconic throughout the Pacific Northwest and posses significant spiritual and economic value. As such, salmon targets were treated with some distinct differences in terms of defining targets and evaluating data, as well as the type of data applied.

Anadromous salmonid targets were defined as evolutionarily significant units (ESUs), as designated by the National Oceanic and Atmospheric Administration (NOAA). Each ESU is comprised of multiple stocks of a given species in an effort to identify populations (i.e., stocks) or groups of populations that are 1) substantially reproductively isolated from other populations, and 2) contribute substantially to ecological/genetic diversity of the biological species (Hard et al. 1996). As such, ESU boundaries are ecologically based, often resulting in ESU boundaries straddling state or international borders. For example, the Puget Sound/Strait of Georgia coho salmon ESU includes parts of Washington and British Columbia. Species-specific ESU boundaries have been defined by the NOAA Fisheries in six technical memorandum reports: NMFS-NWFSC-24, 25, 27, 32, 33, and 35. (Weitkamp et al. 1995; Hard et al. 1996; Busby et al. 1996; Johnson et al. 1997; Gustafson et al. 1997; Myers et al. 1998).

Seasonal run types of a given species within a given basin were treated as separate targets where NOAA designates seasonal runs as distinct ESUs. For example, a spring-run Chinook salmon ESU were treated as a separate target than a fall-run Chinook salmon ESU. Accordingly, it is possible that two ESUs (e.g., spring-run and fall-run) for a given species (e.g., Chinook salmon) may overlap spatially within an Ecological Drainage Unit (EDU). This delineation is consistent with both WDFW and NOAA Fisheries salmon recovery planning methods. Salmonid species with multiple run-types that are affected by this delineation include Chinook salmon, chum salmon, pink salmon (i.e., odd year and even year), and steelhead trout.

Additionally, bull trout, an ESA listed char, were included as a species target. Bull trout targets were defined as the U.S. Fish and Wildlife Service's (USFWS) recovery units (RUs), the equivalent to NOAA Fisheries ESU designation system for salmon and steelhead. RUs and ESUs represent equivalent definitions employed by different agencies. Similar to the ESU designation system, multiple populations of bull trout are included in a given RU and the boundaries cross state jurisdictions.

For each ESU and RU, the entire freshwater portion of the life-history was considered as a single, aggregated target rather than setting multiple independent targets for each freshwater life-history phase (e.g., spawning adult, egg, alevin, parr, smolt).

2.3 Data sources for target species selection

Our initial fish fine filter target species list was developed by consulting a number of relevant databases and assessments that focused on at risk species including:

- Washington, Oregon and California Natural Heritage Program animal target lists
- Washington Department of Fish and Wildlife- priority habitats and species
- Bureau of Land Management- freshwater species of concern list
- U.S. Forest Service- NW Forest Plan special status species
- Shasta-Trinity National Forest (USFS)- list of aquatic species of concern
- Fine filter target species lists from all ecoregions adjacent to the East and West Cascades
- U.S. Fish and Wildlife Service- list of native fish of the Klamath Basin and Bull Trout distribution data
- National Oceanographic and Atmospheric Association- anadromous salmonid ecologically significant unit data

We also used several publications, notably *Inland Fishes of California* (Moyle 2002) and *Inland Fishes of Washington* (Wydoski and Whitney 2003), to obtain conservation status and distribution information on many species.

2.4 Target species list and expert review

The final fish target species list for the East and West Cascades ecoregions, including data for the entire 11 EDUs, along with inclusion criteria, distribution, and other information is presented in Appendix 4J. The target species list included 89 species (including separate populations of the same species), of which 35 were endemic. Eight species were listed as federally endangered or threatened. The west and east ecoregions were represented by 42 and 60 species, respectively, while 13 species occurred in both ecoregions. The Salmonidae comprised over half of the list, represented by 46 species, and accounted for 74% and 38% of the total for the west and east ecoregions, respectively. The complete species list that included coverage of the 11 EDUs comprised 109 species, with 20 species present within the EDUs that did not occur within the two ecoregions. The western portion of the Great Basin EDU contained five species that did not occur within the ecoregions, the most of any EDU. Nearly half of the additional species were endemic to a region, while the remainder were primarily anadromous forms that utilize spawning and rearing habitat beyond the ecoregional boundaries.

We consulted with a number of regional fisheries experts (Table 1) to review the initial species list. We asked these experts to review the list for omission and commission errors based on target selection criteria as well as their knowledge and understanding of species conservation status and needs. Requests were delivered via e-mail and included: (1) written instructions, (2) the draft fish target species list, (3) an ecoregional map, (4) defined target selection criteria. Reviewers were encouraged to provide justifications for any changes to the list and, if possible, provide specific data sources for species occurrences. Response to the request for review was robust with the majority of reviewers responding. All comments were considered and most incorporated into the target species list. Questions concerning species under consideration for inclusion were investigated and a decision to include or not was made after this investigation. This expert review resulted in the addition of seven new species (4 Salmoindae, 1 Catostomidae and 1 Petromyzontidae) and the deletion of three species, all cottids. The review also highlighted the challenged faced by species classification. In some cases, recent genetic research had elucidated some of the taxonomic similarities or differences between related species. As much as possible, this new information was taken into consideration and included in the analysis.

Table 1. List of experts consulted for target species list review.

Name	Organization
Rodger Smith	ODFW
Dr. Doug Markle	Oregon State University
Dick O'Conner	WDFW
Paul Mongillo	WDFW
Molly Hallock	WDFW
Dr. Paul James	Eastern Washington Univ.
Chris Allen	USFWS
Dr. Stewart Reed	Western Fishes/USFWS
John Fleckenstein	WA Heritage
Jennifer Parsons	WA DoE
Nancy Duncan	BLM
Joan Ziegltrum	Olympic National Park
Jen Stone	USFWS
Lisa Hallock	WA Heritage

3. Data Selection and Inclusion Methodology

3.1 Criteria for Data Inclusion

We relied heavily on the state Natural Heritage Programs databases of species for population occurrence information. We supplemented these data with additional sources, such as state and federal wildlife agencies, experts, and, in the case of anadromous salmonids and bull trout, ESU and RU distribution information from NOAA fisheries and U.S. Fish and Wildlife Service.

Data acquired from the various sources varied considerably in terms of format, certainty of occurrence location, date of occurrence observation, and other qualifying information. As such, we developed the following criteria to screen data for inclusion:

- **Date of observation** required that observations be no more than 20 years old. In cases where the majority or all occurrence observations were within 20-22 years, these data were considered for inclusion on a case by case basis;
- **Extirpated species** known to be no longer present within the ecoregions were excluded;
- **Wide-ranging or highly mobile species** occurrence data were limited to reproductively critical sites, such as redds, nests, and larval and juvenile rearing habitats;

- **Certainty of source** required that unverified or non-credible sources of data be excluded;
- **Viability** of data required the consideration of all confirmed and credible data sources, even though these sources are not ranked for quality;
- **Locational certainty** of the occurrence data was generally available in two formats. Point occurrences are confirmed observations from distinct locations, while line (arc) occurrences were used for data where the distribution was not specifically known.

Distributional criteria were determined for each species using the following criteria:

Endemic	=	>90% of global distribution in ecoregion,
Limited	=	global distribution in 2-3 ecoregions,
Disjunct	=	distribution in ecoregion quite likely reflects significant genetic differentiation from main range due to historic isolation; roughly >2 ecoregions separate this ecoregion from central parts of it's range
Widespread	=	global distribution >3 ecoregions,
Peripheral	=	<10% of global distribution in ecoregion

3.2 Data Refinement

After all data had been subjected to the screening process and reviewed for accuracy, it was necessary to add in additional occurrence data specific to several species for which recent filed or genetic research had provided updated information. Also, occurrence information for species that were no longed deemed viable in light of this recent information were removed from inclusion. In the cases of adding data, occurrence data were entered by constructing polygon in the GIS layer for species occurrences.

3.2.1 Data incorporation for anadromous salmonids

Assessment of anadromous salmonids involved the integration of habitat quality data to evaluate the relative conservation value of reach habitat. Relative habitat quality was evaluated using Ecosystem Diagnosis and Treatment (EDT), developed by Mobrand Biometrics Inc., to characterize river reaches for protection potential. EDT was used to develop ranks of relative protection value, which were evaluated in combination with the quantity of habitat (reach length) to select salmon conservation areas. EDT is currently being applied to Washington salmon recovery planning. EDT modeling has been conducted in nearly all basins with salmon that intersect the ecoregions currently under assessment in Washington.

Salmonid targets were represented by documented reach-scale spawning or rearing habitat. Where EDT data were available and relevant, EDT reaches defined target occurrences and distribution for species that had EDT data (chum, coho, Chinook, and steelhead). Where EDT is not relevant, state reach-scale spawning and rearing habitat maps were used to define distribution of salmonids. Habitat data in Washington was supplied by the Washington Department of Fish and Wildlife's State Salmonid Stock Inventory (SaSI) database. SaSI data included the spatially explicit identification of spawning and freshwater rearing habitat for all stocks of salmon, steelhead trout, and bull trout in Washington. Due to lack of availability for many streams, EDT habitat data in Oregon and California were not used. Rather, all occurrence data were derived from Heritage databases.

Within a watershed (e.g., Klickitat River watershed), EDT reaches were delineated for each salmon species. EDT characterizes habitat conditions for 46 habitat attributes (e.g., % of reach composed of pool habitat) for each reach and provides evaluations of current conditions and historical conditions. EDT then uses habitat-dependent survival rules to simulate population performance measures (i.e., intrinsic productivity, equilibrium abundance, life-history diversity) for both current and historical habitat conditions.

In addition to simulating population performance, EDT estimates both the restoration and protection potential for each reach. The protection potential will be applied to this assessment. In order to estimate protection potential, EDT simulates the relative decrease in population performance that would be expected if habitat conditions for a given reach become fully degraded (as defined by the habitat attribute values) beyond current habitat conditions. The result is a set of reach-specific protection values expressed as % change in population performance parameters from current conditions.

EDT models are species-specific and run-type specific resulting in the creation of *n* number of EDT models for a given watershed where *n* = the number of salmonid targets. Reach delineations and habitat characterizations are identical among EDT models for a given watershed. Spatial extent, however, and thus total number of reaches can vary among models due to differences in total spatial distribution among species.

In any case where EDT has not been conducted or is otherwise unavailable, as in Oregon and California, occurrences were ranked and will be considered equal in quality. All applicable reaches (i.e., those identified by the SaSI database as spawning or rearing habitat) received equal habitat quality scores (i.e., habitat quality score = 500) unless other data indicate otherwise. In this case, freshwater suitability indices, applied to analysis units for all targets, were then the primary means of selection of best available habitat.

3.3 Setting Goals

For freshwater fish species targets, methodologies for the development of conservation goals differed slightly between EDUs. In Oregon and California EDUs (Deschutes, Willamette, Rogue-Umpqua, Upper Klamath, Pit, Honey Lake and Great Basin) goals were based on a percentage of total occurrences or occupied habitat for individual species. For these EDUs, goals for MARXAN runs were initially set at 30% of the total occurrences for a particular species or population. Due to their high degree of vulnerability and status as indicator species, goals for all anadromous salmonids were set at 50% of all occurrences. Additionally, goals for some species, including those for G1 and G2 ranked species were also increased to 50%. Adjustment of goals for other species were considered on a case-by-case basis.

In Washington EDUs (Okanogan, Yakima-Palouse, Lower Columbia and Puget Sound) conservation goals for species targets were determined following “moderate risk” guidelines proposed by Comer (2003) and based largely on current distribution of the species for spatially limited species (Table 2). Goals were established for number of “occurrences”, or populations, for spatially limited species, and as a percentage of available reproductive and rearing habitat for mobile and wide-ranging species. In all cases where available target data were expressed as point data, points were assumed to be populations. Goals for species targets were set based on their global distribution across EDUs according to the following guidelines (Comer 2003):

Table 2. Conservation goals for spatially limited (resident) fish species in Washington EDUs.

Spatial Distribution	Goal	Definition
Endemic	50 occurrences	>90% of global distribution in EDU
Limited	25 occurrences	<90% of global distribution in EDU, limited to 2-3 EDUs
Disjunct	13 occurrences	Genetically distinct from other populations and substantially separated from other populations
Widespread	13 occurrences	Global distribution >3 EDUs
Peripheral	7 occurrences	<10% of distribution is within EDU

Due to their complex and wide-ranging life-history, and their special consideration under the Endangered Species Act, anadromous salmonid populations (including bull trout) represented a special circumstance and were treated slightly different from other fish species in terms of setting goals. Salmon, steelhead and bull trout species data were represented by habitat distribution (stream arcs) rather than spatially distinct occurrences, or populations. For the majority of these targets, a conservation goal was set as 50% of available spawning and rearing habitat. For others, a conservation goal of 50% of the product of length of spawning habitat and a habitat-quality rank (derived from EDT) was used.

3.4 Special Occurrences and Targets

The following targets or locations are considered special occurrences. Special occurrences are either targets with no occurrence or observation data, or targets whose occurrence/observation data were not included the site selection algorithm runs. In particular, species targets with very limited occurrence data were excluded from EDU assessments in Washington so that they would not exert inordinate influence on Marxan output. Species listed here as special targets were considered conservation targets, but did not have goals set for them in Marxan analysis.

Yakima EDU

- **Class 3 Rivers, Yakima EDU – Yakima River, Satus Creek, and Crab Creek mainstems**. Representation of Size Class 3 rivers was incorporated in the portfolio manually, after the algorithm. These mainstems are considered essential components of the overall portfolio and include the Yakima River, Crab Creek, and Satus Creek. The Yakima River mainstem in particular contains numerous species targets that were not explicitly included in the site selection algorithm. However, for many of these species, the Yakima represents the majority of documented observations or occurrences within the EDU.

- **Class 4 Rivers - Columbia River mainstem, Hanford Reach**. The Columbia River mainstem was not explicitly identified in the portfolio. Despite its central importance to the EDU, the scale of the Columbia River warrants an alternative or different approach to evaluating conservation issues than those applied in this EDU assessment. Certain species targets exist only or primarily within the Columbia, but may migrate through or beyond the EDU, were omitted from the site selection algorithm. The Hanford Reach of the Columbia is the only free-flowing portion of the river within this EDU and should be considered as part of the conservation portfolio and planning for this EDU.

- ***Acipenser transmontanus*, white sturgeon**. White sturgeon is known to be within the Columbia River and potentially lower Yakima River, though no observation or occurrence data are available. Effective conservation may require additional area within these rivers that may not have been identified in the portfolio.

- ***Catostomus platyrhynchus*, mountain sucker**. Mountain sucker is documented as observations at certain points within the Yakima River. The Yakima River mainstem contains these points. Effective conservation is presumed to require additional area within the Yakima River that may not have been identified in the data.

- ***Couesius plumbeus*, lake chub.** Lake chub are presumed to be present in isolated lakes within the EDU. However, there are no occurrence data are available.

- ***Lampetra ayresei*, river lamprey.** River lamprey are presumed to be present in isolated lakes within the EDU. However, there are no occurrence data are available.

- ***Lampetra tridentate*, Pacific lamprey.** Pacific lamprey is documented as observations at certain points within the Yakima River. The Yakima River mainstem contains these points. Effective conservation is presumed to require additional area within the Yakima River that may not have been identified in the data.

- ***Lampetra richardsoni*, western brook lamprey.** Western brook lamprey is documented as observations at certain points within the Yakima River. The Yakima River mainstem contains these points. Effective conservation is presumed to require additional area within the Yakima River that may not have been identified in the data.

- ***Percopsis transmontana*, sand roller.** Sand roller is documented as observations at certain points within the Columbia River. The Columbia River mainstem contains these points. Effective conservation is presumed to require additional area within the Columbia River that may not have been identified in the data.

- ***Rhinichthys falcatus*, leopard dace.** Leopard dace is documented at certain points within the Yakima River and Columbia River. Effective conservation is presumed to require additional area within the Yakima and Columbia Rivers that may not have been identified in the data.

- ***Rhinichthys Umatilla*, Umatilla dace.** Umatilla dace is documented as observations at certain points within the Yakima River. The Yakima River mainstem contains these points. Effective conservation is presumed to require additional area within the Yakima River that may not have been identified in the data.

- ***Onchorhynchus mykiss*, Snake River steelhead.** Snake river steelhead exist (spawn and rear) primarily outside of the EDU. Only a small portion of the Snake River is contained within this EDU, and that is primarily a migratory route. No goals were set for this target, assuming it will be addressed in EDUs where it is or was historically prominent.

- ***Onchorhynchus gorbuscha*, odd year pink salmon.** Pink salmon is documented at certain points within the Columbia River. Effective conservation is presumed to require additional area within the Columbia River and its tributaries that may not have been identified in the data.

- ***Onchorhynchus tshawytscha*, Snake River spring/summer Chinook salmon.** Snake river chinook exist (spawn and rear) primarily outside of the EDU. Only a small portion of the Snake River is contained within this EDU. No goals were set for this target, assuming it will be addressed in EDUs where it is or was historically prominent.

- ***Onchorhynchus tshawytscha*, upper Columbia River spring Chinook salmon.** Upper Columbia River Chinook exist (spawn and rear) primarily outside of the EDU. Only a small portion of the Snake River is contained within this EDU. No goals were set for this target, assuming it will be addressed in EDUs where it is or was historically prominent.

- ***Potamogeton foliosus fibrillosus*, fibrous pondweed.** Pondweed is documented at certain points within the Yakima River. Effective conservation and recovery is presumed to require additional area within the Yakima River that may not have been identified in the portfolio.

- ***Potamogeton obtusifolius*, blunt-leaf pondweed.** Blunt-leaf pondweed is presumed to be present within the EDU, but no data were available.

Lower Columbia EDU

- **Class 3 Rivers – Klickitat River, Clackamas River, and Cowlitz River mainstems**. Representation of Size Class 3 rivers was incorporated in the portfolio manually, after the algorithm. These mainstems are considered essential components of the overall portfolio and include the Klickitat River, Clackamas River, and Cowlitz River. The Yakima River mainstem in particular contains numerous species targets that were not explicitly included in the site selection algorithm. However, for many of these species, the Yakima represents the majority of documented observations or occurrences within the EDU.

- **Class 4 Rivers - tidal Columbia River mainstem, up to the Dalles Dam**. The Columbia River mainstem was not explicitly identified in the portfolio. Despite its central importance to the EDU, the scale of the Columbia River warrants an alternative or different approach to evaluating conservation issues than those applied in this EDU assessment. Certain species targets exist only or primarily within the Columbia, but may migrate through or beyond the EDU, were omitted from the site selection algorithm. The Columbia Estuary and tidal portions of the mainstem, up to the Dalles Dam, should be considered as part of the conservation portfolio and planning for this EDU.

- ***Acipenser transmontanus*, white sturgeon**. White sturgeon is documented as observations at certain points within the Columbia River. The Columbia River mainstem contains these points. Effective conservation is presumed to require additional area within the Columbia River that may not have been identified in the data.

- ***Catostomus platyrhynchus*, mountain sucker**. Mountain sucker is documented as a single observation within the Cowlitz River basin. Effective conservation is presumed to require additional area within the Cowlitz River that may not have been identified in the data.

- ***Couesius plumbeus*, lake chub.** Lake chub are presumed to be present in isolated lakes within the EDU. However, there are no occurrence data are available.

- ***Lampetra ayresei*, river lamprey.** River lamprey are presumed to be present within the EDU. However, there are no occurrence data are available.

- ***Lampetra tridentate*, Pacific lamprey.** Pacific lamprey is documented as observations at certain points within the Columbia River mainstem and its tributaries. Observations within tributaries were included in site selection algorithm and portfolio; observations within the Columbia River mainstem were not. Effective conservation is presumed to require additional area within the Columbia River that may not have been identified in the data.

- ***Lampetra richardsoni*, western brook lamprey.** Western brook lamprey is documented as observations at certain points within the Columbia River mainstem and its tributaries. Observations within tributaries were included in site selection algorithm and portfolio; observations within the Columbia River mainstem were not. Effective conservation is presumed to require additional area within the Columbia River that may not have been identified in the data.

- ***Percopsis transmontana*, sand roller.** Sand roller is documented as a single observation within the Cowlitz River basin. Effective conservation is presumed to require additional area within the Cowlitz River that may not have been identified in the data.

- ***Rhinichthys falcatus*, leopard dace.** Leopard dace are presumed to be present within the EDU. However, there are no occurrence data are available.

- ***Onchorhynchus keta*, Columbia River chum salmon.** Chum salmon is documented as observations at certain points within the Columbia River mainstem and its tributaries. Observations within tributaries were included in site selection algorithm and portfolio; observations within the Columbia River mainstem were not. Effective conservation is presumed to require additional area within the Columbia River that may not have been identified in the data.

- ***Onchorhynchus gorbuscha*, odd year pink salmon.** Pink salmon is documented at certain points within the Columbia River. Effective conservation is presumed to require additional area within the Columbia River and its tributaries that may not have been identified in the data.

- ***Onchorhynchus mykiss gairdneri*, inland Columbia redband trout (rainbow trout).** Redband trout are presumed to be present within the EDU. However, there are no occurrence data are available.

- ***Lobelia dortmanna*, water lobelia.** Water lobelia is presumed to be present within the EDU, but no data were available.

- ***Wolffia columbiana*, Columbian watermeal.** Columbian watermeal presumed to be present within the EDU, but no data were available.

- ***Potamogeton foliosus fibrillosus*, fibrous pondweed.** Pondweed is presumed to be present within the EDU, but no data were available.

- ***Potamogeton obtusifolius*, blunt-leaf pondweed.** Blunt-leaf pondweed is presumed to be present within the EDU, but no data were available.

Appendix 4J – Targets Lists for Fishes

Table 1. Fish Targets for the East and West Cascades Ecoregions

Inclusion Criteria (IC): D=decling, E=endemic, FC/T/E= federal candidate/threatened/endangered, I=indicator (keystone), V=vulnerable.

Ecoregional Presence (ER):W=West Cascades, E=East Cascades and Modoc Plateau.

Distribution (Dist): E=Endemic, L=Limited, W=Widespread, P=Peripheral.

Ecological Drainage Unit Presence (EDUs): C=Lower Columbia, Y=Yakima-Palouse, O=Okanogan, P=Puget Sound, D=Deschutes, W=Willamette, R=Rogue/Umpqua, UK=Upper Klamath, H=Honey Lake, GB=Great Basin, Pi=Pit.

Scientific name	Common Name	Element Code	Grank	IC	ER	Dist.	EDUs
Petromyzontidae							
Lampetra (Entosphenus) minima	Miller Lake lamprey	AFBAA02070	G1	E	E	E	UK
Lampetra (Entosphenus) tridentata	Pacific lamprey	AFBAA02100	G5	D	W/E	W	C,LK,P,R,O,W,Y
Lampetra (Entosphenus) sp.	Upper Klamath Lake lamprey		?	E	E	E	UK
Lampetra (Entosphenus) similis	Klamath River lamprey	AFBAA02140	G3G4Q	E	E	L	UK,LK
Lampetra (Entosphenus) lethophagus ssp.	Klamath brook lamprey		?	E	E	E	UK
Lampetra (Entosphenus) sp.	Goose Lake lamprey (predatory)	AFBAA02101?	?	E	E	E	Pi
Lampetra (Entosphenus) lethophagus	Pit/Goose brook lamprey (includes Goose Lake pop.)	AFBAA02060?	G3G4	E	E	L	Pi,G
Lampetra (Entosphenus) richardsoni	Western brook lamprey	AFBAA02090	G5	I	W/E	W	C,Y,P,O
Lampetra ayresi	River lamprey	AFBAA02030	G4	D	W/E	W	C,Pi,P,Y
Acipenseridae							
Acipenser transmontanus	White sturgeon	AFCAA01050	G4	D	W/E	W	C,Y,R,LK,O,P
Cottidae							
Cottus pitensis	Pit sculpin	AFC4E02190	G4	E	E	L	Pi
Cottus princeps	Klamath Lake sculpin	AFC4E02200	G3	E	E	E	UK
Cottus tenuis	Slender sculpin	AFC4E02240	G3	E	E	E	UK
Cottus klamathensis macrops	Bigeye marbled sculpin (Pit River)	AFC4E02151	G4T3	E,D	E	E	Pi
Cottus klamathensis klamathensis	Marbled sculpin ssp.(Upper Klamath)	AFC4E02150?	G4	E	E	E	UK
Cottus asperrimus	Rough sculpin	AFC4E02030	G2	E	E	E	Pi

Scientific name	Common Name	Element Code	Grank	IC	ER	Dist.	EDUs
Umbridae							
Novumbra hubbsi	Olympic mudminnow	AFCHD03010	G3	E,I	W	L	C,P,D
Percopsidae							
Percopsis transmontana	Sand roller	AFCLC01020	G4	E	E	L	C,Y
Cyprinidae							
Siphateles thalassinus	Goose Lake tui chub	AFCJB1303Q	G4T2	E	E	E	Pi,G
Siphateles bicolor ssp.	Eagle Lake tui chub	AFCJB1303L	G4T1	E	E	E	H
Siphateles bicolor	Klamath Lake tui chub		?	E	E	E	UK
Gila coerulea	Blue chub	AFCJB13050	G3	E	E	E	UK
Oregonichthys crameri	Oregon chub	AFCJB56010	G2	E	W	E	W
Oregonichthys kalawatseti	Umpqua chub	AFCJB56020	G3	E, D	W	E	R
Gila bicolor	Tui chub	AFCJB13030	G4	V	E	P	C,Y
Richardsonius egregius	Lahontan redside	AFCJB39020	G5	E,P	E	W	H
Rhinichthys evermanni	Umpqua dace	AFCJB37030	G3	E	W	E	R
Rhinichthys umatilla	Umatilla dace	AFCJB37120	G4	E	E	L	Y,O
Rhinichthys osculus	Speckled dace	AFCJB37050	G5	??	W	W	O
Rhinichthys osculus klamathensis	Klamath speckled dace	AFCJB37050?	G5	E	E	L	UK,LK
Rhinichthys falcatus	Leopard dace	AFCJB37040	G4	Disj	E	L	C,Y,O
Lavinia symmetricus mitrulus	Pit roach	AFCJB19027	G5T3	E,D	E	L	Pi,G
Mylopharodon conocephalus	Hardhead	AFCJB25010	G3	I	E	P	Pi
Ptychocheilus umpquae	Umpqua pikeminnow	AFCJB35040	G4	E	W	E	R
Catostomidae							
Catostomus microps	Modoc sucker	AFCJC02140	G1	E	E	E	Pi,G
Catostomus occidentalis lacusanserinus	Goose Lake sucker	AFCJC02151	G5T2T3Q	E	E	E	G
Catostomus rimiculus ssp.	Rogue smallscale sucker		??	E	E	E	R
Catostomus rimiculus ssp.	Klamath smallscale sucker (Jenny Creek pop included)	AFCJC02180?	G5T2Q	E	E	L	UK,LK
Catostomus snyderi	Klamath largescale sucker	AFCJC02200	G3	E	E	E	UK
Chasmistes brevirostris	Shortnose sucker	AFCJC03010	G1	E	E	E	UK
Deltistes luxatus	Lost River sucker	AFCJC12010	G1	E	E	E	UK
Catostomus tahoenesis	Tahoe sucker (Eagle Lake pop. included)	AFCJC02210	G5	E	E	P	Pi, H
Catostomus platyrhnchus	Mountain sucker	AFCJC02160	G5	D	W/E	W	H,Y,C,O

Scientific name	Common Name	Element Code	Grank	IC	ER	Dist.	EDUs
Salmonidae							
Oncorhynchus mykiss gairdneri	Inland Columbia Basin redband trout	AFCHA02092	G5T4	D	W/E	W	C,W,R,D,Y,O
Oncorhynchus mykiss pop 18	Great Basin redband trout	AFCHA0209S	G5T3Q	I,V	E	E	G
Oncorhynchus mykiss pop 19	Klamath Basin redband trout	AFCHA0209T	G5T3T4Q	E	E	E	UK
Oncorhynchus mykiss pop 2	Redband trout (Jenny Creek pop)	AFCHA0209E	G5T2Q	Disj, I	E	E	UK
Oncorhynchus mykiss pop 6	Goose Lake redband trout	AFCHA02096	G5T2Q	E	E	E	G
Oncorhynchus mykiss pop	Eagle Lake rainbow trout	AFCHA2097	G5T1	E	E	E	H
Oncorhynchus clarki lewisi	Westslope cutthroat trout	AFCHA02088	G4	V,I	L	E	Y,O
Prosopium coulteri	Pygmy whitefish	AFCHA03020	G5	D, V	P	W	P,Y,O
Salvelinus confluentus RU 1	Bull trout - Klamath River Basin	AFCHA05020	G3T2Q	FT, I	E	W	UK
Salvelinus confluentus RU 5	Bull trout - Hood River Basin	AFCHA05020	G3T2Q	FT, I	W/E	W	C
Salvelinus confluentus RU 4	Bull Trout - Willamette River Basin	AFCHA05020	G3T2Q	FT, I	W	W	W
Salvelinus confluentus RU 19	Bull Trout - Lower Columbia River Basin	AFCHA05020	G3T2Q	FT, I	W/E	W	C
Salvelinus confluentus RU 20	Bull Trout - Middle Columbia River Basin	AFCHA05020	G3T2Q	FT, I	E	W	Y?
Salvelinus confluentus RU 21	Bull Trout - Upper Columbia River Basin	AFCHA05020	G3T2Q	FT,I	E	W	O
Salvelinus confluentus RU	Bull Trout - Puget Sound Basin	AFCHA05020	G3T2Q	FT,I	W	W	P
Salvelinus confluentus RU 6	Bull Trout - Deschutes River Basin	AFCHA05020	G3T2Q	FT,I	E	W	D
Oncorhynchus kisutch	Coho salmon - So.OR/No.CA Coasts ESU	AFCHA02030	G4T2Q	FT,I	W	W	LK,R
Oncorhynchus kisutch	Coho salmon - OR Coast ESU	AFCHA02030	G4T2Q	FT,I	W	W	R
Oncorhynchus kisutch	Coho salmon - Puget Sound Strait of Georgia	AFCHA02030	G4T3Q	FC,I	W	W	P
Oncorhynchus kisutch	Coho salmon - Lwr. Columbia/SW WA ESU	AFCHA02030	G4T3Q	FC,I	W/E	W	C
Oncorhynchus gorbuscha	Pink salmon - Even-year ESU	AFCHA02010	G5	I	W	W	P
Oncorhynchus gorbuscha	Pink salmon - Odd-year ESU	AFCHA02010	G5	I	W	W	P,LC,Y
Oncorhynchus tshawytscha	Chinook salmon - Upr Willamette R. ESU	AFCHA02050	G5T2Q	FT,I	W	W	W
Oncorhynchus tshawytscha	Chinook salmon - Lwr Columbia R. ESU	AFCHA02050	G5T2Q	FT,D,I	W/E	W	C
Oncorhynchus tshawytscha	Chinook salmon - Puget Sound ESU	AFCHA02050	G5T2Q	FT,D,I	W	W	P
Oncorhynchus tshawytscha	Chinook salmon - Oregon Coast ESU	AFCHA02050	G5T?Q	I	W	W	R
Oncorhynchus tshawytscha	Chinook salmon - So. OR/No. CA Coasts ESU	AFCHA02050	G5T3Q	D,I	W	W	LK,R
Oncorhynchus tshawytscha	Chinook salmon - Upr Columbia R. Summer/Fall ESU	AFCHA02050	?	I	E	W	O
Oncorhynchus tshawytscha	Chinook salmon - Upr. Columbia R. Spring run ESU	AFCHA02050	G1	FE,I	E	W	O
Oncorhynchus tshawytscha	Chinook salmon - Mid Columbia R. Spring run ESU	AFCHA02050	G5T?Q	I	E	W	Y
Oncorhynchus mykiss	Steelhead - Upr. Willamette R. ESU	AFCHA02090	G5T2Q	FT,D,I	W	W	W

Scientific name	Common Name	Element Code	Grank	IC	ER	Dist.	EDUs
Oncorhynchus mykiss	Steelhead - Mid Columbia R. ESU	AFCHA02090	G5T2Q	FT,I	W/E	W	Y?
Oncorhynchus mykiss	Steelhead - Lwr Columbia R. ESU	AFCHA02090	G5T2Q	FT,I	W	W	C
Oncorhynchus mykiss	Steelhead - OR Coast ESU	AFCHA02090	G5T2T3Q	FC,D,I	W	W	R
Oncorhynchus mykiss	Steelhead - Puget Sound ESU	AFCHA02090	?	I	W	W	P
Oncorhynchus mykiss	Steelhead - Upr Columbia R. ESU	AFCHA02090	G1	FE, I	E	W	O
Oncorhynchus nerka	Sockeye salmon - Lake Wenatchee EUS	AFCHA02040	G5?	I	E	W	O
Oncorhynchus keta	Chum salmon - Columbia R ESU	AFCHA02020	G3T3Q	FT, I	W/E	W	C
Oncorhynchus keta	Chum salmon - Pacific Coast ESU	AFCHA02020	G5T3Q	I	W	W	R??
Oncorhynchus keta	Chum salmon - Puget Sound/Strait of Georgia ESU	AFCHA02020	G5T2Q	FT, I	W	W	P
Oncorhynchus keta	Chum salmon - Hood Canal Summer Run ESU	AFCHA02020	G5T2Q	FT,I	W	W	P
Oncorhynchus clarki clarki	Searun Cutthroat trout - Upr Willamette R ESU	AFCHA0208A	G4T?Q	I	W	W	W
Oncorhynchus clarki clarki	Searun Cutthroat trout - OR Coast ESU	AFCHA0208A	G4T3Q	FC, I	W	W	R
Oncorhynchus clarki clarki	Searun Cutthroat trout - So. OR/No. CA Coasts ESU	AFCHA0208A	G4T?Q	I	W	W	LK,R
Oncorhynchus clarki clarki	Searun Cutthroat trout - SW WA/Columbia R. ESU	AFCHA0208A	G4T3Q	I	W/E	W	C
Oncorhynchus clarki clarki	Searun Cutthroat trout - Puget Sound ESU	AFCHA0208A	?	I	W	W	P

Table 2. Fish Targets for EDUs which intersect the East and West Cascades Ecoregions

Ecological Drainage Unit Presence (EDU): C=Lower Columbia, Y=Yakima-Palouse, O=Okanogan, P=Puget Sound, D=Deschutes, W=Willamette, R=Rogue/Umpqua, UK=Upper Klamath, H=Honey Lake, GB=Great Basin, Pi=Pit.

Inclusion Criteria (IC): D=decling, E=endemic, FC/T/E= federal candidate/threatened/endangered, I=indicator (keystone), V=vulnerable.

Distribution (Dist): E=Endemic, L=Limited, W=Widespread, P=Peripheral.

EDU	Family	Scientific name	Common Name	Element Code	Grank	IC	Dist.
Deschutes	**Umbridae**	*Novumbra hubbsi*	Olympic mudminnow	AFCHD03010	G3	E	L
	Salmonidae	*Oncorhynchus mykiss gairdneri*	Inland Columbia Basin redband trout	AFCHA02092	G5T4	D	W
		Salvelinus confluentus RU 6	Bull trout - Deschutes River Basin	AFCHA05020	G3T2Q	FT,I	W
		Oncorhynchus mykiss	Steelhead - Mid Columbia R. ESU	AFCHA02090	G5T2Q	FT,I	W
		Oncorhynchus tshawytscha	Chinook salmon - Deschutes R. Summer/Fall ESU	AFCHA02050		I	W
Great Basin (western portion)	**Cyprinidae**	*Siphateles thalassinus "Warner Basin"*	Goose Lake tui chub ssp.	AFCJB1303S?	G?	E	L
		Siphateles obesus oregonensis	Lahontan tui chub	AFCJB1303G	G4T2	E	E

EDU	Family	Scientific name	Common Name	Element Code	Grank	IC	Dist.
Great Basin (western portion) con't.		*Siphateles sp.*	Silver Lake tui chub		G?	E	E
		Catosotmus warnerensis	Warner sucker	AFCJC02220	G1	E	E
	Salmonidae	*Oncorhynchus mykiss pop 18*	Great Basin redband trout	AFCHA0209S	G5T3Q	I,V	E
		Oncorhynchus mykiss pop 4	Warner Valley redband trout	AFCHA02099	G5T2Q	E	E
Honey Lake (western portion)	**Cyprinidae**	*Siphateles bicolor ssp.*	Eagle Lake tui chub	AFCJB1303L	G4T1	E	E
		Richardsonius egregius	Lahontan redside	AFCJB39020	G5	E,P	W
	Catostomidae	*Catostomus platyrhnchus*	Mountain sucker	AFCJC02160	G5	D	W
		Catostomus tahoenesis	Tahoe sucker (Eagle Lake pop)	AFCJC02210	G5	E	P
	Salmonidae	*Oncorhynchus mykiss pop*	Eagle Lake rainbow trout		G5T1	E	E
Lower Columbia	**Petromyzontidae**	*Lampetra (Entosphenus) tridentata*	Pacific lamprey	AFBAA02100	G5	D	W
		Lampetra (Entosphenus) richardsoni	Western brook lamprey	AFBAA02090	G5	I	W
		Lampetra ayresi	River lamprey	AFBAA02030	G4	D	W
	Acipenseridae	*Acipenser transmontanus*	White sturgeon	AFCAA01050	G4	D	W
		Acipenser medirostris	Green sturgeon - Northern DPS	AFCAA01030	G3	V	L
	Percopsidae	*Percopsis transmontana*	Sand roller	AFCLC01020	G4	E	L
	Cyprinidae	*Rhinichthys falcatus*	Leopard dace	AFCJB37040	G4	D?	L
		Couesius plumbeus	Lake chub	AFCJB06010	G5	V	P
		Oregonichthys crameri	Oregon chub	AFCJB56010	G2	E	E
		Gila bicolor	Tui chub	AFCJB13030	G4	V	P
	Catostomidae	*Catostomus platyrhnchus*	Mountain sucker	AFCJC02160	G5	D	W
	Salmonidae	*Oncorhynchus mykiss gairdneri*	Inland Columbia Basin redband trout	AFCHA02092	G5T4	D	W
		Salvelinus confluentus RU 19	Bull trout - Lower Columbia River Basin	AFCHA05020	G2	FT,I	W
		Salvelinus confluentus RU 5	Bull trout - Hood River Basin	AFCHA05020	G3T2Q	FT,I	W
		Salvelinus confluentus RU 4	Bull trout - Willamette River Basin	AFCHA05020	G3T2Q	FT,I	W
		Oncorhynchus gorbuscha	Pink salmon - Odd-year ESU	AFCHA02010	G5	I	W
		Oncorhynchus kisutch	Coho salmon - Lwr. Columbia/SW WA ESU	AFCHA02030	G4T3Q	FC,I	W
		Oncorhynchus tshawytscha	Chinook salmon - Lwr Columbia R. ESU	AFCHA02050	G5T2Q	FT,D,I	W

EDU	Family	Scientific name	Common Name	Element Code	Grank	IC	Dist.
Lower Columbia con't.		*Oncorhynchus tshawytscha*	Chinook salmon - Mid Columbia R. spring run ESU	AFCHA02050	G5	I	W
		Oncorhynchus mykiss	Steelhead - Lwr Columbia R. ESU	AFCHA02090	G5T2Q	FT,I	W
		Oncorhynchus mykiss	Steelhead - Mid Columbia R. ESU	AFCHA02090	G5T2Q	FT,I	W
		Oncorhynchus mykiss	Steelhead - Washington Coast ESU	AFCHA02090	G5T3Q	I	W
		Oncorhynchus keta	Chum salmon - Columbia R ESU	AFCHA02020	G3T3Q	FT,I	W
		Oncorhynchus clarki clarki	Searun Cutthroat trout - SW WA/Columbia R. ESU	AFCHA0208A	G4T4	I	W
Okanogan	**Petromyzontidae**	*Lampetra (Entosphenus) tridentata*	Pacific lamprey	AFBAA02100	G5	D	W
	Acipenseridae	*Acipenser transmontanus*	White sturgeon	AFCAA01050	G4	D	W
	Cottidae	*Cottus bairdii*	Mottled sculpin	AFC4E02050	G5	??	W
		Cottus sp.	Cultus Lake Sculpin			E	E
	Cyprinidae	*Rhinichthys umatilla*	Umatilla dace	AFCJB37120	G4	E	L
		Rhinichthys falcatus	Leopard dace	AFCJB37040	G4	D?	L
		Couesius plumbeus	Lake chub	AFCJB06010	G5	L	P
		Rhinichthys osculus	Speckled dace	AFCJB37050	G5	??	W
	Catostomidae	*Catostomus platyrhnchus*	Mountain sucker	AFCJC02160	G5	D	W
	Salmonidae	*Oncorhynchus mykiss gairdneri*	Inland Columbia Basin redband trout	AFCHA02092	G5T4	D	W
		Prosopium coulteri	Pygmy whitefish	AFCHA03020	G5	D, V	P
		Oncorhynchus clarki lewisi	Westslope cutthroat trout	AFCHA02088	G4	V,I	L
		Salvelinus confluentus RU 21	Bull Trout - Upper Columbia River Segment	AFCHA05020	G3T2Q	FT,I	W
		Salvelinus confluentus RU 22	Bull Trout - Northeast Washington Rivers Segment	AFCHA05020	G3T2Q	FT,I	W
		Oncorhynchus tshawytscha	Chinook salmon - Upr Columbia R. Summer/Fall ESU	AFCHA02050	?	I	W
		Oncorhynchus tshawytscha	Chinook salmon - Upr. Columbia R. Spring run ESU	AFCHA02050	G1	FE,I	W
		Oncorhynchus mykiss	Steelhead - Upr Columbia R. ESU	AFCHA02090	G1	FE,I	W
		Oncorhynchus nerka	Sockeye salmon - Lake Wenatchee ESU	AFCHA02040	G5 check	I	W
		Oncorhynchus nerka	Sockeye salmon - Okanogan River ESU	AFCHA02040	G5 check	I	W

EDU	Family	Scientific name	Common Name	Element Code	Grank	IC	Dist.
Pit	**Petromyzontidae**	*Lampetra (Entosphenus) lethophagus*	Pit/Goose brook lamprey (includes Goose Lake pop.)	AFBAA02060?	G3G4	E	E
		Lampetra (Entosphenus) sp.	Goose Lake lamprey (predatory)		??	E	L
	Cottidae	*Cottus asperrimus*	Rough sculpin	AFC4E02030	G2	E	E
		Cottus pitensis	Pit sculpin	AFC4E02190	G4	E	E
		Cottus klamathensis macrops	Bigeye marbled sculpin (Pit River)	AFC4E02151	G4T3	E,D	E
	Cyprinidae	*Lavinia symmetricus mitrulus*	Pit roach	AFCJB19027	G5T3	E,D	L
		Siphateles thalassinus	Goose Lake tui chub		G4T2	E	L
		Mylopharodon conocephalus	Hardhead	AFCJB25010	G3	I	P
	Catostomidae	*Catostomus microps*	Modoc sucker	AFCJC02140	G1	E	E
		Catostomus occidentalis lacusanserinus	Goose Lake sucker		G5T2T3Q	E	E
		Catostomus tahoenesis	Tahoe sucker (including Eagle Lake pop)	AFCJC02210	G5	E	L
	Salmonidae	*Oncorhynchus mykiss pop 6*	Goose Lake redband trout		G5T2Q	E	E
		Oncorhynchus mykiss pop 7	McCloud River redband trout	AFCHA02097	G5T1T2Q	E,I	E
Puget Sound	**Petromyzontidae**	*Lampetra (Entosphenus) tridentata*	Pacific lamprey	AFBAA02100	G5	D	W
		Lampetra (Entosphenus) richardsoni	Western brook lamprey	AFBAA02090	G5	I	W
		Lampetra ayresi	River lamprey	AFBAA02030	G4	D	W
	Acipenseridae	*Acipenser transmontanus*	White sturgeon	AFCAA01050	G4	D	W
		Acipenser medirostris	Green sturgeon - Northern DPS	AFCAA01030	G3	IS	L
	Umbridae	*Novumbra hubbsi*	Olympic mudminnow	AFCHD03010	G3	E,I	L
	Catostomidae	*Catostomus sp 4*	Salish sucker	AFCJC02260	G1	FE,I	E
	Cyprinidae	*Rhinichthys sp. 4*	Nooksack dace	AFCJB37110	G3	D, E	E
	Salmonidae	*Prosopium coulteri*	Pygmy whitefish	AFCHA03020	G5	D, V	P
		Salvelinus confluentus RU ?	Bull trout - Puget Sound Basin	AFCHA05020	G2	FT,I	W
		Salvelinus confluentus RU ?	Bull trout - Olympic Peninsula	AFCHA05020	G2	FT,I	W
		Oncorhynchus gorbuscha	Pink salmon - Even-year ESU	AFCHA02010	G5	I	W
		Oncorhynchus gorbuscha	Pink salmon - Odd-year ESU	AFCHA02010	G5	I	W
		Oncorhynchus keta	Chum salmon - Hood Canal Summer Run ESU	AFCHA02020	G5T2Q	FT,I	W
		Oncorhynchus keta	Chum salmon - Puget Sound/Strait of Georgia ESU	AFCHA02020	G5T2Q	I	W
		Oncorhynchus tshawytscha	Chinook salmon - Puget Sound ESU	AFCHA02050	G5T2Q	FT,D	W

EDU	Family	Scientific name	Common Name	Element Code	Grank	IC	Dist.
Puget Sound con't.		*Oncorhynchus nerka*	Sockeye salmon - Baker River ESU	AFCHA02040	G5T3	I	W
		Oncorhynchus kisutch	Coho salmon - Puget Sound Strait of Georgia	AFCHA02030	G4T3Q	FC,I	W
		Oncorhynchus mykiss	Steelhead - Puget Sound ESU	AFCHA02090	G5T2Q?	I	W
		Oncorhynchus clarki clarki	Coastal cutthroat trout - Puget Sound ESU	AFCHA0208A	G4T4	I	W
Rogue/ Umpqua	**Petromyzontidae**	*Lampetra (Entosphenus) tridentata*	Pacific lamprey	AFBAA02100	G5	D	W
	Acipenseridae	*Acipenser medirostris*	Green sturgeon - Northern DPS	AFCAA01030	G3	IS	L
	Catostomidae	*Catostomus rimiculus ssp.*	Rogue smallscale sucker		?	E	E
	Cyprinidae	*Oregonichthys kalawatseti*	Umpqua chub	AFCJB56020	G3	E	E
		Rhinichthys evermanni	Umpqua dace	AFCJB37030	G3	E	E
		Ptychocheilus umpquae	Umpqua pikeminnow	AFCJB35040	G4	E	E
	Salmonidae	*Oncorhynchus kisutch*	Coho salmon - So.OR/No.CA Coasts ESU	AFCHA02030	G4T2Q	FT,I	W
		Oncorhynchus kisutch	Coho salmon - OR Coast ESU	AFCHA02030	G4T2Q	FT,I	W
		Oncorhynchus tshawytscha	Chinook salmon - Oregon Coast ESU	AFCHA02050	G5T?Q	I	W
		Oncorhynchus tshawytscha	Chinook salmon - So. OR/No. CA Coasts ESU	AFCHA02050	G5T3Q	D	W
		Oncorhynchus mykiss	Steelhead - OR Coast ESU	AFCHA02090	G5T2T3Q	FC,D	W
		Oncorhynchus keta	Chum salmon - Pacific Coast ESU	AFCHA02020	G5T3Q	I,D	W
		Oncorhynchus clarki clarki	Coastal cutthroat trout - OR Coast ESU	AFCHA0208A	G4T3Q	FC,I	W
		Oncorhynchus clarki clarki	Coastal cutthroat trout - So. OR/No. CA Coasts ESU	AFCHA0208A	G4T4	I	W
Upper Klamath	**Petromyzontidae**	*Lampetra (Entosphenus) minima*	Miller Lake lamprey	AFBAA02070	G1	FE,E	E
		Lampetra (Entosphenus) sp.	Upper Klamath Lake lamprey		G?	E	E
		Lampetra (Entosphenus) similis	Klamath River lamprey	AFBAA02140	G3G4Q	E	L
		Lampetra (Entosphenus) lethophagus ssp.	Klamath brook lamprey	AFBAA02060?	G3G4	E	E
	Cottidae	*Cottus princeps*	Klamath Lake sculpin	AFC4E02200	G3	E	E
		Cottus tenuis	Slender sculpin	AFC4E02240	G3	E	E
		Cottus klamathensis klamathensis	Marbled sculpin ssp. (Upper Klamath)	AFC4E02150?	G4	E	E
	Cyprinidae	*Siphateles bicolor bicolor*	Klamath Lake tui chub		G?	E	E
		Rhinichthys osculus klamathensis	Klamath speckled dace	AFCJB37050	G5	E	L

EDU	Family	Scientific name	Common Name	Element Code	Grank	IC	Dist.
Upper Klamath con't.		*Gila coerulea*	Blue chub	AFCJB13050	G3	E	E
	Catostomidae	*Catostomus rimiculus*	Klamath smallscale sucker (Jenny Creek pop)	AFCJC02180?	G5T2Q	E	L
		Catostomus snyderi	Klamath largescale sucker	AFCJC02200	G3	E	E
		Chasmistes brevirostris	Shortnose sucker	AFCJC03010	G1	FE,E	E
		Deltistes luxatus	Lost River sucker	AFCJC12010	G1	FE,E	E
	Salmonidae	*Oncorhynchus mykiss pop 19*	Klamath Basin redband trout	AFCHA0209T	G5T3T4Q	E	E
		Oncorhynchus mykiss pop 2	Redband trout (Jenny Creek pop.)	AFCHA0209E	G5T2Q	Disj,I	E
		Salvelinus confluentus pop 1	Bull trout - Klamath Basin Segment	AFCHA05020	G3T2Q	FT,I	W
Willamette	**Petromyzontidae**	*Lampetra (Entosphenus) tridentata*	Pacific lamprey	AFBAA02100	G5	D	W
	Cyprinidae	*Oregonichthys crameri*	Oregon chub	AFCJB56010	G2	E	E
	Catostomidae	*Catostomus platyrhnchus*	Mountain sucker	AFCJC02160	G5	D	W
	Salmonidae	*Salvelinus confluentus RU 4*	Bull trout - Willamette River Basin	AFCHA05020	G3T2Q	FT,I	W
		Oncorhynchus tshawytscha	Chinook salmon - Upr Willamette R. ESU	AFCHA02050	G5T2Q	FT,I	W
		Oncorhynchus mykiss	Steelhead - Upr. Willamette R. ESU	AFCHA02090	G5T2Q	FT,D,I	W
		Oncorhynchus clarki clarki	Searun Cutthroat trout - Upr Willamette R ESU	AFCHA0208A	G4T?Q	I	W
		Oncorhynchus mykiss gairdneri	Inland Columbia Basin redband trout	AFCHA02092	G5T4	D	W
Yakima-Palouse	**Petromyzontidae**	*Lampetra (Entosphenus) tridentata*	Pacific lamprey	AFBAA02100	G5	D	W
		Lampetra ayresi	River lamprey	AFBAA02030	G4	D	W
		Lampetra richardsoni	Western brook lamprey	AFBAA02090	G4G5	I	W
	Acipenseridae	*Acipenser transmontanus*	White sturgeon	AFCAA01050	G4	D	W
	Umbridae	*Novumbra hubbsi*	Olympic mudminnow	AFCHD03010	G3	E	L
	Percopsidae	*Percopsis transmontana*	Sand roller	AFCLC01020	G4	E	L
	Cyprinidae	*Rhinichthys umatilla*	Umatilla dace	AFCJB37120	G4	E	L
		Couesius plumbeus	Lake chub	AFCJB06010	G5	V	P
		Gila bicolor	Tui chub	AFCJB13030	G4	V	P
		Rhinichthys falcatus	Leopard dace	AFCJB37040	G4	D?	L
	Catostomidae	*Catostomus platyrhnchus*	Mountain sucker	AFCJC02160	G5	D	W
	Salmonidae	*Oncorhynchus mykiss gairdneri*	Inland Columbia Basin redband trout	AFCHA02092	G5T4	D	W

EDU	Family	Scientific name	Common Name	Element Code	Grank	IC	Dist.
Yakima-Palouse con't.		*Oncorhynchus clarki lewisi*	Westslope cutthroat trout	AFCHA02088	G4	V,I	L
		Prosopium coulteri	Pygmy whitefish	AFCHA03020	G5	D, V	P
		Salvelinus confluentus RU 20	Bull Trout - Middle Columbia River Basin	AFCHA05020	G3T2Q	FT,I	W
		Salvelinus confluentus RU 21	Bull Trout - Upper Columbia River Basin	AFCHA05020	G3T2Q	FT,I	W
		Oncorhynchus gorbuscha	Pink salmon - Odd-year ESU	AFCHA02010	G5	I	W
		Oncorhynchus tshawytscha	Chinook salmon - Upr Columbia R. Summer/Fall ESU	AFCHA02050	?	I	W
		Oncorhynchus tshawytscha	Chinook salmon - Upr. Columbia R. Spring run ESU	AFCHA02050	G1	FE,I	W
		Oncorhynchus tshawytscha	Chinook salmon - Snake River spring/summer run ESU	AFCHA02050	G5T1Q	I	W
		Oncorhynchus tshawytscha	Chinook salmon - Mid Columbia ESU	AFCHA02050	G5T?Q	I	W
		Oncorhynchus mykiss	Steelhead - Mid Coulmbia spring run ESU	AFCHA02090	G5T2Q	FT,I	W
		Oncorhynchus mykiss	Steelhead - Snake River Basin ESU	AFCHA02090	G5T2T3Q	FT,I	W
		Oncorhynchus mykiss	Steelhead - Upr Columbia R. ESU	AFCHA02090	G1	FE,I	W

Appendix 5A – List of Currently Protected Areas

See Chapter 5 for explanation and analyses

Washington: East Cascades Protected Areas	Hectares	Acres
Alpine Lakes Wilderness	99,632	246,189
Bauguess Wildlife Area Unit	7	17
Buck Creek NWR	16	38
Cedar River Watershed	11	27
Chelan Butte Wildlife Area Unit	3,840	9,489
Colockum Wildlife Area Unit	23,669	58,487
Conboy Lake NWR	4,450	10,996
Cowiche Wildlife Area Unit	1	2
Dillacort Canyon Wildlife Area	131	323
Entiat Wildlife Area Unit	2,478	6,123
Fisher Hill Wildlife Area	216	534
Glacier Peak/Henry M. Jackson Wilderness	127,957	316,181
Goat Rocks Wilderness	15,127	37,379
Goldendale Hatchery Wildlife Area	85	210
Indian Heaven Wilderness	3,925	9,699
Klickitat Oaks	937	2,316
L.T. Murray Wildlife Area Unit	19,919	49,221
Lake Chelan-Sawtooth Wilderness	22,955	56,722
Little Salmon River NWR	9	22
Lookout Mountain Preserve	194	480
Mineral Springs Wildlife Area	364	899
Mt. Adams Wilderness	7,646	18,894
Mt. Rainier NP Wilderness	4	11
Nile Springs Wildlife Area Unit	7	18
Norse Peak Wilderness	14,828	36,641
North Cascades NP	54,321	134,227
Oak Creek Wildlife Area	16,157	39,923
Quilomene Wildlife Area Unit	2,571	6,353
Sandino Ponds Wildlife Area	220	542
Sinlahekin Wildlife Area	169	417
Soda Springs Wildlife Area Unit	5,663	13,994
Swakane Wildlife Area Unit	4,498	11,114
Swauk Creek Preserve	413	1,020
Tieton River Preserve	2,172	5,368
USFWS property (name and status unknown)	18	45
Wahkiacus Oaks	25	62
WA DNR, Natural Area Preserves (various)	3,365	8,314
Wenas Wildlife Area Unit	14,837	36,661
West Major Creek Preserve	16	40
White River Wildlife Area Unit	172	424
William O. Douglas Wilderness	61,871	152,884
Yakima River Wildlife Area Unit	224	555

Washington: West Cascades Protected Areas	**Hectares**	**Acres**
Beacon Rock NWR	167	413
Beacon Rock State Park	1,854	4,582
Bear Creek Watershed	5,200	12,850
Carson National Fish Hatchery	62	152
Cedar Crek Wildlife Area	46	115
Cedar River Watershed	36,215	89,488
Clearwater Wilderness	5,875	14,518
Davis Lake Wildlife Area Unit	114	281
Gardner Wildlife Area Unit	26	64
Glacier View Wilderness	1,247	3,081
Goat Rocks Wilderness	28,788	71,135
Indian Heaven Wilderness	4,505	11,132
Kiona Creek Wildlife Area Unit	173	428
Kosmos Wildlife Area Unit	305	753
Little Salmon River NWR	4	11
Mayfield Buffer Wildlife Area Unit	258	639
Moss Cave	23	57
Mossyrock Wildlife Area Unit	534	1,320
Mount Saint Helens Wildlife Area	1,235	3,053
Mt Pleasant NWR	616	1,521
Mt St Helens National Volcanic Monument	45,602	112,683
Mt. Adams Wilderness	11,416	28,208
Mt. Rainier NP Wilderness	94,992	234,725
Norse Peak Wilderness	6,309	15,589
Peterman Ridge Wildlife Area Unit	2,767	6,838
Pierce Island Preserve	49	120
Riffe Buffer Wildlife Area Unit	932	2,303
Skamania NWR	297	734
Skookumchuck Wildlife Area Unit	274	678
Spears Wildlife Area Unit	166	410
Swofford Wildlife Area Unit	123	304
Tatoosh Wilderness	6,355	15,704
Trapper Creek Wilderness	2,408	5,950
WA DNR, Natural Area Preserves (various)	3,860	9,538
William O. Douglas Wilderness	6,401	15,816
Oregon: East Cascades Protected Areas	**Hectares**	**Acres**
Badger Creek Wilderness	9,980	24,660
Badlands ACEC	398	984
Badlands Wilderness Study Area	137	340
Barlow Road SIA	1,726	4,266
Bear Valley NWR	1,710	4,226
Big Marsh Creek/Crescent Creek Wild and Scenic River	2,939	7,263
Bluejay RNA	85	210

Oregon: East Cascades Protected Areas con’t.	Hectares	Acres
Bull Run RNA	44	109
Cache Mountain RNA	251	620
Cannon Well RNA	325	804
Cascade-Siskiyou National Monument	14,692	36,304
Cherry Basin RNA	687	1,697
Cloud Cap-Tilly Jane PSIA	627	1,550
Collier Memorial State Park	290	716
Columbia River Gorge NSA	512	1,266
Columbia Wilderness	8,975	22,178
Crane Reservoir Osprey Management Area	8,364	20,666
Crater Lake National Park	38,622	95,436
Cultus River PRNA	157	388
Deadhorse Whitebank Pine PRNA	350	865
Deschutes River Wild and Scenic River	4,223	10,436
Devils Garden Lava Beds ACEC	1,125	2,780
Diamond Peak Wilderness	13,668	33,774
Ewauna Flat Preserve	6	14
Gearhart Mountain Wilderness	9,070	22,413
Goodlow Mountain RNA	492	1,215
Gumjuwac-Tolo RNA	1	4
Hatfield Wilderness	4,904	12,119
Hoxie Creek ACEC	103	255
Jenny Creek ACEC	407	1,006
Katsuk Butte PRNA	367	907
Klamath Marsh NWR	20,065	49,581
Klamath River Wild and Scenic River	337	834
Klamath Wildlife Management Area	1,635	4,040
Koberg Beach State Wayside	1	2
La Pine State Recreation Area	951	2,350
Lang State Park	83	204
Lava Butte Geological SIG	4,159	10,276
Lava Cast Forest SIA	2,429	6,001
Lindsey Creek State Park	66	163
Little Deschutes River Wild and Scenic River	1,453	3,591
Lost Lake PSIA	538	1,329
Lost Lake RNA	114	282
Lower Klamath NWR	4,373	10,807
Many Lakes PRNA	299	740
Mayer State Park	422	1,042
Memaloose State Park	178	439
Metolius River Preserve	12	29
Metolius River RNA	553	1,367
Metolius River Wild and Scenic River	3,430	8,477
Mill Creek Buttes PSIA	694	1,714

Oregon: East Cascades Protected Areas con't.	Hectares	Acres
Mill Creek Ridge Preserve	49	121
Mill Creek RNA	337	832
Miller Creek ACEC	380	939
Mokst Butte RNA	580	1,432
Moon Prairie ACEC	37	92
Mount Hood Wilderness	2,250	5,559
Mount Jefferson Wilderness	4,429	10,944
Mount Thielson Wilderness	3,916	9,676
Mount Washington Wilderness	1,241	3,067
Mountain Lakes Wilderness	9,311	23,007
Mountain Lakes WSA	137	340
Mt. Hood Wilderness	5,605	13,849
Mt. Jefferson Wilderness	9,289	22,953
Mt. Thielson Wilderness	9,609	23,744
Mt. Washington Wilderness	4,540	11,218
Mud Creek Preserve	196	484
Mud Creek TNC Managed Area	60	149
Newberry Crater National Monument	5,970	14,751
North Fork Sprague River Wild and Scenic River	1,167	2,884
Old Baldy RNA/ACEC	211	520
Ollalie Lake Scenic Area Expansion PSIA	1,286	3,178
Oregon Gulch ACEC/RNA	424	1,049
Pecks Milkvetch ACEC	15	36
Pringle Falls RNA	364	899
Rock Creek State Park	112	277
Roweena Creek State Park	4	10
Salmon Wild and Scenic River	14	34
Sand Creek Canyon SIG	1,394	3,445
Seneca Fouts Memorial State Natural Area	238	587
Silver Lake Exclosure RNA	34	84
Sky Lakes Wilderness	17,111	42,281
Slide Mountain SIG	260	642
Spencer Creek Wild and Scenic River	586	1,447
Squaw Creek Wild and Scenic River	1,747	4,317
Starvation Creek State Park	121	300
Stringer Meadows PSIA	58	143
Sun Pass State Forest Special Stewardship	173	429
Sycan Marsh (ZX Ranch) Preserve	262	648
Sycan Marsh Preserve	12,203	30,154
Sycan River Wild and Scenic River	4,648	11,485
Three Sisters Wilderness	38,886	96,086
Tin Cup ACEC	33	82
Tom McCall Preserve at Rowena	93	230
Torrey-Charlton PRNA	230	568

Oregon: East Cascades Protected Areas con't.	**Hectares**	**Acres**
Upper Klamath NWR	5,436	13,433
Upper Klamath River ACEC	3,030	7,487
USFS Special Interest Areas (Various)	10,903	26,940
Vee Pasture RNA	292	722
Viento State Park	175	432
Vinzenz Lausmann Memorial State Natural Area	51	126
Wasco Butte State Park	2	5
Wechee Butte PRNA	155	382
White River NWR	126	311
White River Wild and Scenic River	2,925	7,227
White River Wildlife Management Area	8,752	21,626
Wildhaven Preserve	70	173
Williamson River Delta - Goose Bay Preserve	1,143	2,824
Williamson River Delta Preserve	1,942	4,799
Wood River Wetland ACEC	1,305	3,224
Wygant State Natural Area	245	604
Yainax Butte ACEC	286	706
Oregon: West Cascades Protected Areas	**Hectares**	**Acres**
Abbott Creek RNA	947	2,340
Ainsworth State Park	207	511
Bagby Hot Springs PSIA	596	1,474
Bagby RNA	211	521
Baker Cypress ACEC	4	10
Barlow Road SIA	858	2,120
Benson State Recreation Area	127	313
Big Bend Mountain PRNA	1,979	4,889
BLM Special Interest Area	18	44
Boulder Creek Wilderness	8,057	19,909
Bridal Veil Falls State Scenic Viewpoint	7	17
Bull of the Woods Wilderness	13,876	34,287
Bull Run Lake PRNA	176	435
Bull Run RNA	307	758
Carolyn's Crown ACEC	93	229
Cascade-Siskiyou National Monument	2,497	6,170
Cascadia State Park	115	284
Cedar Creek Fish Hatchery	95	236
Clackamas Wild and Scenic River	6,037	14,919
Coburg Hills RFI ACEC	200	495
Coburg Ridge Preserve	10	25
Columbia River Gorge ACEC	283	700
Columbia River Gorge NSA	131	324
Columbia Wilderness	1,592	3,933
Corps of Engineers Special Interest Area	281	695

Oregon: West Cascades Protected Areas con't.	Hectares	Acres
Cottage Grove Lake RFI ACEC	6	16
Cougar Butte RNA	491	1,212
Cougar Mountain Yew Grove ACEC	4	10
Crabtree Lake ACEC	165	408
Crater Lake National Park	34,940	86,336
Crown Point State Scenic Corridor	126	311
Diamond Peak Wilderness	7,543	18,639
Dorena Lake RFI ACEC	8	19
Eagle Creek Falls NWR	50	123
George W. Joseph State Natural Area	51	127
Gold Lake Bog RNA	173	427
Grassy Mountain ACEC	30	74
Grizzly Canyon SIG	77	191
Guy W. Talbot State Park	150	371
Hagan RNA	462	1,141
Hatfield Wilderness	1,624	4,012
Hole-in-the-Rock ACEC	26	63
Horse Rock Ridge ACEC	152	375
Horse Rock Ridge Preserve	25	61
Horse Rock Ridge TNC Managed Area	1	2
John B. Yeon State Park	64	158
John B. Yeon State Scenic Corridor	88	219
Lang State Park	1	2
Lewis and Clark State Park	15	36
Limpy Rock RNA	768	1,898
Lindsey Creek State Park	3	7
Little Crater Lake Expansion PSIA	134	332
Little River Rock Arch ACEC	32	78
Lost Lake ACEC/RNA	238	589
McKenzie Pass RNA	170	420
McKenzie Wild and Scenic River	1,710	4,226
McLoughlin State Park	149	368
Menagerie Wilderness	1,966	4,858
Middle Santiam River RNA	36	88
Middle Santiam Terrace ACEC	39	96
Middle Santiam Wilderness	3,515	8,685
Mohawk ACEC	117	288
Mount Hood Wilderness	2,609	6,447
Mount Jefferson Wilderness	5,424	13,402
Mount Thielson Wilderness	5,084	12,564
Mount Washington PRNA	249	616
Mount Washington Wilderness	2,176	5,376
Mt. Hood Wilderness	7,962	19,675
Mt. Jefferson Wilderness	24,594	60,772

Oregon: West Cascades Protected Areas, con't.	Hectares	Acres
Mt. Thielson Wilderness	3,734	9,228
Mt. Washington Wilderness	13,876	34,289
Multorpor Fen Preserve	34	83
North Bank ACEC	1	2
North Fork of the Middle Fork Willamette Wild and Scenic River	3,135	7,746
North Umpqua River ACEC	746	1,843
North Umpqua Wild and Scenic River	3,361	8,306
Olallie Ridge RNA	314	777
Old Baldy RNA/ACEC	0	0
Old Maid Flat PSIA	686	1,695
Ollalie Lake Scenic Area Expansion PSIA	3,673	9,077
Opal Creek Wilderness	8,390	20,732
Poverty Flat ACEC	19	47
Quartzville Creek Wild and Scenic River	884	2,184
Rebel Rock Geological Area SIG	184	455
Red Pond ACEC	57	141
Rigdon Point RNA	123	304
Rogue-Umpqua Divide Wilderness	13,842	34,203
Rooster Rock State Park	403	995
Round Top Butte Preserve	2	6
Round Top Butte RNA	4	10
Salmon Wild and Scenic River	2,326	5,749
Salmon-Huckleberry Wilderness	18,290	45,194
Sandy River Gorge ACEC	187	463
Sandy River Gorge Preserve	213	527
Sandy Wild and Scenic River	456	1,127
Seneca Fouts Memorial State Natural Area	3	8
Shafer Creek ACEC	237	586
Sharon Fen Preserve	747	1,845
Shepperds Dell State Park	172	425
Sherwood Butte PRNA	623	1,540
Silver Falls State Park	3,422	8,457
Sky Lakes Wilderness	28,429	70,249
Soosap Meadows ACEC	190	470
Squaw Flat RNA	326	805
Squaw Meadows PSIA	380	938
Starvation Creek State Park	35	87
Sugarpine Botanical Area	16	39
Table Rock Wilderness	2,566	6,341
Tater Hill ACEC	122	303
Three Creeks RNA	256	632
Three Sisters Wilderness	75,138	185,665
Torrey-Charlton PRNA	535	1,322
Upper Elk Meadows ACEC	90	223

Oregon: West Cascades Protected Areas con't.	Hectares	Acres
Upper Elk Meadows RNA	62	154
Upper Rogue River Wild and Scenic River	4,898	12,103
USFS Special Interest Areas (Various)	114	282
Viento State Park	12	29
Waldo Lake Wilderness	15,099	37,310
White River Wild and Scenic River	0	0
White Rock Fen ACEC	20	50
Wickiup Springs PRNA	5	12
Wildcat Mountain RNA	424	1,048
Williams Lake ACEC	40	99
Wygant State Natural Area	2	5
California: East Cascades and Modoc Plateau Protected Areas	**Hectares**	**Acres**
Ahjumawi Lava Springs State Park	2,398	5,926
Ash Creek Wildlife Area	5,504	13,601
Butte Valley National Grassland	7,144	17,652
Butte Valley Wildlife Area	5,424	13,402
Caribou Wilderness	139	343
CDFG Wildlife Area	604	1,493
Clear Lake National Wildlife Refuge	13,700	33,852
Lassen Volcanic National Park	2,218	5,482
Lava Beds National Monument	10,553	26,077
Lava Beds Wilderness	8,558	21,148
Lava Wilderness Study Area	4,450	10,996
Lower Klamath NWR	17,891	44,210
Modoc National Wildlife Refuge	3,249	8,028
Pit River Canyon Wilderness Study Area	4,435	10,960
Rosenburg Trust (Lassen Land Trust Easement)	5	14
Soda Mountain SIA	64	158
South Warner Wilderness	27,530	68,028
Swain Mountain Experimental Forest	1,210	2,990
Timbered Crater RNA	498	1,230
Timbered Crater Wilderness Study Area	7,296	18,029
Tule Lake National Wildlife Refuge	16,417	40,567
Tule Mountain Wilderness Study Area	7,118	17,587

Appendix 6A – Suitability Indices Methodology and Factors

6.1 General Overview

Successful conservation will entail choices about where conservation should and should not be pursued. Optimal reserve selection is an analytical technique that addresses this issue (Ando et al. 1998, Pressey and Cowling 2001). Optimal reserve selection analyzes the trade-off between conservation values and conservation costs to arrive at an efficient set of conservation areas that satisfies conservation goals (Possingham et al. 2000, Cabeza and Moilanen 2001). The conservation value of a place is represented by the presence of target species, habitats, and ecological communities. The number of targets, amount of each target, and rarity of targets present at a particular place determines the conservation value of that place.

The optimization algorithm searches for the lowest "cost" set of assessment units that will meet goals for all conservation targets. The actual "cost" of conservation encompasses many complicated factors: acquisition or easement costs, management costs, restoration costs, and the cost of failing to maintain a species at a site. Because determining the monetary cost of conservation for every assessment unit would be an extremely demanding task, we used a surrogate measure for cost called a *suitability index*. A place with a high “cost” for maintaining biodiversity has low suitability for conservation. Suitability indicates the relative likelihood of successful conservation at each assessment unit.

Land use suitability is a well-established concept amongst land use planners (see Hopkins 1977, Collins et al. 2001 for reviews), and there are many different methods for constructing an index (Banai-Kashini 1989, Carver 1991, Miller et al. 1998, Stoms et al. 2002). Suitability indices have been used to locate the best places for a wide range of land uses – from farms to nuclear waste sites. We are using a suitability index in an optimization algorithm that will guide us toward best places for biodiversity conservation.

The suitability indices were based in part on three well-accepted principles of conservation biology (Diamond 1975, Forman 1995):

1) Areas with low habitat fragmentation are better than areas with high fragmentation.
2) Large areas of habitat are better than small areas.
3) Habitat areas close together are better than areas far apart.

A fourth principle guiding this work was that existing public land is generally more suitable for conservation than private land. This assumption was based on the work of the Gap Analysis Program (Cassidy et al. 1997, Kagan et al. 1999). Both the Oregon and Washington GAP projects rated most public lands as better managed for biodiversity than most private lands. Furthermore, eminent conservation biologists have noted that existing public lands are the logical core of large multiple-use landscapes where biodiversity is a major management goal (Dwyer et al. 1995). By focusing conservation on lands already set aside for public purposes the overall cost of conservation would be less than if public and private lands were treated equally.

Our indices are based on the analytic hierarchy process (AHP; Saaty 1980, Banai-Kashini 1989). AHP generates an equation that is a linear combination of factors thought to affect suitability. Each factor is represented by a separate term in the equation, and each term is multiplied by a weighting factor. AHP is unique because the weighting factors are obtained through a technique known as pair-wise comparisons (Saaty 1977) through which experts are asked for the relative importance of each term in the equation. AHP has been used in other conservation assessments where expert judgments are needed in lieu of empirical data (Store and Kangas 2001, Clevenger et al. 2002, and Bojorquez-Tapia 2003).

We readily admit that our simple index cannot account for the many complex local situations that influence successful conservation, but we believe that some reasonable generalities are still quite useful for assessing conservation opportunities across an entire ecoregion.

Separate suitability indices were calculated for the two major components of our analysis; terrestrial and aquatic. Cartographic representations of the suitability indices by assessment unit are shown in Maps 6.1 and 6.2. The factors considered for each suitability index varied slightly. We will describe the data collected for each factor used in any suitability equation and then describe the calculations for each index separately.

6.2 Factors Used in the Terrestrial or Aquatic Suitability Indices

The following spatial data was used in one or more of the suitability indices:

Dams – Dam data was compiled from the best available information for each state within the broader planning area. All data was projected to UTM zone 10, NAD27, and clipped to the planning boundary. A common set of attributes was defined and populated, including impoundment area and dam height. The data was then merged into one layer, *Casc_EDU_dams*. The data sources by state are:

California – The state of California has adopted the National Inventory of Dams (US Army Corps of Engineers) as their standard. The data was originally compiled between 1997 and 1998, and the state of California has made some subsequent updates. This layer includes data on all dams which meet the following criteria; dams at least 25 feet high or 50 acre feet of storage, or dams that due to their location or other physical characteristics may pose a significant threat to life or property in the event of failure.

Oregon – Data for Oregon dams was obtained from StreamNet; a cooperative information management and dissemination project focused on fisheries and aquatic related data in the Columbia River basin and the Pacific Northwest. Information about the location of each dam facility was collected from StreamNet personnel at WDFW (Washington Dept of Fish & Wildlife), ODFW (Oregon Dept of Fish & Wildlife), IDFG (Idaho Dept of Fish & Game), and MFWP (Montana Fish, Wildlife & Parks) and the tabular information about each hatchery in the StreamNet database was then added to each dam facility point in the GIS coverage. Original information for most facilities was derived from the National Inventory of Dams and then revised and amended when better information could be found by the StreamNet data compilers.

Washington – Data for Washington dams was obtained from the Washington Department of Ecology (Ecology), which is responsible for regulating dams that capture and store at least 10 acre-feet (about 3.2 million gallons) of water or watery materials such as mine tailings, sewage and manure waste. Ecology's Dam Safety Office currently oversees about 870 dams across the state. Through plan reviews and construction inspections, the agency helps ensure these facilities are properly designed and constructed. To reasonably secure the safety of human life and property, Ecology also conducts inspections of existing dams to assure proper operation and maintenance.

Land Ownership/Management – Ownership/management data was compiled from the best available information for each state within the broader planning area. All data was projected to UTM zone 10 NAD27, and a common set of attributes was defined and populated. The data was then merged into one layer, *Casc_own*, and clipped to the planning boundary. Special administrative designations resulting from the Northwest Forest Plan were attributed to federal ownerships through intersections with the data from the 2002 Land-Use Allocation update (http://www.reo.gov/gis/data/gisdata/index.htm). Each parcel was assigned a GAP status and a land-use designation. If multiple designations applied (a Wilderness Area within a National Park, for example) the highest protection level designation was used in assigning a weight for the suitability index. As errors were detected through the course of the planning process they were rectified in this final coverage. The base data sources by state are:

California – Interior Columbia Basin Ecosystem Management Project, under supervision of the USFS, collected ownership data throughout Northern California for all major landowner categories. This data was compiled from various sources in 1995 for use at the sub-basin (4th field HUC), and the sub-watershed (6th field HUC) level. GAP status was assigned to each parcel through crosswalks and intersections.

Oregon – The Oregon Natural Heritage Information Center created maps of major ownerships and management classes within the state of Oregon to assist the Oregon Department of Fish and Wildlife in the creation of their state comprehensive wildlife plan. This data was compiled in 2004 from various sources at approximately 1:24000 scale.

Washington – Beginning with the Washington ownership data developed by the Interior Columbia Basin Ecosystem Management Project, WDFW updated state and federal ownerships throughout the planning area.

Land Use – Land use data characterizes the type and degree of man-made conversions to the landscape, from minor (Natural/Semi-Natural) to major conversions (High Intensity Commercial). The National Land Cover Database (NLCD), produced by the Multi-Resolution Land Characteristics (MRLC) at the USGS EROS Data Center, provides consistently classified land-cover and ancillary data for the United States. NLCD 2001 is based on imagery taken in 2001 and has a resolution of approximately 1:24,000. This data was clipped to the planning boundary and projected to UTM zone 10, NAD27.

Mines – Mine data was compiled from the best available information for each state within the broader planning area. All data was projected to UTM zone 10, NAD27, and clipped to the planning boundary. The data sources by state are:

California – The Environmental Protection Agency (EPA) maintains a

comprehensive geospatial database of mine locations as part of their regulatory oversight mandate. This data, in addition to location, contains information on the commodities mined, the current status of the mine, and the relative size of the mining operation.

Oregon – The Oregon Department of Geology and Mines (DOGAMI) permits all mining operations in the state of Oregon. In 2005 they released a new version of their mine database with updated information on all active mines in the state. This data, in addition to location, contains information on the commodities mined, the current status of the mine, and the relative size of the mining operation in a format similar to the EPA's mine database.

Washington - The mine data from the Environmental Protection Agency was also used in Washington.

Roads – Road data was compiled from the best available information for each state within the broader planning area. All data was projected to UTM zone 10, NAD27, and clipped to the planning boundary. As this information was only used to generate road densities within assessment units, no attempt was made at edge matching, routing, or categorizing the roads by type (highway, 2-lane County, etc). The data was merged into a single layer, *Casc_rds_10*. The data sources by state are:

California – The California Department of Fish and Game developed a roads layer (roads) which was used for all planning areas within the state of California. The data contains several classes of transportation features including jeep trails, city streets, thoroughfares, unpaved roads, state highways, and interstates. The data within the roads layer was collected from 1997 – 2000, though some of the data is 20 years old. The currency of the State highway system (those for which Caltrans has responsibility) is very good. The data can be very dense in highly urbanized counties.

Oregon - The Bureau of Land Management's Ground Transportation Network (GTRN) was used for all planning areas within the state of Oregon. This layer is the main Ground Transportation layer for the BLM in Oregon and includes linework for roads and trails. In addition to the official linework for BLM roads and trails, most other roads in the states are included to make the theme more useful. The source linework was collected in 1998 from USGS digital line graphs, US Forest Service cartographic feature files, Washington DOT and DNR road data and BLM's Western Oregon road database (TRB). The theme is edited frequently for BLM road and trail information and less frequently for the non-BLM road and trail data. All state and federal highways are coded. Private roads, especially those on private industrial forest lands are not up to date and represent the greatest area for improvement.

Washington – The Washington State Department of Natural Resources developed a transportation (TRANS) data layer which was used for all planning areas within the state of Washington. The data represents road, railroad, and other land and water routes existing within the State of Washington. The data was intended for forest practice regulation; timber, fish & wildlife (TFW) planning and analysis applications, natural resource planning and general mapping reference. Initial data compilation was completed May 1994. Focus of data collection for the initial phase was on forested state and private lands within the state of Washington. Through a multi-agency agreement (Data96) layer was extended to cover remaining portions of the state, which became available February 1996. Starting in 1996, updates to the data were entered on a site-by-site basis, primarily on DNR managed lands for proprietary road management purposes. No updates have been made to the data set since February 2000.

Seral Stage – Seral stage information was compiled from the QMD data developed by the Interagency Vegetation Mapping Project (IVMP; http://www.reo.gov/monitoring/lsog/IVMP%20summary%20update.htm). This data was not continuous over the full extent of the eastern portions of the planning area, therefore, no seral information was used for most of the sub-sections east of the divide. Late seral information was obtained from the Modoc National Forest and was included as a target for that sub-section, but only early seral forests within riparian corridors were included in the aquatic suitability equations.

6.3 Calculation of Terrestrial and Aquatic Suitability Indices

As our ecoregional analysis maintained separate terrestrial and aquatic planning unit layers, suitability indices were also developed independently for each realm. An additional level of refinement was achieved for the aquatic suitability indices by querying experts independently for each EDU, and tailoring the factors and weightings accordingly. Using the Analytic Hierarchy Process (AHP; Saaty 1980, Banai-Kashini 1989), experts were solicited for their relative weightings of the factors selected for use in the indices. A series of terms were weighted against each other for their relative impact to biodiversity, and sub-terms within each term were also weighted. For example, all suitability indices used land management as a main term, factored against other main terms like landuse and road density. The value of the management status was derived by subdividing management into 10 subtypes representing differing levels of protection; from private lands with no protections to Wilderness areas and National Parks with a high degree of protection. Each management subtype was assigned a weighting relative to the other subtypes, and the percentage of the assessment unit under each management subtype was multiplied by its weighting. A sum was then calculated for each AU for all management subtypes within it. These values were then normalized on a 1-1000 scale for each AU within an ecoregion or EDU, and then weighted against the other normalized main terms of the suitability index. All final suitability values for each EDU or ecoregion were then normalized on a 0-10,000 scale for use within the Marxan portfolio assembly tool.

Simplified suitability equations are in Chapter 6 of the Main Report. The full equations for the suitabilty indices are listed here for the terrestrial ecoregions and aquatic EDUs.

Terrestrial Ecoregions

East and West Cascades:

[((((((Gap4% * 55.5) + (GAP4 HCP% * 18.3) + (GAP3 State% * 10.2) + (GAP3 Fed% * 4.3) + (GAP3 State HCP% * 3.3) + (GAP3 Riparian Matrix% * 2.7) + (GAP3 Adaptive Management Area% * 2.4) + (GAP3 Late Successional Reserve% * 1.5) + (GAP2% * 1.1) + (GAP1% * 0.9)) Normalized from 0 – 1,000) * 42.4) + ((((urban% * 94.8) + (agriculture% * 5.2)) Normalized from 0 – 1,000) * 46.9) + (((Road kms/AU Hectares) Normalized from 0 – 1,000) * 10.7)) Normalized from 0 – 10,000]

Freshwater Ecological Drainage Units

Rogue-Umpqua, Willamette and Oregon Portion of the Lower Columbia EDU

[((((((Gap4% * 60.03) + (GAP4 HCP% * 12.29) + (GAP3 State% * 5.55) + (GAP3 Fed% * 4.62) + (GAP3 State HCP% * 4.12) + (GAP3 Riparian Matrix% * 3.14) + (GAP3 Adaptive Management Area% * 3.36) + (GAP3 Late Successional Reserve% * 2.26) + (GAP2% * 1.78) + (GAP1% * 1.44)) Normalized from 0 – 1,000) * 19.0) + ((((urban% * 90.23) + (agriculture% * 9.77)) Normalized from 0 – 1,000) * 54.76) + (((Road kms/AU Hectares) Normalized from 0 – 1,000) * 8.98) + ((((Dam height * 41.77) + (Dam impoundment hectares * 58.23)) Normalized from 0 – 1,000) * 12.45) + ((Early shrub/tree hectares within 150 meters of stream, normalized from 0 – 1,000) * 2.75)) + ((Number of mines within 150 meters of stream, normalized from 0 – 1,000) * 2.06)) Normalized from 0 – 10,000]

Deschutes, Great basin (partial), Honey Lake, Pit, and Upper Klamath Basin EDUs

[((((((Gap4% * 60.03) + (GAP4 HCP% * 12.29) + (GAP3 State% * 5.55) + (GAP3 Fed% * 4.62) + (GAP3 State HCP% * 4.12) + (GAP3 Riparian Matrix% * 3.14) + (GAP3 Adaptive Management Area% * 3.36) + (GAP3 Late Successional Reserve% * 2.26) + (GAP2% * 1.78) + (GAP1% * 1.44)) Normalized from 0 – 1,000) * 19.56) + ((((urban% * 90.23) + (agriculture% * 9.77)) Normalized from 0 – 1,000) * 56.27) + (((Road kms/AU Hectares) Normalized from 0 – 1,000) * 9.23) + ((((Dam height * 41.77) + (Dam impoundment hectares * 58.23)) Normalized from 0 – 1,000) * 12.79) + ((Number of mines within 150 meters of stream, normalized from 0 – 1,000) * 2.12)) Normalized from 0 – 10,000]

Puget Sound and the Washington portion of the Lower Columbia EDU

[((((Agriculture and urban% * 0.33) + (Number of dams/hectare * 0.33) + (Road kilometers/Stream kilometers)) * 0.33) Normalized from 0 – 10,000]

Yakima/Palouse EDU

[(((Agriculture and urban% excluding riparian zone * 0.32) + (Agriculture and urban% within riparian zone * 0.30) + (dams per stream kilometer * 0.17) + (Private ownership% * 0.04) + (Irrigated agriculture% * 0.17)) * 1000) Normalized from 0 – 10,000]

Okanagan EDU

[(Management status * 0.142) + (Land use *0.249) + (Road density *0.135) + (Dams *0.474)]

Weightings of sub-factors for Okanagan EDU:

Management Status
Gap1 0.044
Gap2 0.094
Gap3 0.248
Gap4 0.614

Converted Land Use
Agriculture 0.106
Urban 0.618
Mining 0.276

Road Density (road km/km2 within assessment unit)
Value1 0.135 > 2.75280 km/ km2
Value2 0.061 2.75280 - 1.51994 km/ km2
Value3 0.030 1.51993 - 0.07348 km/ km2
Value4 0.016 0.07347 - 0.00009 km/ km2
Value5 0.008 < 0.00009 km/ km2

Dams
1 dam 0.044
2 dams 0.093
3 dams 0.201
4 or more dams 0.474

Appendix 7A – Prioritization of Assessment Units

7.1 Introduction

A conservation portfolio could serve as a conservation plan to be implemented over time by nongovernmental organizations, government agencies and private land owners. In reality, however, an entire portfolio cannot be protected immediately and some conservation areas in the portfolio may never be protected (Meir et al. 2004). Limited resources and other social or economic considerations may make protection of the entire portfolio impractical. This inescapable situation can be addressed two ways. First, we should narrow our immediate attention to the most important conservation areas within the portfolio. This can be facilitated by prioritizing conservation areas. Second, we should provide organizations, agencies and land owners with the flexibility to pursue other options when portions of the portfolio are too difficult to protect. Assigning a relative priority to all AUs in the ecoregion will help planners explore options for conservation.

The prioritization of potential conservation areas is an essential element of conservation planning (Margules and Pressey 2000). The importance of prioritization is made evident by the extensive research conducted to develop better prioritization techniques (e.g., Margules and Usher 1981, Anselin et al. 1989, Kershaw et al. 1995, Pressey et al. 1996, Freitag and Van Jaarsveld 1997, Benayas et al. 2003). Consequently, many different techniques are available for addressing the prioritization problem. None are obviously better than the rest. We used an optimal site selection algorithm to assign a relative priority to every AU in the ecoregion. The relative priorities were expressed as two indices – irreplaceability and utility.

AUs were prioritized for the terrestrial and aquatic realms. A more extensive analysis was done for the terrestrial realm only because: (1) the terrestrial data have a greater influence on the portfolio than the freshwater data; (2) terrestrial environments and species have been more thoroughly studied, and therefore, our assumptions about terrestrial biodiversity are more robust than for freshwater biodiversity; and (3) the terrestrial portfolio has the greatest potential influence on land use planning and policy decisions affecting private lands.

The results of our prioritization should not be the only information used to direct conservation action. Unforeseen opportunities have had and should continue to have a major influence on conservation decisions. Local attitudes toward conservation can hinder or enhance conservation action. Considerations such as these are difficult to incorporate into long-range priority setting but must be dealt with case by case.

7.2 Methods

7.2.1 Irreplaceability

Irreplaceability is an index that indicates the relative conservation value of a place. Irreplaceability has been defined a number of different ways (Pressey et al. 1994, Ferrier et al. 2000, Noss et al. 2002, Leslie et al. 2003, Stewart et al. 2003). However, the original operational definition was given by Pressey at al. (1994). They defined irreplaceability of a site as the percentage of alternative reserve systems in which it occurs. Following this definition, Andelman and Willig (2002) and Leslie et al. (2003) each exploited the stochastic nature of the simulated annealing algorithm to calculate an irreplaceability index.

Simulated annealing is a stochastic heuristic search for the global minimum of an objective function. Since it is stochastic, or random, simulated annealing can arrive at different answers for a single optimization problem. The algorithm may not converge on the optimal solution, i.e., the global minimum, but it will find local minima that are nearly as good as the global minimum (McDonnell et al. 2002). The random search of simulated annealing enables it to find multiple nearly-optimal solutions, and an AU may belong to many different nearly-optimal solutions.

The number of simulated annealing solutions that include a particular AU is a good indication of that AU's irreplaceability. This is the assumption made by Andelman and Willig (2002) and Leslie et al. (2003) for their irreplaceability index. The index of Andelman and Willig (2002) was:

$$H_j = (1/n) \sum_{i=1}^{n} s_i \qquad (1)$$

where H is relative irreplaceability, n is the number of solutions, and s_i is a binary variable that equals 1 when AU_j is selected but 0 otherwise. H_j have values between 0 and 1, and are obtained from a running the simulated annealing algorithm n times at a single representation level.

Irreplaceability is a function of the desired representation level (Pressey et al. 1994, Warman et al. 2004). Changing the representation level for target species often changes the number of AUs needed for the solution. For instance, low representation levels typically yield a small number of AUs with high irreplaceability and many AUs with zero irreplaceability, but as the representation level increases, some AUs attain higher irreplaceability values. The fact that some AUs go from zero irreplaceability to a positive irreplaceability demonstrates that Willig and Andelman's index is somewhat misleading – at low representation levels, some AUs are shown to have no value for biodiversity conservation when they actually do. We created an index for relative irreplaceability that addresses this shortcoming. Our comprehensive irreplaceability index for AU_j was defined as:

$$I_j = (1/m) \sum_{k=1}^{m} H_{jk} \qquad (2)$$

where H_{jk} are relative irreplaceability values as defined in equation (2) and m is the number of representation levels used in the site selection algorithm. I_j have values between 0 and 1. Each H_{jk} is relative irreplaceability at a particular representation level. We ran MARXAN at ten representation levels for coarse and fine filter targets. At the highest representation level nearly all AUs attained a positive irreplaceability.

Many applications of "irreplaceability" have implicitly subsumed some type of conservation efficiency (e.g., Andelman and Willig 2002, Noss et al. 2002, Leslie et al. 2003, Stewart et al. 2003). Efficiency is usually achieved by minimizing the total area needed to satisfy the desired representation level. Our watershed AUs ranged in size from 54 to 153,000 ha. However, the size of watersheds between the 10^{th} and 90^{th} percentiles ranged 1700 to 8900 ha, roughly the same order of magnitude. Hence, for the purposes of calculating the irreplaceability index, we choose to ignore AU area and the optimization simply minimized the total number of AUs.

7.2.1.1 Conservation Utility

We extended upon the concept of irreplaceability with *conservation utility*, a term coined by Rumsey et al. (2004). Conservation utility is defined by equation (2), but the optimization algorithm is run with the AU costs incorporating a suitability index. To create a map of conservation utility values, AU "cost" reflects practical aspects of conservation – current land uses, current management practices, habitat condition, etc. (see Chapter 6). In effect, conservation utility is a function of both biodiversity value and the likelihood of successful conservation.

AU area should influence AU selection because the real cost of a conservation site is related to its area. Larger conservation sites are more costly to obtain and to maintain, smaller AUs are more efficient. To account for area, we combined suitability and AU area with the weighted geometric mean:

$$\text{COST} = [N(\text{suitability})^X * N(\text{AU area})^Y]^{[1/(X+Y)]} \qquad (3)$$

where the function N(•) normalizes the values. If X + Y = 1, then the equation simplifies to:

$$\text{COST} = N(\text{suitability})^X * N(\text{AU area})^Y \qquad (4)$$

The geometric mean is commonly used for habitat suitability indices (USFWS 1981). We used the geometric mean for two reasons. First, if the suitability of an AU equals zero, then that AU is highly desirable and its overall cost should be zero regardless of area. Second, suitability and area are grossly incommensurate, and therefore, should not be summed. The values of X and Y for the final cost equation were set to 0.75 and 0.25, respectively.

7.2.2 Representation Levels

Each representation level corresponds to a different degree of risk for species extinction. Although we cannot estimate the actual degree of risk, we do know that risk is not a linear function of representation. It is roughly logarithmic.

7.2.2.1 Coarse Filter

We based the assumption that there is a logarithmic relationship between the risk of species extinction and the amount of habitat on the species-area curve. The species-area curve is arguably the most thoroughly established quantitative relationship in all of ecology (Conner and McCoy 1979, Rosenzweig 1995). The curve is defined by the equation $S=cA^z$, where S is the number of species in a particular area, A is the given area, c and z are constants. The equation says that the number of species (S) found in a particular area increases as the habitat area (A) increases. The parameter z takes on a wide range of values depending on the taxa, region of the earth, and landscape setting of the study. Most values lie between 0.15 and 0.35 (Wilson 1992). An oft cited rule-of-thumb for the z's value is called Darlington's Rule (MacArthur and Wilson 1967, Morrison et al. 1998). The rule states that a doubling of species occurs for every 10 fold increase in area, hence z = log(2) or 0.301. We used this relationship to derive representation levels that roughly correspond to equal increments of biodiversity – i.e., each increase in coarse filter area captured an additional 10% of species.

Coarse filter representation levels specify a minimum area, i.e., hectares, of each habitat type to be captured within a set of conservation areas. Other ecoregional assessments have used representation levels that increased linearly. For instance, Rumsey et al. (2004) set levels at 30, 40, 50, 60, and 70 percent of the currently extant area of each habitat type. Each of these representation levels captured the same incremental area of habitat, but from the species-area curve we know that each of these representation levels captures successively smaller increments of total biodiversity. That is, the step from 10 to 20 percent may capture 12 % of all species but the step from 60 to 70 percent may capture about only 4 % (assuming z = 0.301). In effect, the first 10 % of habitat is more important than the last 10 %.

We used the species-area relationship to create representation levels that correspond to equal increments of risk. The coarse filter representation levels did not increase linearly but rather according to a power function: $S = A^z$. To derive the coarse filter levels, the desired amount of biodiversity was increased linearly (10, 20, 30, . . ., 100 percent) and the corresponding area was calculated for each (Table 7A.1).

Table 7A.1. Coarse filter representation levels derived from the species area curve with z = 0.301.

	Percent of species									
	10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Representation Level (percent extant area)	0.05	0.5	1.8	4.8	10	18	31	48	70	100

7.2.2.2 Fine Filter

Fine filter representation levels specify the number of species occurrences to be captured within a set of conservation areas. The relationship between species survival and number of isolated populations is also a power function:

$$\text{Species Persistence Probability} = 1 - [\ 1 - pr(P)\ ]^{n} \qquad (5)$$

where pr(P) is the persistence probability of each isolated population and n is the number of populations. This equation says, in effect, that the first population (i.e., occurrence) is more important than the second population and much more important than the tenth population. That is, the function exhibits diminishing returns as the number of occurrences increases. According to this relationship, if we want representation levels to correspond to equal degrees of risk, then fine filter representation levels should not increase linearly but logarithmically. However, the above equation won't work for our purposes. We don't know pr(P), but even if we did, pr(P) is not equal across all populations.

Luckily, other relationships were available to us. The natural heritage programs use many criteria to determine G and S ranks. These criteria indicate the degree of imperilment, i.e., the risk of extinction. One such criterion relates the number of occurrences to degree of imperilment (Table 7A.2) (Master et al., 2003)[1]. This system expresses the idea that the first 5 occurrences make about the same contribution toward species rank as the next 6 to 20 occurrences.

If we assume equal imperilment intervals and equate A, B, C (a nominal scale) with 1, 2, 3 (an ordinal scale), then the relationship in the above table can be modeled as a power function. We used the function to interpolate between 1, 2, and 3 to yield multiple regularly spaced steps for the fine filter levels. We did this to give 10 representation levels; the same number as for the coarse filter.

Table 7A.2. Categories for the known occurrence ranking criterion used by Natureserve and natural heritage programs to assign species S ranks and G ranks.

Condition Status	Number of Known Occurrences
A	1 to 5
B	6 to 20
C	21 to 80
D	81 to 300
E	>300

[1] Table 2 is a modification of the older system (Master 1994) for species ranking, where G1/S1 equaled 1 to 5 occurrences, G2/S2 equaled 6 to 20 occurrences, and G3/S3 equaled 21 to 100 occurrences.

Table 7A.3. Representation levels for target occurrences that roughly correspond to populations, subpopulations, or populations segments.

	Condition Status									
	A			B			C			D
regular steps within condition status	⅓	⅔	1	1⅓	1⅔	2	2⅓	2⅔	3	> 3
Representation Level (number of occurrences)	2	3	5	8	13	20	31	49	80	all occurrences

Table 7A.3 is to be used for species for which target occurrences (TOs)[2] roughly correspond to populations, subpopulations, or populations segments. Fine filter representation levels are complicated because the TOs currently in our databases do not have consistent meaning. Some TOs roughly represent a population or population segment (e.g., plant, invertebrates, amphibians). Other TOs may simply represent a nest, a territory (e.g., raptors), or a group of nests (e.g., marbled murrelets). TOs of this type must be dealt with somewhat differently. We followed the same approach as above but used a different G/S rank criterion that relates the number of individuals in a population to degree of imperilment (Table 7A.4) (Master et al., 2003).

We converted the number of individuals to number of nests simply by dividing by 2. Again, if we assume equal imperilment intervals and equate A, B, C with 1, 2, 3, then the relationship in the above table can be modeled as a power function. We used the function to interpolate between 1, 2, and 3 to yield multiple regularly spaced steps for the fine filter levels and created 10 representation levels (Table 7A.5).

Table 7A.4. Categories for the number of individual ranking criterion used by natural heritage programs to assign species S ranks and G ranks.

Condition Status	Number of Individuals	Maximum Number of Nests or Dens
A	1 to 50	25
B	51 to 250	125
C	251 to 1000	500
D	1001 to 2500	1250
E	2501 to 10000	5000

Table 7A.5. Representation levels for target occurrences that correspond to nests, den, or territory.

	Condition Status									
	A				B				C	
regular steps within condition status	¼	½	¾	1	1¼	1½	1¾	2	2¼	≥ 2½
Representation Level (number of nests)	8	12	18	25	38	55	80	125	170	all occurrences

[2] Target occurrence (TO) roughly corresponds to an element occurrence (EO). However, since many of our TOs did not meet the NatureServe species-specific EO definitions we used different terminology.

Species-specific habitat maps were used to represent the spatial distribution of bighorn sheep, mountain goat, gray squirrel, harlequin duck, yellow rail (in California only), and bald eagle communal roosts. Representation levels had to be set for the amount of each species' habitat.

The two ungulates often form herds. For herd animals, representation levels were based on Table 7A.4, but the number of individuals was used (Table 7A.6). The amount of habitat needed at each level was calculated by dividing the number of individuals needed by a "typical" population density. Population densities used were the midpoint of a range of values given by Verts and Carraway (1998): 1.55 individuals/ 100 ha for mountain goat (p. 494) and 7.1 individuals/ 100 ha for bighorn sheep (p. 500). For western gray squirrels, the representation levels were also based on Table 7A.4, but because this species has relatively small territories (mean size 20.8 ha; Linders et al. 2004) the number of territories was increased (Table 7A.7).

Table 7A.6. Representation levels for target occurrences that correspond to number of individuals in a herd.

	Condition Status									
	A	B		C		D		E		F
regular steps within condition status	1	1⅓	1⅔	2	⅓	2⅔	3	3⅓	3⅔	≥ 4
Representation Level (individuals)	50	91	141	250	338	523	1000	1255	1944	all occurrences

Table 7A.7. Representation levels for western gray squirrels.

	Condition Status									
	A	B		C		D		E		F
regular steps within condition status	1	1¼	1½	1¾	2	2¼	2½	2¾	3	> 3
Representation Level (female territories)	25	38	55	80	125	169	245	357	1000	all occurrences

For harlequin duck the representation levels were those of Table 7A.5, and a single territory was assumed to be the stream length used by breeding adult females (2.1 km; Roberstson and Goudie 1999). For yellow rail the representation levels were those of Table 7A.3, and an occurrence was equated to the mean habitat area of places where rails have been detected (231.9 ha; Goldade et al. 2002). The targets for bald eagles were nests and communal roosts. The representation levels for nests were those of Table 7A.5 and levels for communal roosts were those of Table 7A.3. Communal roosts were represented as the actual area of the roost. For setting the representation levels, one roost "occurrence" was equated to the median communal roost size in Washington. If the area of a roost was unknown then, then the median area was assigned to that roost. Because of the highly skewed distribution of roost sizes, the median was better than the mean for representing central tendency.

We emphasize that even though we used natural heritage program criteria for imperilment, the representation levels should not be interpreted as levels of imperilment or conservation goals. The numbers are just a device for creating a map that shows the relative conservation priority of all AUs in an ecoregion. We used a power function in recognition of the fact that the relationship between the number of occurrences (or of individuals) protected and the risk of extinction exhibits a law of diminishing returns. We did not have the resources needed to estimate the actual shape of this relationship, but we believe that our representation levels yielded a prioritization of AUs that reflects the nonlinear nature of conservation priorities.

7.2.3 Comparing Utility and Irreplaceability

We would like to know how the suitability index influences the relative priority of assessment units. We compared the utility and irreplaceability maps several ways. First, three similarity measures were calculated: mean absolute difference, Bray-Curtis similarity measure, and Spearman rank correlation (Krebs 1999; pp 379-386). The Bray-Curtis similarity measure normalizes the sum absolute difference to a scale from 0 to 1. Because utility and irreplaceability will be used for prioritizing AUs, rank correlation is a particularly informative because it told us how the relative AU priorities changed. We were especially interested in how the ranks of the most highly ranked AUs would change. To examine this, we also calculated a weighted Spearman rank correlation using Savage scores (Zar 1996, pp. 393-395).

Second, we determined whether the difference between utility and irreplaceability was significantly different. This was done by testing the following hypothesis for mean absolute difference:

H_{01}: the mean absolute difference between utility and irreplaceability maps equals zero.
H_{A1}: the mean absolute difference between utility and irreplaceability maps is greater than zero.

And for the Bray-Curtis similarity measure and Spearman rank correlation, this hypothesis:

H_{02}: similarity between the utility and irreplaceability maps equals one.
H_{A2}: similarity between the utility and irreplaceability maps is less than one

The hypotheses were tested using a randomization test (Sokal and Rohlf 1995, pp. 808-810). Pairs of random maps were generated by lumping together all scores from the original utility and irreplaceability maps, reshuffling the scores, and then assigning half the scores to one random map and the other half to a second random map (i.e., random sampling of utility and irreplaceability scores without replacement). The four measures of similarity were calculated for 1000 random map pairs. The proportion of times that the mean absolute difference between the random map pairs is smaller (or the similarity is larger) than the difference between the utility map and irreplaceability maps equals the probability that utility map and irreplaceability map are significantly different. This was a one-tailed test of significance with $\alpha = 0.05$. Since we were using a randomization test, the hypotheses could be restated as follows:

H_{01}: the mean absolute difference between the utility map and the irreplaceability map is equal to or less than the mean absolute difference between random map pairs;
H_{A1}: the mean absolute difference between the utility and the irreplaceability maps is greater than the mean absolute difference between random map pairs;

H_{02}: similarity between the utility map and the irreplaceability map is equal to or greater than the similarity between random map pairs;
H_{A2}: similarity between the utility map and irreplaceability map is less than the similarity between random map pairs.

If the observed similarity measure is significantly less than (or the distance is significantly greater than) that expected from chance, then the null hypothesis is false, and we can state that the utility and irreplaceability maps are different. For Spearman rank correlation, the alternative hypothesis is equivalent to $r \leq 0$. This test is similar to that done by Warman et al. (2004)

Third, a contingency table analysis was done to compare the utility values and irreplaceability values of paired AUs. The log-likelihood ratio method (Zar 1996; pp. 502-503) was used to test the following hypotheses:

H_{03}: AU selection is independent of cost index
H_{A3}: AU selection is dependent on cost index

Paired AUs were considered to be significantly different for $P <= 0.05$.

7.2.4 Running the Selection Algorithm

MARXAN produces an output that is equivalent to nH_j, i.e., the number of times an AU was selected out of n replicates. We ran 25 replicates at each representation level. Hence, the product m•n equaled 250 for both irreplaceability and conservation utility. The irreplaceability and conservation utility values were normalized such that 250 equaled 100. For the terrestrial and freshwater analyses, the boundary length modifier parameter (BM) was set to zero. When BM is set to zero, neighboring AUs have no influence on the selection frequency of an AU.

We set a minimum clump size for bighorn sheep, mountain goat, gray squirrel, harlequin duck, yellow rail, bald eagle communal roosts, and some ecological systems. For the two ungulates, the minimum clump size equaled the area needed for 50 individuals (the lowest representation level). For gray squirrel and harlequin duck the minimum clump size was the mean territory size of each species. For yellow rail, the minimum size was the smallest area of places where rails have been detected (24 ha; Goldade et al. 2002). The smallest allowed bald eagle communal roost was 4.4. ha, the size of roost at the 10^{th} percentile of roosts in Washington.

MARXAN has three options for clump type (Ball and Possingham 2000; pp. 13-14). We used option 0 – clumps less than the minimum size are not counted toward meeting the representation level. Clumping was done for the first nine representation levels only. At the tenth level, the representation level was 100% of all habitat so clumping was meaningless.

The algorithm's objective function says, in effect, minimize cost (or unsuitability) subject to T constraints, where T equals the number of targets. All T constraints are the same – the amount captured must be greater than or equal to the target's desired representation level. The third term in the objective function imposes these constraints; however, they are soft constraints. "Soft" means that the constraints can be violated. Each constraint's "hardness" is determined by the penalty factors (PFs) set for each target – the larger the PF, the firmer the constraint. Hard constraints can be established by setting an arbitrarily large PF. However, very large PFs can create ill-conditioned objective functions exhibiting sharp peaks or valleys, both of which make optimization more difficult, i.e., requiring many more iterations to find the optimal solution (Gottfried and Weisman 1973). The best set of PFs is problem dependent.

Clearly, setting PF values is tricky. To address this problem, we used an iterative search to set PF values. We began the search with PF equal to 1 for every target. We ran MARXAN (5 replicates, 1 million iterations per replicate) and then checked the results of the best solution. MARXAN reports how much of the representation level was met for each target. If a target's representation level was not met, we used the modified bisection method to converge on a PF value. We repeated these steps until the representation level was met for all targets. The iterative search was done at each of the ten representation levels. Hence, a target could have a different PF at each representation level. For the vast majority of targets, this process found the PF value in a reasonable amount of time. However, finding the PF value that yields 100 % of the desired representation level for every target took too much processing time. Hence, we terminated the PF search when only 98% of a target's representation level was met. On average, about 80 % of targets (both ecoregional and eco-sectional) had PF values equal to 1 and only 2% had PF values greater than 6. Other details about running MARXAN are summarized in Table 7A.8.

The spatial representation of TOs was different than that used for generating the portfolio. For the portfolio, each TO was represented as a circle, with a radius corresponding to the assumed locational uncertainty of the target. For the irreplaceability analysis, these same TOs were represented as points.

Table 7A.8. Values for Marxan parameters used for irreplaceablity and utility analyses.

Parameter	Function	terrestrial		aquatic	
		irreplaceability	utility	irreplaceability	utility
Algorithm	Type of optimization routine	simulated annealing		simulated annealing	
Replications	Number of times to repeat optimization per representation level	25		25	
Iterations	Number of times to create new combination of AUs	2,000,000		5,000,000	
Boundary length modifier	Weighting factor for "cost" of AU perimeter. Encourages clusters of AUs	0		0	
Target penalty factor	"cost" of not meeting a target's representation level	determined with modified bisection method search		determined with increasing incremental search	
AU status	Initial selection state of each AU	0 for all AUs (no "lock-ins")		0 for all AUs	
Suitability Index	Indicates likelihood of successful conservation at AU	1 AU = 100	Section 6.X	1 AU = 100	Section 6.Y

7.2.5 Aquatic Analyses

The aquatic analyses were done separately from the terrestrial analyses. Analyses for conservation of aquatic biodiversity are typically organized by ecological drainage units (EDUs), not ecoregions. The East and West Cascades Ecoregions intersect 13 ecological drainage units (EDUs). However, the overlap with two of those EDUs (Olympic-Chehalis and John Day-Umatilla) is relatively insignificant and we did not include data from these EDUs in the analysis. Some EDUs have been analyzed in conjunction with other ecoregional assessments, e.g., the Okanogan EDU was associated with the Okanagan Ecoregion and the Puget Sound EDU was associated with the North Cascades Ecoregion. Other EDUs, such as the Lower Columbia and Yakima-Palouse, have been analyzed in advance of this ecoregional assessment because salmon recovery planning created a critical need for such information. Two EDUs, the partial Great Basin, and Honey Lake did not have a complete classification and mapping of aquatic systems. For these reasons the aquatic analyses done for this ecoregional assessment should not be used as "stand alone" analyses. The aquatic analyses were done only to guide efficient integration of terrestrial and aquatic conservation priorities. When establishing priorities for aquatic conservation only, such as planning associated with salmon recovery, the more thorough aquatic assessments should be used.

The generation of aquatic utility and irreplaceability maps followed the same methods as the terrestrial maps except for the following:

- Separate analyses were done for each of the 10 ecological drainage units (EDUs) that have a large overlap with the ecoregion. However, the analyses were done concurrently within the same Marxan runs.

- Aquatic AUs within the ecoregion had the same boundaries as the terrestrial AUs. Aquatic AUs outside the ecoregion had boundaries delineated by prior assessments wherever available (Okanogan, Puget Sound, Lower Columbia, and Yakima-Palouse EDUs).

- Representation levels were linear not logarithmic. We set representation levels at 10, 20, 30, . . ., 90, and 100 percent of the total amount available for each target in the EDU. The nature of aquatic systems and EDT, which were much different than any terrestrial targets, did not allow us to develop logarithmic relationships.

- Within the ecoregion, many aquatic system watersheds were dissected by AUs (aquatic systems were generally larger than the AUs). To regroup the AUs which comprised each watershed the minimum clump size for aquatic systems was set to 80 percent.

- And, other differences listed in Table 7A.8.

7.2.6 Integrating Terrestrial and Aquatic Analyses

Conserving both aquatic and terrestrial biodiversity in the same set of places will enhance the efficiency of conservation actions. Aquatic and terrestrial analyses were done separately but they must be "integrated" for the sake of efficiency. We averaged the aquatic and terrestrial irreplaceability scores and the aquatic and terrestrial conservation utility scores to yield an "integrated" score. The averages were unweighted, however, a case could be made for assigning a greater weight to the terrestrial scores because the terrestrial data density was much greater than the aquatic.

Greater efficiency may have been attained with the technique of vertical integration (see Appendix 8A). This technique was not used, however, because it requires that the BM parameter equal a value greater than zero. If BM is nonzero, then neighboring AUs influence the selection frequency of an AU. This is undesirable when determining AU irreplaceability

7.3 Results

7.3.1 Terrestrial Analysis

The terrestrial irreplaceability and utility maps for the terrestrial only analysis are shown in Maps 7.1 and 7.2. The categories on these maps correspond to deciles. That is, the statistical distribution of utility and irreplaceability scores were each divided into 10% quantiles. The decile map answers the question, where are the AUs with a score (or selection frequency) in the top 10 percent of all AUs. The 90^{th} percentile scores for both replaceability and utility equaled 99 out of 100. One might also ask, how many AUs had a selection frequency (or score) greater 90 percent? For both ecoregions combined, the percentage of AUs with a score greater than 90 was 13.3 % and 14.2 % for irreplaceability and utility, respectively (Figure 7A.1).

AUs with scores equal to 100 are those selected in every replicate at every representation level. For both ecoregions combined, 9.7% of AUs had irreplaceability equal to 100, 10.8 % had utility equal to 100, and 9.6 % of AUs had both scores equal to 100 (Table 7A.9).

At the lowest representation level, the best solutions for irreplaceability and utility consisted of 13.9 % and 14.5 % of AUs, respectively. Perfect scores (equal to 100) were attained by 70 % of AUs in the irreplaceability best solution and the 79 % of AUs in utility best solution, which demonstrates that few options existed for meeting the lowest representation level. That is, rare targets could only be captured at the high scoring AUs. This also shows how incorporating suitability into the analysis narrows the number of options for efficient solutions.

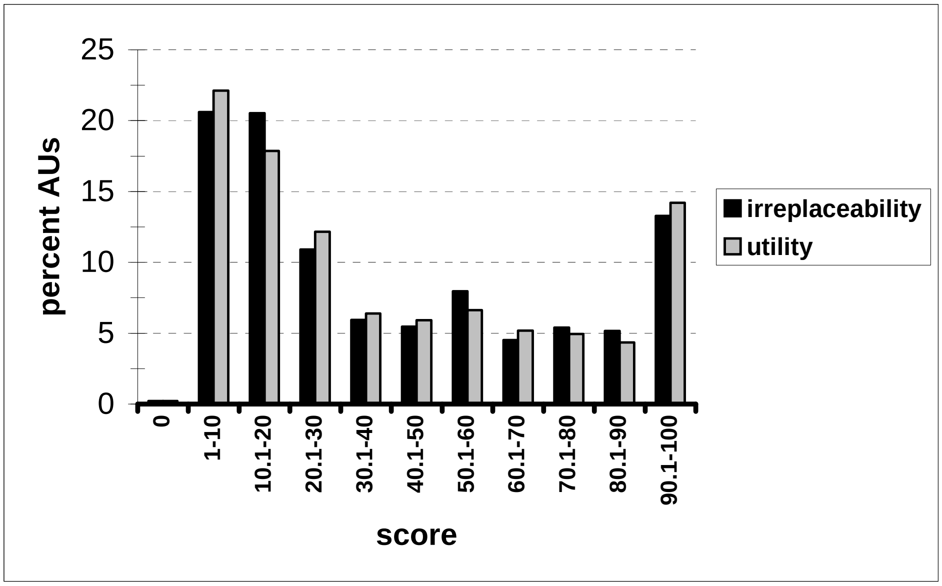


Figure 7A.1. Distribution of irreplaceability and conservation utility scores for the terrestrial only analysis.

7.3.2 Integrated Analysis

The irreplaceability and utility maps for the integrated analysis are shown in Maps 7.5 and 7.6. A score greater than 90 was attained by 0.8 % of AUs for irreplaceability and 1.7 % of AUs for utility (Figure 7A.2). Twelve AUs had an irreplaceability score of 100 ,15 had a utility score of 100, and 12 AUs had both scores equal to 100 (Table 7A.9). The number AUs attaining perfect utility scores is greater than the number attaining perfect irreplaceability scores because when the optimization involved suitability, the higher suitability scores of some AUs causes them to be selected in every replicate.

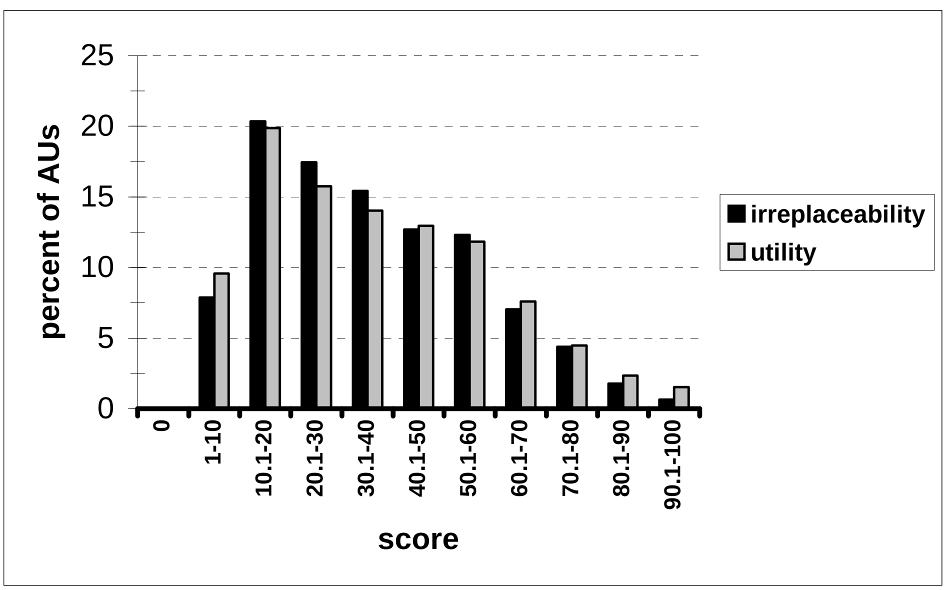


Figure 7A.2. Distribution of irreplaceability and conservation utility scores for the integrated analysis.

Table 7A.9. Percentage of AUs with high selection frequencies for both terrestrial and integrated analyses.

realm	Ecoregion	number of AUs	selection frequency	irreplace-ability	utility	both
terrestrial	East	2931	100 %	8.0	8.9	7.8
			≥ 95%	9.9	10.5	9.2
			≥ 90 %	11.8	13.0	11.1
	West	1608	100 %	12.9	14.3	12.7
			≥ 95%	15.0	15.9	14.3
			≥ 90 %	17.2	19.1	16.4
	Both	4539	100 %	9.7	10.8	9.6
			≥ 95%	11.7	12.4	11.0
			≥ 90 %	17.2	19.1	16.4
integrated	East	2931	100 %	0.2	0.3	0.2
			≥ 95%	1.2	1.5	1.2
			≥ 90 %	1.6	2.2	1.4
	West	1608	100 %	0.1	0.1	0.1
			≥ 95%	1.4	2.0	1.4
			≥ 90 %	1.6	3.0	1.6
	Both	4539	100 %	0.3	0.3	0.3
			≥ 95%	0.4	0.9	0.4
			≥ 90 %	0.8	1.7	0.6

7.3.3 Utility versus Irreplaceability

7.3.3.1 Terrestrial Comparison

By all similarity measures, the utility and irreplaceability maps from the terrestrial analysis were similar (Table 7A.10). No statistically significant differences were found. The values for weighted Spearman rank correlation show that differences between maps at high scores are less than differences at low scores.

As demonstrated in Table 7A.10 the overall patterns of utility and irreplaceability scores are very similar. That is, at the ecoregion scale that the maps generally agree. If examined AU by AU, however, we find that about 69 % are different and that 22 % have a significant difference between utility and irreplaceability (Figure 7A.3). However, very few significant changes occur at high utility scores. Of all the AUs with significant differences between utility and irreplaceability, only 0.7 % had utility scores equal to 100. Fifty seven percent of the significant changes were for AUs with utility scores less than or equal to 50.

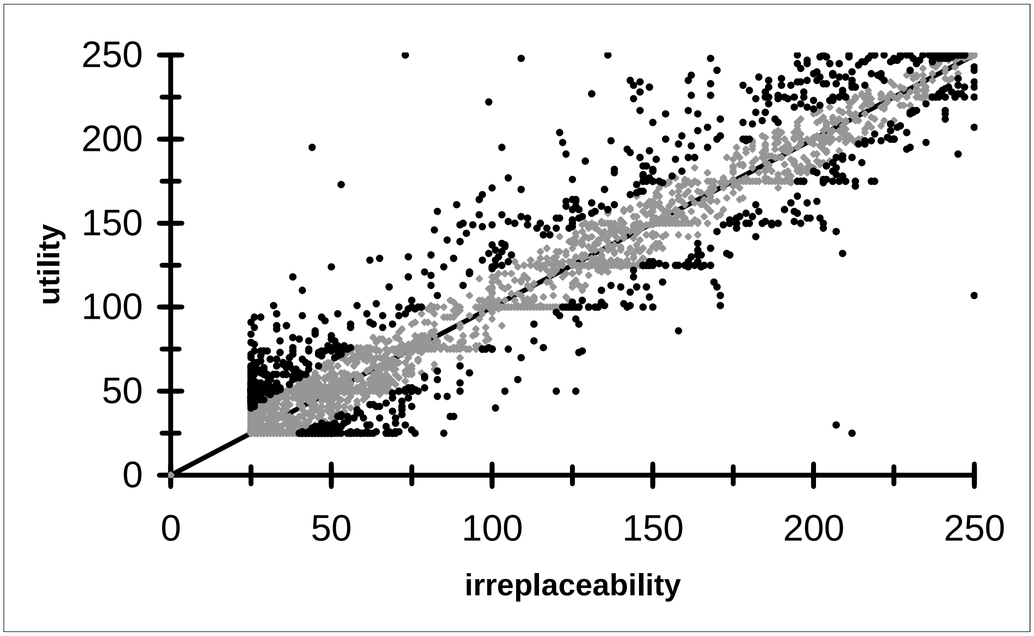


Figure 7A.3. Unnormalized conservation utility versus unnormalized irreplaceability scores for the terrestrial only analysis. Black points denote significant differences in scores.

On terrestrial maps, 442 AUs had a irreplaceability score of 100, 491 had an utility score of 100, and 435 AUs had both scores equal to 100. The overlap between utility and irreplaceability at the highest possible score is evident in maps XX1 and XX2. The large overlap indicates that suitability had a small influence on which AUs attained scores equal to 100. In other words, target locations greatly determined which AUs attained a perfect score. Such AUs contained rare targets, targets for which we had very little occurrence data, occurrences of multiple targets, or a large number of occurrences per target.

Table 7A.10. Similarity measures for comparison of terrestrial irreplaceability and conservation utility maps. There was no significant difference between the irreplaceability and utility maps for any of the similarity measures (alpha = 0.05).

metric	Terrestrial	Integrated
mean absolute difference	10.2	17.8
Bray-Curtis measure	0.951	0.902
Spearman rank correlation	0.949	0.894
weighted Spearman rank correlation	0.972	0.873

7.3.3.2 Integrated Comparison

A comparison of the integrated irreplaceability and utility scores yielded results similar to the terrestrial comparison. By all similarity measures, the utility and irreplaceability maps from the integrated analysis were similar (Table 7A.10) but there was less similarity relative to the terrestrial comparison. This makes sense. Adding more information about each AU, i.e., incorporating the aquatic scores, should enhance the distinctiveness of the AUs.

If examined AU by AU, however, we find that about 92 % are different and that 36 % have a significant difference between utility and irreplaceability. However, very few significant changes occur at high utility scores. Of all the AUs with significant differences between utility and irreplaceability, only 0.3 % had utility scores equal to 100. Seventy-four % of the significant changes were for AUs with utility scores less than or equal to 50.

7.4 Discussion

How should our irreplaceability and conservation utility indices be interpreted? These indices were constructed by running MARXAN at ten representation levels. The first level captured a very small amount of each target and the last level captured everything, i.e., all known occurrences of all targets. Think of the first representation level as the amount of biodiversity to be captured in an initial set of reserves, the second level as an additional amount to be captured by an enlarged set of reserves, the third level as an even greater additional amount, and so on. At each level, Marxan's output indicates the relative necessity of each AU for efficiently capturing that particular amount of biodiversity. When the outputs from each level are summed together, the result specifies the most efficient sequence of AU protection that will eventually capture all biodiversity. The sequence in which AUs should be protected is one way to gauge their relative importance. AUs that have the highest irreplaceability or utility scores should be protected first, and therefore, are the most important AUs for biodiversity conservation.

The selection algorithm generates a set of AUs corresponding to a local minimum of the objective function. AUs are included in a solution because they serve to minimize the objective function. Therefore, AUs with high irreplaceability or high utility scores are those that (1) contain one or more rare targets and/or (2) contain a large number of target occurrences. High utility scores are also attained by AUs with low unsuitability (i.e., high suitability). AUs with scores of 100 are those that were selected in every replicate at every representation level. To be chosen in every replicate the AU must be unique. That is, the AU contained target occurrences that were found in no other AU, contained a substantially larger number of occurrences than other AUs, or contained targets and had a substantially lower unsuitability than other AUs.

Table 7A.11 shows the main terrestrial targets for the selection of some AUs with high utility scores. In some cases the AU had the only occurrence in an ecoregion or ecosection (e.g., AUs 1296, 1413, 1288), and consequently had perfect scores for utility and irreplaceability. If an AU has the only target occurrence, then its utility and irreplaceability scores will be 100 regardless of its suitability. For example, AU 1296 had perfect utility score despite its rather high unsuitability value. In several of these examples, the AU had one of only two occurrences in the entire ecosection, and because the minimum representation level equaled two occurrences per ecosection, these AUs had a selection frequency of 100 (e.g., AUs 1574, 1047, 1486). Many examples have utility scores between 80 and 100. In each case, the optimal selection algorithm had other options for capturing the targets located within these AUs, however, the higher scoring AUs attained their scores because they were the more efficient places to capture the targets (e.g., AUs 5047, 1530, 1591).

The differences between utility and irreplaceability scores in Table 7A.11 demonstrates the influence of the suitability index. The irreplaceability score of AU 1487 is much lower than its utility score. The main target for its selection was a bald eagle nest, and it has lower unsuitability than any of the other 22 AUs that contained bald eagle nests. Hence, it is selected much more frequently than these other AUs. When the unsuitability index is removed from the optimization, other AUs are more efficient than AU 1487 (i.e., better for minimizing the objective function), and hence, its irreplaceability score decreases.

Table 7A.11. Examples of main terrestrial targets for selection of AUs with high utility scores.

AU number	Utility Score	Irreplace-ability Score	Un-suitability	Number of Targets	Main Targets for Selection	Amount per Ecosection	Amount per Ecoregion
Ecoregion: West Cascades; Ecosection: Columbian Cascades							
1818	100	100	509	11	Adder's Tongue	1 / 1	1 / 8
1376	100	100	262	10	non-vascular plant 2	1 / 1	1 / 7
1574	100	100	1282	9	Giant Polypore Fungus	1 / 2	1 / 2
1047	100	100	858	12	non-vascular plant 1	1/ 2	1 / 3
1486	100	100	1481	4	Bristly-stemmed Sidalcea	1 / 2	1 / 3
1575	100	100	2202	5	North Pacific Lowland Riparian	100%	--
1585	100	100	332	13	Common Loon Cope's Giant Salamander	1 / 5 2 / 24	1 / 11 2 / 38
1598	100	100	385	10	Common Loon Small Twisted-stalk	1 / 5 3 / 50	1 / 11 3 / 50
1049	100	100	405	12	North Pacific Hardwood - Conifer Swamp Mediterranean California Subalpine Woodland	9% 5%	-- --
1052	100	100	3022	9	Band-Tailed Pigeon North Pacific Coastal Herbaceous Bald and Bluff	1 / 4 11%	1 / 13 --
1112	100	95	433	9	North Pacific Montane Grassland North Pacific Hardwood - Conifer Swamp	21% 6%	-- --
1465	100	87	652	5	North Pacific Hardwood - Conifer Swamp	5%	--
1487	99	82	521	5	Bald Eagle Nest	1 / 24	1 / 79
1138	99	82	1365	6	North Pacific Coastal Herbaceous Bald and Bluff	31%	--
1727	97	96	405	10	Columbia Oregonian Tall Bugbane	1 / 3 2 / 24	1 / 3 2 / 112
1658	95	88	324	12	Loose-flowered Bluegrass Weak Bluegrass	2 / 5 3 / 34	2 / 6 3 / 34
1096	94	100	510	11	Van Dyke's Salamander Western Toad	2 / 7 1 / 10	2 / 14 1 / 35
5047	92	94	769	9	Oregon Red Tree Vole Oregon Megomphi Weak Bluegrass	1 / 4 2 / 25 2 / 34	1 / 243 2 / 191 2 / 34
1530	90	90	1071	12	Alaska Large Awn Sedge Oregon Bolandra Oregon Fleabane	1 / 3 4 / 17 2 / 10	1 / 3 4 / 17 2 / 10

Table 7A.11 (continued). Examples of main targets for selection of AUs with high utility scores.

AU number	Utility Score	Irreplace-ability Score	Un-suitability	Number of Targets	Main Targets for Selection	Amount per Ecosection	Amount per Ecoregion
Ecoregion: East Cascades; Ecosection: Eastside Oak							
1413	100	100	986	10	Siskiyou False Hellebore	1 / 1	1 / 1
1296	100	100	2467	5	Band-Tailed Pigeon	1 / 1	1 / 1
1288	100	100	2603	6	Adder's Tongue	1 / 1	1 / 2
1314	100	100	2045	12	Diffuse Stickseed	3 / 4	3 / 4
1365	100	100	1644	5	Coyote Thistle Long-bearded Sego Lily	1 / 2 1/ 13	1 / 2 1 / 165
5434	100	100	2255	6	Ames Milk-vetch	2 2	2 / 35
1434	100	100	2472	7	Golden Eagle Suksdorf's Desert-parsley	1 / 5 3 / 31	1 / 49 3 / 31
1479	100	100	2708	12	White Meconella Golden Eagle	3 / 11 1 / 5	3 / 11 1 / 49
5474	99	97	459	15	North Pacific Wooded Lava Flow Pale Blue-eyed Grass	34% 1 / 7	-- 1 / 7
5056	95	94	467	10	Red-legged Frog Cascades Frog Northern Goshawk	1 / 8 2 / 46 1 / 25	1 / 11 2 / 98 1 / 275
1198	94	76	448	9	North Pacific Montane Grassland Pale Blue-eyed Grass	17% 1 / 7	-- 1 / 7
1508	93	90	2237	6	Western Pond Turtle	1 / 3	1 / 23
1225	89	40	1585	8	Northern Rocky Mountain Montane Grassland	43%	--
1591	86	86	609	11	Sierra Onion Coastal Tailed Frog Cascade Rockcress	1 / 4 2 / 11 2 / 19	1 / 16 2 / 20 2 / 20
5498	86	80	2440	9	Few-flowered Collinsia	1 / 4	1 / 4
1599	82	90	1669	10	Violet Suksdorfia Northern Goshawk	2 / 5 1 / 25	2 / 5 1 / 275
1518	82	84	204	10	Red-legged Frog Oregon Bolandra	3 / 8 1 / 6	3 / 11 1 / 6
1680	82	78	687	11	Northern Goshawk Cascades Frog	1 / 25 1 / 46	1 / 275 1 / 98
5458	82	76	678	13	Pale Blue-eyed Grass Rocky Mountain Lodgepole Pine	1 / 7 10%	1 / 7 --

Utility and irreplaceability scores are different ways to prioritize places for conservation. Irreplaceability has been the most commonly used index (e.g., Andelman and Willig 2002, Noss et al. 2002, Leslie et al. 2003, Stewart et al. 2003), our index assumes that the number of places (i.e., AUs) is the sole consideration for efficient conservation. Utility incorporates other factors that can effect efficient conservation such as land management status and current condition. In our analysis, many AUs attained scores of 100 for both utility and irreplaceability. These results demonstrate that for scores at or near 100 the cost had little influence on selection frequency; occurrence data drove the results. More importantly, it demonstrated that the results are robust. Under two different assumptions about efficiency (number of AUs versus unsuitability), the highest priority AUs were very similar.

Utility and irreplaceability scores were significantly different for many individual AUs at the middle and low end of the utility score range. This is useful information for prioritization. AUs at the low end of utility (or irreplaceability) typically are unremarkable in terms of biodiversity value. They contribute habitat or target occurrences, but they are interchangeable with other AUs. For these AUs, prioritizing on the basis of suitability rather than biodiversity value makes most sense. If an AU can be distinguished from other AUs because conservation there will be cheaper or more successful, then that AU should be a higher priority for action. For these AUs, the utility score should be used for prioritization.

7.4.1 Uncertainty

There were two major sources of uncertainty in our analysis. First, there were errors in the biological data. The target occurrence data undoubtedly had both errors of omission and commission but the error rates were unknown. Also, the accuracy of the ecological systems/land cover data was also unknown. Second, the suitability index was not an empirical model; variable selection and parameter estimates for the index were based on professional judgment. The index "model" was "validated" through expert opinion but it was not verified with data. In addition, the various GIS data used to compute the suitability index also had errors, but the error rate for these were unknown as well. We would like to express the uncertainty of the irreplaceability or utility values by calculating confidence limits around them but no technique for doing so currently exists. Even if such a technique were available, it would probably require some knowledge of the input data error rates, which were unknown.

One way of addressing this situation is through sensitivity analyses. A sensitivity analysis is necessary whenever there is considerable uncertainty regarding modeling assumptions or parameter values. A sensitivity analysis determines what happens to model outputs in response to a systematic change of model inputs (Jorgensen and Bendoricchio 2001, pp. 59-61). Sensitivity analysis serves two main purposes: (1) to measure how much influence each parameter has on the model output; and (2) to evaluate the potential effects of poor parameter estimates or weak assumptions (Caswell 1989). Through a sensitivity analysis, we can ascertain the robustness of our results and judge how much confidence we should have in our conclusions.

Other ecoregional assessments (Vander Schaaf et al. 2006, Pryce et al. 2006, Iachetti et al. 2006) have explored the sensitivity of the utility indices to changes in the suitability index. Each analysis found that AU utility and rank change in response to changes in the suitability index. Similarity measures that compared "before" and "after" utility maps of the entire ecoregion indicated that the overall map was relatively insensitive to changes in suitability index parameters. That is, the average change over all AUs was small. However, the utility and rank of many AUs did change and some exhibited significant changes. The number of AUs that changed significantly depended of which index parameter was changed and the amount of change to that parameter. These findings are similar to our comparisons of the irreplaceability and utility values.

Evaluating the sensitivity of irreplaceability and utility scores to errors in the biological data is complex. Before we can explore the sensitivity of our results to errors in the biological data, we need to understand the potential errors in the biological data. For occurrence data, error rates will be target specific (or taxon specific) and a function of several factors: data age, survey methods, survey interval, survey intensity, survey extent, and the nature of the species and its habitat. To complicate the analysis further, error rates for a single target may be uneven across the ecoregion. To obtain meaningful results from a sensitivity analysis, we needed, at the very least, a set of target-specific (or taxon-specific) error rates or error-rate models. Error rates were also needed for the ecological systems/land cover data – ideally, omission and commission rates by land cover category. All this suggested a level of complexity that was beyond the capacity of this ecoregional assessment. Hence, we were forced to assume the error rates in the biological data were minimal and did not have a significant influence on the irreplaceability and utility scores.

Appendix 8A – Portfolio Design Using Vertical Integration

8.1 Portfolio Design

Ecoregional assessment requires the synthesis of vast amounts of biological and land-use information. From the biological perspective, data on aquatic and terrestrial species and communities must be analysed in such a way that priorities from either realm can be looked at independently or in a combined fashion. The land-use data includes information on land ownership and management, basic infrastructure like dams and roads, and land conversion information. These data are compiled to represent the biodiversity value and relative conservation suitability across the landscape, and are sufficiently complex to preclude the use of manual inspection to arrive at an efficient set of conservation priorities. Therefore, software is employed to optimize the conservation area design. MARXAN (Ball and Possingham, 2000), an automated portfolio design tool, originally developed to identify conservation priorities on the Australian Great Barrier Reef, was used to synthesize and analyze our data. See Chapter 8.1 – 8.5 in the Main Report for details on assessment units and freshwater and terrestrial analyses.

8.2 Vertical Integration with MARXAN

To complete the draft automated integrated portfolio we used the vertical integration technique developed by the Oregon Chapter of The Nature Conservancy (Schindel 2005, Appendix 8A in Vander Schaaf 2006). This technique utilizes the component of MARXAN's objective function that attempts to minimize fragmentation. Groupings of contiguous AUs have a shorter total perimeter, as the edge/area ratio is smaller than in a Conservation Area comprised of isolated AUs. MARXAN utilizes a "boundary modifier" option to modify the clustering in a conservation area design.

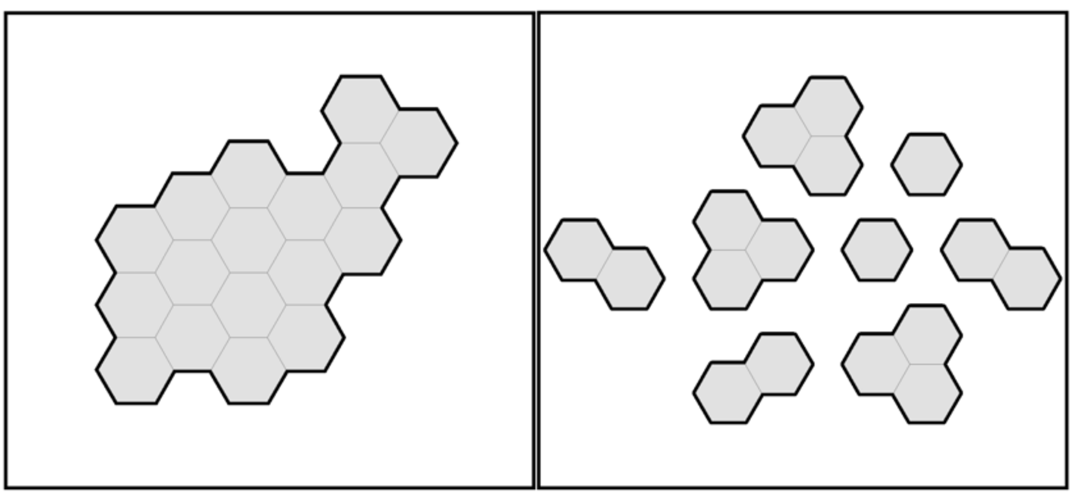


Figure 1. Both of these selections of AUs have the same area. The right hand grouping has a perimeter more than twice as long as the left grouping.

This works by altering the penalty for fragmentation. As the computer examines possible AU combinations, the tendency to prefer solutions with contiguous groupings of AUs increases as the boundary modifier is increased.

In vertical integration, the boundary relations between AUs are used to allow the model to recognize that two or more polygons stacked upon each other are also adjacent. In these situations the model attempts to minimize the length of the total solution boundary by clustering vertically through a stack of AUs. As the boundary modifier is increased, the importance of clustering, horizontally as well as vertically, is increased. This 3 dimensional approach mimics GIS analysis though no spatial analysis is involved in the MARXAN algorithm.

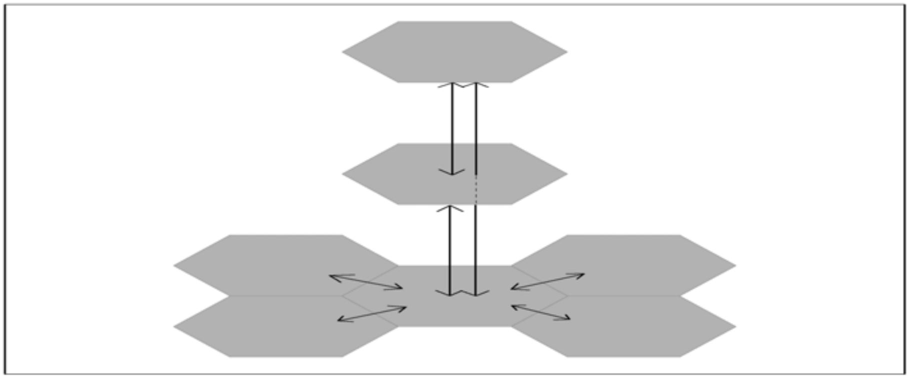


Figure 2. A schematic demonstrating the boundary relations between stacked and horizontally adjacent AUs. Each AU may relate to all other AUs above or below it, and in some cases, from side to side.

The length of each boundary between any adjacent terrestrial AUs was measured and stored in the boundary relations file. The aquatic AUs were then related to the terrestrial AUs they overlapped. In this case, the aquatic and terrestrial AUs were spatially identical; the length of their shared boundaries could be measured as the area of the polygons, or set at some synthetic value. We initially set all of the aquatic-terrestrial boundaries at the mean of the terrestrial to terrestrial boundaries, so the model was generally as likely to clump upwards through the stack as from side to side within a layer. These relations were also stored to the boundary relations file.

A final component of the analysis was the small to medium river drainages. The aquatic habitats are typically represented by three classes of nesting polygonal watersheds, tributary and headwater drainages less than 100 km^2 (Class 1), small to medium river drainages between 100 - 1000 km^2 (Class 2), and large river drainages more than 1000 km^2 (Class 3). Only class 1 and 2 polygons were analyzed in our MARXAN runs. The Class 3 polygons are extremely large, and very few types are identified throughout the EDUs. Their selection was done manually using the final integrated portfolio as a guide. For our analysis, the Class 1 drainages were attributed to their best fit aquatic AU, and Class 2 polygons were related to all the aquatic AUs below them using boundary relations. Three components were then part of the complete boundary relations file; the traditional boundary relations between the terrestrial AUs, the relations of the aquatic AUs to the terrestrial AUs they overlapped, and the relations between the aquatic AUs and the Class 2 polygons they overlapped.

An iteration of a site selection algorithm analysis begins with any "locked in" AUs that should be part of any conservation area (in this case, the intersection of the stand-alone aquatic and terrestrial outputs), and a partial random selection of additional AUs. All selected AUs are then scored for how well they meet target goals, the total cost of the solution, and total length of boundary. All exposed boundaries of selected AUs are included in the boundary length score. In vertical integration, those exposed boundaries also include the values relating a selected AU with other non-selected AUs above or below it. For example, if a terrestrial AU and the aquatic unit above it are both selected, there will be no penalty in the vertical plane, while a terrestrial unit selected without any corresponding aquatic AU would accrue a penalty. Similarly, the aquatic AUs would accumulate penalties for the unselected terrestrial AUs beneath them. Solutions which maximize the overlap between AU layers will be favored by the algorithm. Similarly, solutions with Class 2 aquatic polygons corresponding with selected aquatic AUs are favored. However, the algorithm is not forced to select overlapping AUs in all cases. If the costs of an AU are prohibitive, or if the conservation targets in an AU are no longer required to meet goals, the algorithm can choose to forgo its selection even when the unit above or below it has been selected.

A big advantage of this analytical technique is that the inputs from the stand-alone analysis can be used with little modification. As we had crafted our AU target and suitability data with integration in mind, the algorithm was able to use the same inputs that were used in the stand-alone runs. The only additional pieces of information MARXAN required were the boundary relations between the various polygonal layers. A final modification to the original input files involved the portions of each EDU which extended beyond the borders of the terrestrial ecoregions. As mentioned previously, all aquatic analyses are conducted across the full extent of the EDUs. In order to use the goals established for each EDU, and to accommodate integration only in those areas of overlap between the EDUs and the terrestrial ecoregions, all aquatic AUs and Class 2 polygons beyond the ecoregional boundaries were frozen into their stand-alone portfolio dispositions. By locking these in or out, the proportion of the targets captured inside and outside of the ecoregions remained constant, and the AUs outside the ecoregions had no further influence on the portions of the portfolios that were to be integrated. All AUs inside the ecoregional boundaries, except the locked in core, were then allowed to shift to accommodate integration.

We tested this methodology against the standard practice of attributing all biological information to a single set of AUs with a suitability index blended to address impacts to both realms. In this case, when an AU is selected, then both freshwater and terrestrial set of targets are always selected. Using the same boundary modifier, the same scale of suitability indices (by averaging the two values to derive a blended index), the same goals, and the same boundary values for horizontal adjacency, head-to-head comparisons were done between the two methods. Both selected very similar numbers of AUs (857 for the vertical method, 852 for the single-layer), and had similar areas (2,365,980 ha vertical, 2,328,306 ha single). However, the mean AU cost (calculated from the suitability index) for the vertical method was about 20% lower for the single-layer method, and goal attainment was higher (94.7% vs. 92.5%). Also, the amount that goals were exceeded was 13% lower in the vertical solution. The vertically integrated solution was more discriminating in its selection of conservation priorities within each realm. See Appendix 8A for more details.

The resulting inputs were run in the MARXAN algorithm. 10 runs were performed for each ecoregion, each using 5 million iterations and a boundary modifier of 0.1. Each of the runs was scored on how well it met goals, its total size (and the correlated measurement of how much overlap existed between the selected aquatic and terrestrial AUs), and total cost. The output with the highest score for each ecoregion was the subsequent basis for modification through peer review to derive the final suite of priority conservation areas.

Appendix 8B – List of Review Meetings and Reviewers

Draft Portfolio Review Meeting Locations and Dates (2005)

Portland, October 25 (9am-12pm): USFS Regional Office, 333 S.W. First Avenue, Rooms 3A and B. Contact: Elaine Rybak, 503/808-2663, erybak@fs.fed.us

Vancouver, October 26 (10am-3pm): WDFW office, 2108 Grand Blvd, Vancouver, WA 98661. Contact: Jeff Azzerad, 360.906.6754, azerrjma@DFW.WA.GOV or Ken Popper, 503-802-8116, kpopper@tnc.org

Eugene, October 28 (10am-3pm): BLM Regional office. 2890 Chad Drive, Eugene, OR 97440. Contact: Jonathan Soll, 503-802-8100, jsoll@tnc.org

Olympia, November 1 (10am-3pm): WDFW's headquarters in the Natural Resource Building in Olympia: 1111 Washington St. SE, Olympia, WA 98501. Contact: George Wilhere, 360-902-2369, or Fayette Krause, 206-343-4344, fkrause@tnc.org

Yakima, November 4 (10am-3pm): USFS Naches Ranger District office, Naches, WA (10237 Highway 12). Contact: Betsy Bloomfield, 509-248-6672, bbloomfield@tnc.org

Wenatchee, November 7 (10am-3pm): Wenatchee National Forest, 215 Melody Lane Wenatchee, WA 98801. Contact Nancy Warner, 509-665-9595, nwarner@tnc.org

Medford/Jacksonville November 16 (10am-3pm): Jacksonville Library

340 C Street, Jacksonville, Oregon 97501. Contact Darren Borgias, 541-770-7933, dborgias@tnc.org

Klamath Falls, November 17 (10am-3pm): Winema National Forest, 2819 Dahlia Street, Klamath Falls, OR 97601. Contact: Mark Stern, 503-802-8116 mstern@tnc.org or George Stroud, 530-926-4366, gstroud@tnc.org

Bend, November 18 (10am-3pm): TNC office, 805 SW Industrial Way, Ste. 3. Contact Garth Fuller, 541-388-3020, gfuller@tnc.org

List of Experts Consulted and Reviewers of Targets Lists and Portfolio

Additional experts and contributors can be found in the Acknowledgements, and Appendices 4E, 4G and 4I.

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Last Name	First Name	Organization	City	State
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Appendix 8C -- List of Integrated Portfolio Sites by Ecoregion

Table 1. Integrated Portfolio Sites in the East Cascades - Modoc Plateau Ecoregion

Site Name	State(s)	Target Focus	Hectares	Acres	Site # (N to S)
Adobe Flat	California	Terrestrial & Freshwater	12,194	30,131	125
Ahtanum / Cowiche	Washington	Terrestrial & Freshwater	20,346	50,275	22
Ancient Tule Lake	California	Terrestrial & Freshwater	18,747	46,324	101
Antelope and Butte Creeks	California	Terrestrial & Freshwater	8,449	20,877	111
Antoine Creek	Washington	Freshwater	3,231	7,983	5
Applegate Flats	Oregon	Terrestrial & Freshwater	18,763	46,363	70
Badger Basin / Willow Creek	California	Terrestrial & Freshwater	29,107	71,924	108
Badger Creek	Oregon	Terrestrial & Freshwater	33,163	81,947	42
Ball Mountain	California	Freshwater	4,912	12,137	99
Bear Creek	California	Terrestrial & Freshwater	6,896	17,039	124
Beaver Creek	Oregon	Terrestrial & Freshwater	16,411	40,551	44
Big Valley	California	Terrestrial & Freshwater	2,929	7,236	130
Big Valley North	California	Terrestrial & Freshwater	21,563	53,283	118
Big Valley South	California	Terrestrial & Freshwater	4,097	10,124	132
Black Canyon	Washington	Freshwater	3,030	7,487	3
Boles / Fletcher Creek	California	Terrestrial & Freshwater	46,344	114,515	104
Butte Valley	California	Terrestrial & Freshwater	23,357	57,714	102
Cascade Lakes	Oregon	Terrestrial & Freshwater	56,395	139,352	57
Chelan	Washington	Terrestrial & Freshwater	93,806	231,794	2
Chelan Butte	Washington	Terrestrial & Freshwater	4,251	10,503	7
Chiwawa River	Washington	Terrestrial & Freshwater	26,842	66,326	4
Clear Lake	California	Terrestrial & Freshwater	57,620	142,380	106
Columbia Gorge - East	Oregon	Terrestrial & Freshwater	42,534	105,102	34
Columbia Rocky Reach	Washington	Terrestrial & Freshwater	49,366	121,983	10
Crater Lake - East	Oregon	Terrestrial & Freshwater	56,125	138,686	66
Crescent Creek	Oregon	Terrestrial & Freshwater	26,916	66,509	60
Diamond Peak	Oregon	Terrestrial & Freshwater	17,318	42,792	58
Drews Creek	Oregon	Terrestrial & Freshwater	34,777	85,934	86
Dry Pine	Oregon	Terrestrial & Freshwater	4,663	11,523	59
Eagle Lake	California	Terrestrial & Freshwater	18,910	46,727	142
Egg Lake	California	Terrestrial & Freshwater	21,212	52,414	113
Eightmile Creek	Oregon	Terrestrial & Freshwater	12,035	29,738	39
Entiat River	Washington	Terrestrial & Freshwater	61,461	151,870	8
Fall River	California	Terrestrial & Freshwater	30,987	76,568	128
Fifteenmile Creek	Oregon	Terrestrial & Freshwater	9,374	23,163	40
Gerber	Oregon	Terrestrial & Freshwater	25,579	63,206	85
Goose Lake	Oregon/California	Terrestrial & Freshwater	38,189	94,366	97
Goose Lake East Shore	California	Terrestrial & Freshwater	22,845	56,449	100
Goose Lake West Shore	California	Terrestrial & Freshwater	11,605	28,677	103
Grasshopper Valley	California	Terrestrial & Freshwater	1,671	4,129	136
Hat Creek	California	Terrestrial & Freshwater	8,028	19,836	139
Hat Creek Rim	California	Terrestrial & Freshwater	15,799	39,039	135
Hood River	Oregon	Terrestrial & Freshwater	39,480	97,555	38
Horse Creek	California	Terrestrial & Freshwater	33,106	81,805	134
Horse Lake	California	Terrestrial & Freshwater	11,816	29,197	138

Table 1. Integrated Portfolio Sites in the East Cascades - Modoc Plateau Ecoregion con't.

Site Name	State(s)	Target Focus	Hectares	Acres	Site # (N to S)
Icicle Creek	Washington	Terrestrial & Freshwater	55,525	137,202	11
Indian Ford Creek	Oregon	Terrestrial & Freshwater	14,786	36,537	50
Jack Creek	Oregon	Terrestrial & Freshwater	29,058	71,802	62
Klamath Marsh	Oregon	Terrestrial & Freshwater	26,095	64,480	65
Klickitat Headwaters	Washington	Terrestrial & Freshwater	13,710	33,877	23
L T Murray	Washington	Terrestrial & Freshwater	20,376	50,349	17
Lava Beds	California	Terrestrial & Freshwater	18,969	46,874	107
Little Klickitat River	Washington	Terrestrial & Freshwater	32,504	80,318	30
Little Naches Headwaters	Washington	Terrestrial & Freshwater	66,505	164,333	18
Little White Salmon River	Washington	Terrestrial & Freshwater	21,280	52,584	32
Lost Creek	California	Terrestrial & Freshwater	30,077	74,319	140
Lower Alkali Lake	California	Terrestrial & Freshwater	4,770	11,787	121
Lower Ash and Willow Creeks	California	Terrestrial & Freshwater	15,300	37,807	127
Lower Klamath Lake	Oregon/California	Terrestrial & Freshwater	42,172	104,208	98
Lower Klickitat River	Washington	Terrestrial & Freshwater	27,536	68,041	33
Lower Lost River	Oregon/California	Freshwater	4,761	11,764	93
Lower South Fork Pit River	California	Terrestrial & Freshwater	26,936	66,558	119
Lower Sprague	Oregon	Terrestrial & Freshwater	45,438	112,278	77
Lower Sycan River	Oregon	Terrestrial & Freshwater	15,635	38,633	73
Lower Wenatchee	Washington	Terrestrial & Freshwater	77,675	191,934	12
Lower Williamson	Oregon	Terrestrial & Freshwater	16,932	41,838	71
Madeline Plains West	California	Terrestrial & Freshwater	4,022	9,937	131
Medicine Lake	California	Terrestrial & Freshwater	30,580	75,563	114
Metolius River	Oregon	Terrestrial & Freshwater	44,584	110,168	48
Middle Alkali Lake	California	Terrestrial & Freshwater	18,136	44,815	117
Middle Ash Creek	California	Terrestrial & Freshwater	7,377	18,228	122
Middle Klickitat River	Washington	Terrestrial & Freshwater	34,653	85,627	28
Middle South Fork Pit River	California	Terrestrial & Freshwater	32,770	80,975	126
Middle Sprague	Oregon	Terrestrial & Freshwater	16,065	39,696	78
Middle Upper Klamath River	Oregon/California	Terrestrial & Freshwater	14,426	35,646	95
Middle Wenatchee	Washington	Terrestrial & Freshwater	51,793	127,980	9
Mill Creek Forks	Oregon	Terrestrial & Freshwater	19,415	47,974	36
Miller Island	Oregon	Terrestrial & Freshwater	8,864	21,902	88
Mount Hood - East	Oregon	Terrestrial & Freshwater	16,477	40,715	41
Mt. Adams - East	Washington	Terrestrial & Freshwater	16,590	40,995	26
Mt. Bachelor	Oregon	Terrestrial & Freshwater	17,368	42,917	53
Mt. Jefferson - East	Oregon	Terrestrial & Freshwater	20,177	49,858	47
Mt. Thielsen - East	Oregon	Terrestrial & Freshwater	25,567	63,175	63
Mt. Washington - East	Oregon	Terrestrial & Freshwater	9,421	23,280	49
Naches River / Rattlesnake Creek	Washington	Terrestrial & Freshwater	68,490	169,239	20
Naneum Ridge	Washington	Terrestrial & Freshwater	61,306	151,486	15
Newberry / Paulina	Oregon	Terrestrial & Freshwater	36,327	89,764	55
North Fork Pit River	California	Terrestrial & Freshwater	10,937	27,025	115
North Fork Willow Creek	California	Terrestrial & Freshwater	23,326	57,638	96
North Sprague	Oregon	Terrestrial & Freshwater	14,971	36,994	75
Olallie Basin / Mill Creek	Oregon	Terrestrial & Freshwater	19,154	47,329	46
Pine Creek	California	Terrestrial & Freshwater	57,610	142,354	141
Pit River	California	Terrestrial & Freshwater	5,901	14,581	133

Table 1. Integrated Portfolio Sites in the East Cascades - Modoc Plateau Ecoregion con't.

Site Name	State(s)	Target Focus	Hectares	Acres	Site # (N to S)
Pit River Confluence	California	Terrestrial & Freshwater	10,554	26,078	116
Poe Valley / Bonanza	Oregon	Terrestrial & Freshwater	24,517	60,581	87
Rattlesnake Creek	California	Terrestrial & Freshwater	37,175	91,860	109
Round Mountain	California	Terrestrial & Freshwater	5,847	14,447	110
Rowena	Oregon	Terrestrial & Freshwater	12,817	31,672	35
Sand Springs	Oregon	Terrestrial & Freshwater	28,370	70,102	56
Satus Headwaters	Washington	Terrestrial & Freshwater	12,400	30,641	27
Simcoe Creek	Washington	Terrestrial & Freshwater	2,627	6,492	24
Sky Lakes - East	Oregon	Terrestrial & Freshwater	44,627	110,272	76
Smoke Creek	California	Terrestrial & Freshwater	4,513	11,152	137
Soda Mtn. / Jenny Creek*	Oregon/California	Terrestrial & Freshwater	43,292	106,975	89
South Sprague	Oregon	Terrestrial & Freshwater	30,507	75,383	80
Spencer Creek	Oregon	Terrestrial & Freshwater	19,470	48,110	84
Stehekin River	Washington	Terrestrial & Freshwater	83,932	207,396	1
Swan Lake	Oregon	Terrestrial & Freshwater	4,399	10,869	81
Swauk Creek	Washington	Terrestrial & Freshwater	9,715	24,005	16
Sycan Marsh	Oregon	Terrestrial & Freshwater	25,738	63,599	68
Teanaway River	Washington	Terrestrial & Freshwater	16,822	41,567	14
Thomas Creek	Oregon	Terrestrial & Freshwater	60,491	149,473	83
Thompson	Oregon	Terrestrial & Freshwater	80,783	199,615	64
Thorn Lake	California	Terrestrial & Freshwater	5,039	12,451	143
Three Creek / Tumalo	Oregon	Terrestrial & Freshwater	14,853	36,701	51
Three Sisters - East	Oregon	Terrestrial & Freshwater	59,111	146,063	52
Tieton	Washington	Terrestrial & Freshwater	54,876	135,598	21
Twelvemile Creek	Oregon/California	Terrestrial & Freshwater	8,816	21,785	94
Upper Alkali Lake	California	Terrestrial & Freshwater	13,988	34,565	105
Upper Ash Creek	California	Terrestrial & Freshwater	21,405	52,892	129
Upper Chewaucan	Oregon	Terrestrial & Freshwater	26,612	65,758	74
Upper Deschutes	Oregon	Terrestrial & Freshwater	32,191	79,544	54
Upper Dry Creek	Oregon/California	Freshwater	5,224	12,909	91
Upper Klamath Lake	Oregon	Terrestrial & Freshwater	88,231	218,020	79
Upper Little Deschutes	Oregon	Terrestrial & Freshwater	18,998	46,944	61
Upper Lost River	California	Terrestrial & Freshwater	23,006	56,849	92
Upper Rock Creek	Washington	Terrestrial & Freshwater	11,255	27,810	31
Upper South Fork Pit River	California	Terrestrial & Freshwater	18,474	45,650	123
Upper Sycan River	Oregon	Terrestrial & Freshwater	8,070	19,942	72
Upper Toppenish Creek	Washington	Terrestrial & Freshwater	6,749	16,678	25
Upper Wenas Creek	Washington	Terrestrial & Freshwater	19,647	48,548	19
Upper Wenatchee	Washington	Terrestrial & Freshwater	66,670	164,741	6
Upper Williamson	Oregon	Terrestrial & Freshwater	28,603	70,677	67
Upper Yakima	Washington	Terrestrial & Freshwater	77,387	191,224	13
Warm Springs River	Oregon	Terrestrial & Freshwater	22,748	56,211	45
Warm Springs Valley	California	Terrestrial & Freshwater	14,969	36,987	112
Warner Foothills	Oregon	Terrestrial & Freshwater	8,443	20,864	90
Warner Mountains	Oregon/California	Terrestrial & Freshwater	59,025	145,850	82
West Fork Hood River	Oregon	Terrestrial & Freshwater	10,817	26,729	37
White River	Oregon	Terrestrial & Freshwater	26,249	64,860	43
White Salmon River	Washington	Terrestrial & Freshwater	45,729	112,995	29
Whitehorse Flat	California	Terrestrial & Freshwater	11,630	28,737	120
Winter Rim	Oregon	Terrestrial & Freshwater	20,148	49,785	69

*Soda Mtn. / Jenny Creek site crosses into the West Cascades

Table 2. Integrated Portfolio Sites in the West Cascades Ecoregion

Site Name	State(s)	Target Focus	Hectares	Acres	Site # (N to S)
Antelope Creek - Cascades	Oregon	Terrestrial & Freshwater	2,573	6,357	106
Big Butte Creek	Oregon	Terrestrial & Freshwater	33,658	83,170	104
Blowout Cr. / Coopers Ridge	Oregon	Terrestrial & Freshwater	12,911	31,903	59
Blue River	Oregon	Terrestrial & Freshwater	16,768	41,433	70
Boise Ridge	Washington	Freshwater	5,321	13,147	6
Boulder Creek	Oregon	Terrestrial & Freshwater	7,890	19,497	89
Breitenbush River	Oregon	Terrestrial & Freshwater	24,865	61,440	56
Bull of the Woods	Oregon	Terrestrial & Freshwater	28,946	71,526	53
Bull Run	Oregon	Terrestrial & Freshwater	32,806	81,064	45
Butte Creek	Oregon	Freshwater	7,771	19,201	51
Carbon River	Washington	Terrestrial & Freshwater	14,318	35,379	9
Cavitt Creek / Peel	Oregon	Terrestrial & Freshwater	11,767	29,076	93
Cispus River	Washington	Terrestrial & Freshwater	23,562	58,222	25
Clearwater	Washington	Terrestrial & Freshwater	7,396	18,275	7
Coast Fork Willamette	Oregon	Terrestrial & Freshwater	6,641	16,409	75
Columbia Gorge - Collins Cr.	Oregon/Washington	Terrestrial & Freshwater	4,543	11,225	42
Columbia Gorge - West	Oregon/Washington	Terrestrial & Freshwater	39,632	97,930	44
Coweeman River	Washington	Freshwater	20,421	50,460	32
Cowlitz Headwaters	Washington	Terrestrial & Freshwater	40,217	99,377	15
Cowlitz Riffe Lake	Washington	Terrestrial & Freshwater	12,294	30,379	23
Crabtree Creek and Mtn.	Oregon	Terrestrial & Freshwater	30,335	74,957	61
Crater Lake - West	Oregon	Terrestrial & Freshwater	30,927	76,420	98
Deschutes (WA)	Washington	Terrestrial & Freshwater	15,894	39,275	14
East Fork Lewis Headwaters	Washington	Terrestrial & Freshwater	19,847	49,042	39
East Fork Lewis River	Washington	Freshwater	9,119	22,532	38
Elk Trail Foothills	Oregon	Terrestrial & Freshwater	21,513	53,158	102
Elkhorn Peak	Oregon	Terrestrial & Freshwater	15,861	39,192	101
Fairview Peak	Oregon	Terrestrial & Freshwater	15,784	39,003	84
Fall Creek	Oregon	Terrestrial & Freshwater	26,715	66,012	74
Hills Creek	Oregon	Terrestrial & Freshwater	14,989	37,039	82
Horse Rock Ridge	Oregon	Terrestrial & Freshwater	5,366	13,260	66
Howard Hanson	Washington	Terrestrial & Freshwater	4,724	11,674	5
Issaquah Creek	Washington	Terrestrial & Freshwater	7,964	19,678	1
Jackson Creek	Oregon	Terrestrial & Freshwater	27,662	68,354	99
Kalama River	Washington	Terrestrial & Freshwater	24,334	60,128	34
Kanaskat	Washington	Freshwater	2,895	7,153	4
Kiona Creek	Washington	Terrestrial & Freshwater	3,051	7,539	21
Little Butte Creek - Cascades	Oregon	Terrestrial & Freshwater	37,850	93,528	105
Little River	Oregon	Terrestrial & Freshwater	16,638	41,113	92
Lower Cispus Tributaries	Washington	Terrestrial & Freshwater	34,650	85,621	27
Lower Lewis River	Washington	Terrestrial & Freshwater	6,203	15,328	36
Mashel / Ohop	Washington	Terrestrial & Freshwater	36,474	90,128	11
McDowell Creek	Oregon	Freshwater	3,009	7,434	63
Middle Fork Willamette	Oregon	Terrestrial & Freshwater	36,714	90,721	77
Middle Lewis River	Washington	Terrestrial & Freshwater	41,301	102,056	35
Middle North Santiam	Oregon	Terrestrial & Freshwater	27,025	66,780	57
Middle North Umpqua	Oregon	Terrestrial & Freshwater	45,074	111,378	90
Middle Santiam	Oregon	Terrestrial & Freshwater	23,187	57,294	62

Table 2. Integrated Portfolio Sites in the West Cascades Ecoregion con't.

Site Name	State(s)	Target Focus	Hectares	Acres	Site # (N to S)
Middle South Umpqua	Oregon	Terrestrial & Freshwater	22,700	56,092	100
Mohawk / McGowan Creek	Oregon	Terrestrial & Freshwater	3,091	7,637	71
Morgan Creek	Washington	Terrestrial & Freshwater	1,986	4,907	41
Mosby Creek	Oregon	Terrestrial & Freshwater	6,574	16,244	80
Mount Hood - West	Oregon	Terrestrial & Freshwater	27,409	67,727	47
Mt Rainier	Washington	Terrestrial & Freshwater	50,058	123,694	12
Mt. Adams - West	Washington	Terrestrial & Freshwater	12,333	30,476	28
Mt. Bailey	Oregon	Terrestrial & Freshwater	14,974	37,000	95
Mt. Jefferson - West	Oregon	Terrestrial & Freshwater	34,288	84,726	60
Mt. Thielsen - West	Oregon	Terrestrial & Freshwater	11,707	28,929	94
Mt. Washington - West	Oregon	Terrestrial & Freshwater	19,430	48,012	67
Muddy River Tributaries	Washington	Terrestrial & Freshwater	22,010	54,386	30
Newaukum Headwaters	Washington	Terrestrial & Freshwater	9,863	24,370	17
North Fork Middle Fork Willamette	Oregon	Terrestrial & Freshwater	36,566	90,356	76
Opal Creek	Oregon	Terrestrial & Freshwater	17,807	44,002	55
Purcell Slough	Washington	Terrestrial & Freshwater	2,803	6,927	22
Raging River	Washington	Freshwater	4,966	12,270	2
Roaring River / Oak Grove Fork Clackamas	Oregon	Terrestrial & Freshwater	48,441	119,697	49
Rock Creek	Washington	Terrestrial & Freshwater	5,032	12,434	40
Rock Creek (North Umpqua)	Oregon	Terrestrial & Freshwater	13,171	32,546	88
Rogue River Headwaters	Oregon	Terrestrial & Freshwater	21,569	53,297	97
Row River / Mt. June	Oregon	Terrestrial & Freshwater	15,038	37,159	79
Salmon - Huckleberry	Oregon	Terrestrial & Freshwater	34,991	86,463	48
Salt Creek	Oregon	Terrestrial & Freshwater	19,955	49,309	81
Sandy River - Cascades	Oregon	Terrestrial & Freshwater	24,455	60,427	46
Scatter Creek - Cascades	Washington	Terrestrial & Freshwater	2,305	5,695	13
Silver and Abiqua Creeks	Oregon	Terrestrial & Freshwater	27,174	67,147	54
Sky Lakes - West	Oregon	Terrestrial & Freshwater	29,221	72,206	103
Snow Peak / Thomas Creek	Oregon	Terrestrial & Freshwater	12,852	31,758	58
South Fork and Lower McKenzie	Oregon	Terrestrial & Freshwater	33,488	82,748	72
South Santiam	Oregon	Terrestrial & Freshwater	43,794	108,215	64
South St Helens	Washington	Terrestrial & Freshwater	5,074	12,537	33
Steamboat and Canton Creeks	Oregon	Terrestrial & Freshwater	38,672	95,559	87
Three Sisters - West	Oregon	Terrestrial & Freshwater	95,185	235,201	73
Tilton Headwaters	Washington	Terrestrial & Freshwater	8,729	21,570	18
Toutle Green River	Washington	Terrestrial & Freshwater	23,210	57,351	26
Toutle St Helens	Washington	Terrestrial & Freshwater	25,559	63,156	29
Upper Calapooia River	Oregon	Terrestrial & Freshwater	17,389	42,968	69
Upper Calapooya Creek	Oregon	Freshwater	8,379	20,705	85
Upper Cedar River	Washington	Terrestrial & Freshwater	34,567	85,414	3
Upper Clackamas	Oregon	Terrestrial & Freshwater	28,843	71,272	52
Upper Coast Fork Willamette	Oregon	Terrestrial & Freshwater	6,849	16,923	83
Upper Cowlitz River	Washington	Terrestrial & Freshwater	50,437	124,630	19
Upper Lewis River	Washington	Terrestrial & Freshwater	15,161	37,462	31
Upper McKenzie	Oregon	Terrestrial & Freshwater	40,397	99,822	68
Upper Middle Fork Willamette	Oregon	Terrestrial & Freshwater	38,901	96,124	86
Upper Molalla	Oregon	Terrestrial & Freshwater	34,254	84,640	50

Table 2. Integrated Portfolio Sites in the West Cascades Ecoregion con't.

Site Name	State(s)	Target Focus	Hectares	Acres	Site # (N to S)
Upper Nisqually River	Washington	Terrestrial & Freshwater	57,727	142,643	16
Upper North Umpqua	Oregon	Terrestrial & Freshwater	31,020	76,650	91
Upper Puyallup River	Washington	Terrestrial & Freshwater	12,832	31,707	10
Upper South Umpqua	Oregon	Terrestrial & Freshwater	38,723	95,684	96
Upper White River	Washington	Terrestrial & Freshwater	57,152	141,223	8
Waldo Lake	Oregon	Terrestrial & Freshwater	23,820	58,860	78
Walker Creek	Oregon	Terrestrial & Freshwater	7,342	18,142	107
Washougal River	Washington	Terrestrial & Freshwater	20,928	51,713	43
Whalehead Ridge	Washington	Terrestrial & Freshwater	6,575	16,246	20
Wiley Creek	Oregon	Freshwater	11,598	28,658	65
Wind River	Washington	Terrestrial & Freshwater	46,401	114,657	37
Winston Creek	Washington	Terrestrial & Freshwater	3,179	7,854	24

Appendix 8D -- List of River Corridor Portfolio Sites by Ecological Drainage Unit

EDU and State	Site Name	Class size	Length of System Arc (km)	Watershed Area (ha)	EL Code	System Name
Deschutes						
Oregon	Davis Lake / Odell Creek - Mainstem	2	8	23,641	FSDES2.3g	Groundwater influenced, mid elevation, volcanics with significant glacial influence, low stream gradient
Oregon	Deschutes River - Lower Mainstem	3	111	544,206	FSDES3.100	Groundwater influenced, mid-elevation, volcanics with sedimentary inclusions, minor glacial influence, low stream gradient.
Oregon	Deschutes River (OR) - Upper Mainstem	2	74	92,202	FSDES2.2g	Groundwater influenced, mid elevation, mixed geology (volcanics and sediments) with minor glacial influence, low stream gradient
Oregon	Little Deschutes River / Crescent Creek - Mainstem	2	118	98,767	FSDES2.2g	Groundwater influenced, mid elevation, mixed geology (volcanics and sediments) with minor glacial influence, low stream gradient
Oregon	Metolius River - Mainstem	2	41	74,314	FSDES2.1g	Groundwater influenced, mid elevation, volcanics with significant glacial influence, variable stream gradient
Oregon	Shitike Creek - Mainstem	2	25	26,691	FSDES2.7g	Groundwater influenced, low to mid elevation, mixed geology (volcanics with sediment or alluvium) with minor glacial influence, low to med stream gradient
Oregon	Warm Springs River - Lower Mainstem	3	27	138,515	FSDES3.160	Groundwater influenced, low-mid elevation, volcanics with alluvial inclusions
Oregon	Warm Springs River - Upper Mainstem	2	49	77,796	FSDES2.7g	Groundwater influenced, low to mid elevation, mixed geology (volcanics with sediment or alluvium) with minor glacial influence, low to med stream gradient
Oregon	Whychus Creek - Mainstem	2	51	63,191	FSDES2.5g	Groundwater influenced, mid to high elevation, volcanics with glacial influence, low to med stream gradients
Great Basin						
Oregon	Chewaucan River - Mainstem	2	62	98,757	FSGB2.10	Unnamed
Lower Columbia						
Oregon	Bull Run River - Mainstem	2	26	36,205	FSLC2.2	(2) Foothills rivers, basalt, mixed-gradient
Oregon	Clackamas / Collawash Rivers - Mainstem	2	66	84,207	FSLC2.1	(1) Cascades rivers, basalt, moderate-gradient
Oregon	Clackamas River - Lower Mainstem	3	40	243,313	FSLC3.20	(20) West-slope Cascades, mid elevation, medium gradient, basalt, Oregon
Washington	Coweeman River - Mainstem	2	39	33,471	FSLC2.3	(3) Columbia lowland tributaries, basalt, low/mod-gradient
Washington	East Fork Lewis River - Mainstem	2	47	54,893	FSLC2.3	(3) Columbia lowland tributaries, basalt, low/mod-gradient

EDU and State	Site Name	Class size	Length of System Arc (km)	Watershed Area (ha)	EL Code	System Name
Lower Columbia con't.						
Oregon	Eightmile / Fifteenmile Creeks - Mainstem	2	142	95,518	FSLC2.93	(93) Eastside rivers, volcanics, mixed gradient
Washington	Kalama River - Mainstem	2	60	53,705	FSLC2.3	(3) Columbia lowland tributaries, basalt, low/mod-gradient
Washington	Klickitat River - Lower Mainstem	3	58	344,834	FSLC3.30	(30) East-slope Cascades, mid/high elevation, low/mid gradient, basalt, Washington
Washington	Klickitat River - Upper Mainstem	2	101	99,828	FSLC2.1	(1) Cascades rivers, basalt, moderate-gradient
Washington	Lewis River - Mainstem	3	30	316,326	FSLC3.10	(10) West-slopeCascades, mid-elevation, low gradient, basalt, Washington
Washington	Little Klickitat River - Mainstem	2	70	72,110	FSLC2.2	(2) Foothills rivers, basalt, mixed-gradient
Washington	North Fork Toutle / Green Rivers - Mainstem	2	84	78,440	FSLC2.2	(2) Foothills rivers, basalt, mixed-gradient
Washington	Outlet Creek - Mainstem	2	49	28,408	FSLC2.1	(1) Cascades rivers, basalt, moderate-gradient
Oregon	Roaring River - Mainstem	2	4	11,028	FSLC2.92	(92) Cascades rivers, volcanics, mixed-gradient
Oregon	Sandy / Salmon Rivers - Mainstem	2	72	75,197	FSLC2.1	(1) Cascades rivers, basalt, moderate-gradient
Oregon	Sandy River - Lower Mainstem	3	27	129,834	FSLC3.20	(20) West-slope Cascades, mid elevation, medium gradient, basalt, Oregon
Washington	White Creek - Mainstem	2	39	33,199	FSLC2.94	(94) East Cascades rivers, basalt, mixed gradient
Washington	Wind River - Mainstem	2	69	58,481	FSLC2.92	(92) Cascades rivers, volcanics, mixed-gradient
Okanagan						
Washington	Chiwawa River - Mainstem	2	35	45,858	FSOK2.6	FSOK2.6
Washington	Icicle Creek - Mainstem	2	27	53,938	FSOK2.6	FSOK2.6
Washington	Lake Chelan - Mainstem	3	86	234,073	FSOK3.40	FSOK3.40
Washington	Wenatchee River - Mainstem	3	36	340,386	FSOK3.6	FSOK3.6
Washington	Skookumchuck River - Mainstem	2	40	48,757	FSOLY2.15	Chehalis headwater small rivers - volcanic, low to mid elevation, low to moderate gradient
Pit						
California	Ash Creek - Lower Mainstem	3	28	109,419	FSPIT3.1	Surface water dominated, low to mid elevation, pyroclastic silicic with minor sediments and alluvium, low to moderate stream gradient
California	Ash Creek - Upper Mainstem	2	32	42,040	FSPIT2.1	Surface water dominated, mid elevation, pyroclastic silicic with minor alluvium and sediments, variable stream gradient
California	Beaver Creek - Mainstem	2	23	22,390	FSPIT2.3	Surface water dominated, low to mid elevation, pyroclastic silicic with sediments and alluvium, low to moderate stream gradient

EDU and State	Site Name	Class size	Length of System Arc (km)	Watershed Area (ha)	EL Code	System Name
Pit, con't.						
California	Butte Creek - Mainstem	2	21	24,987	FSPIT2.2	Surface water dominated, low to mid elevation, pyroclastic silicic, variable stream gradient
California	East Creek - Mainstem	2	20	27,470	FSPIT2.8	Surface water dominated, mid to high elevation, pyroclastic silicic with minor alluvium, variable stream gradient
California	Horse Creek (Pit River) - Mainstem	2	9	51,659	FSPIT2.1	Surface water dominated, mid elevation, pyroclastic silicic with minor alluvium and sediments, variable stream gradient
California	Hulbert Creek - Mainstem	2	7	14,672	FSPIT2.1	Surface water dominated, mid elevation, pyroclastic silicic with minor alluvium and sediments, variable stream gradient
California	McCloud River - Mainstem	3	15	129,794	FSPIT3.2	Ground water influenced, low to mid elevation, pyroclastic silicic with minor sediments and alluvium, variable stream gradient
California	Pit River - Mainstem	3	253	715,123	FSPIT3.1	Surface water dominated, low to mid elevation, pyroclastic silicic with minor sediments and alluvium, low to moderate stream gradient
California	South Fork Pit River - Lower Mainstem	3	38	173,534	FSPIT3.4	Surface water dominated, mid to high elevation, pyroclastic silicic with minor sediments and alluvium, low stream gradient
California	South Fork Pit River - Upper Mainstem	2	1	73,809	FSPIT2.1	Surface water dominated, mid elevation, pyroclastic silicic with minor alluvium and sediments, variable stream gradient
Oregon	Thomas Creek - Mainstem	2	25	61,600	FSPIT2.5	Surface water dominated, low to mid elevation, sediments with pyroclastic silicic, variable stream gradient
Puget Sound						
Washington	Deschutes River (WA) - Mainstem	2	52	45,342	FSPT2.tw2b	Cascades upper river systems - predominantly volcanic watershed traversing glacial drift, low to mid elevation, low to moderate gradient
Washington	Nisqually River - Mainstem	3	52	185,768	FSPT3.th3	South Puget Sound medium rivers - predominantly volcanic watershed traversing glacial drift and alluvium, low to mid elevation, low gradient
Washington	Nisqually River - Mainstem	2	28	99,799	FSPT2.tw2b	Cascades upper river systems - predominantly volcanic watershed traversing glacial drift, low to mid elevation, low to moderate gradient
Washington	Ohop Creek - Mainstem	2	10	10,938	FSPT2.tw2b	Cascades upper river systems - predominantly volcanic watershed traversing glacial drift, low to mid elevation, low to moderate gradient
Oregon	Jackson Creek - Mainstem	2	24	41,725	FSROU2.10	Mid elevation, non-basalt volcanics with sediments and granitics, low stream gradient

EDU and State	Site Name	Class size	Length of System Arc (km)	Watershed Area (ha)	EL Code	System Name
Puget Sound con't.						
Oregon	North Umpqua / Clearwater Rivers - Mainstem	2	56	90,632	FSROU2.4	Mid-high elevation, non-basalt volcanics with sediments, basalt and galcial influence, low-mod stream gradient
Oregon	Steamboat / Canton Creeks - Mainstem	2	42	58,009	FSROU2.6	Low-mid elevation, mixed geology (granitics, sediments and non-basalt volcanics), low-mod stream gradient
Oregon	Umpqua River - Mainstem	3	318	950,254	FSROU3.60	Low-mid elevation, sediments, non-basalt volcanics and granitics, low stream gradient
Upper Klamath Basin						
California	Boles Creek - Mainstem	2	24	77,161	FSUK2.1s	Low-mid elevation, basalts, low stream gradient
Oregon	Jenny Creek - Mainstem	2	28	54,463	FSUK2.4s	Low to mid elevation, basalts, variable stream gradient
California	North Fork Willow Creek - Mainstem	2	23	31,303	FSUK2.4s	Low to mid elevation, basalts, variable stream gradient
Oregon	Sand Creek - Mainstem	2	8	12,275	FSUK2.8s	Mid to high elevation, mixed geology (Mazama ash, basalts and rhyolites), low stream gradient
Oregon	Sprague River - Mainstem	3	108	364,481	FSUK3.999	Mid elevation, basalts with rhyolite, low stream gradient
Oregon	Sycan River - Mainstem	2	54	145,384	FSUK2.4s	Low to mid elevation, basalts, variable stream gradient
Oregon	Williamson River - Lower Mainstem	3	29	221,708	FSUK3.329	Mid elevation, mixed geology (basalt, Mazama ash, sediment), low stream gradient
Oregon	Williamson River - Upper Mainstem	2	28	70,054	FSUK2.4s	Low to mid elevation, basalts, variable stream gradient
Oregon	Wood River - Mainstem	2	9	33,733	FSUK2.3s	Low to mid elevation, mixed geology (Mazama ash, basalts and lacustrine), low stream gradient
Willamette						
Oregon	Calapooia River - Mainstem	2	102	97,060	FSWIL2.7	Cascade/foothill small river - volcanic, low to mid elevation
Oregon	Coast Fork Willamette River - Mainstem	2	29	39,428	FSWIL2.1	Coast Range small rivers - sedimentary, low to mid elevation
Oregon	Crabtree Creek - Mainstem	2	36	40,647	FSWIL2.7	Cascade/foothill small river - volcanic, low to mid elevation
Oregon	Horse Creek (McKenzie River) - Mainstem	2	33	40,300	FSWIL2.2	Cascade small river - volcanic with glacial features, mid to high elevation
Oregon	Little North Santiam River - Mainstem	2	26	28,076	FSWIL2.8	Cascade small river - volcanic, mid elevation
Oregon	McKenzie River - Mainstem	2	23	91,517	FSWIL2.2	Cascade small river - volcanic with glacial features, mid to high elevation
Oregon	Middle Fork Willamette River - Mainstem	2	39	84,963	FSWIL2.2	Cascade small river - volcanic with glacial features, mid to high elevation
Oregon	North Fork Middle Fork Willamette River - Mainstem	2	43	55,974	FSWIL2.2	Cascade small river - volcanic with glacial features, mid to high elevation
Oregon	Pudding River - Mainstem	3	21	226,077	FSWIL3.th4	Valley/foothill medium river - volcanic, low elevation

EDU and State	Site Name	Class size	Length of System Arc (km)	Watershed Area (ha)	EL Code	System Name
Willamette con't.						
Oregon	Upper Willamette River and Tributaries - Mainstem	2	271	902,575	FSWIL3.th1	Cascade medium river - volcanic, low to mid elevation
Yakima-Palouse						
Washington	Naches / American / Bumping Rivers - Mainstem	2	37	99,860	FSYP2.35	(35) Yakima tributaries - mixed-geology, mid-gradient
Washington	Rattlesnake Creek - Mainstem	2	21	34,788	FSYP2.35	(35) Yakima tributaries - mixed-geology, mid-gradient
Washington	Toppenish Creek - Mainstem	3	43	165,913	FSYP3.5	(5) Mainstem tributaries
Washington	Yakima / Naches Rivers - Mainstem	3	229	990,258	FSYP3.4	(4) Yakima River
Washington	Yakima River - Upper Mainstem	2	36	67,029	FSYP2.33	(33) Upper Yakima River - mixed-geology, low-gradient

Appendix 8G - West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Terrestrial									
Terrestrial Ecological Systems									
Columbia Basin Foothill and Canyon Dry Grassland		Umpqua Cascades Section	2	ha	2	ha	1	ha	200
Columbia Plateau Ash and Tuff Badland		Columbian Cascades Section	5,468	ha	5,205	ha	1641	ha	317
Columbia Plateau Steppe and Grassland		Columbian Cascades Section	18	ha	8	ha	5	ha	160
Columbian Cascades Section Lower Forest and Woodland		Columbian Cascades Section	672,796	ha	245,888	ha	201839	ha	122
Columbian Cascades Section Upper Forest and Woodland		Columbian Cascades Section	335,580	ha	200,261	ha	100674	ha	199
East Cascades Mesic Montane Conifer Forest		Columbian Cascades Section	595	ha	433	ha	178	ha	243
East Cascades Mesic Montane Conifer Forest		Mount Rainier Section	4	ha	1	ha	1	ha	100
East Cascades Oak-Pine Forest and Woodland		Columbian Cascades Section	189	ha	189	ha	57	ha	332
East Cascades Oak-Pine Forest and Woodland		Middle Oregon Cascades Section	8	ha	4	ha	3	ha	133
East Cascades Oak-Pine Forest and Woodland		Umpqua Cascades Section	15	ha	6	ha	4	ha	150
Inter-Mountain Basins Big Sagebrush Steppe		Umpqua Cascades Section	98	ha	30	ha	29	ha	103
Inter-Mountain Basins Montane Sagebrush Steppe		Columbian Cascades Section	4	ha	3	ha	1	ha	300
Inter-Mountain Basins Montane Sagebrush Steppe		Umpqua Cascades Section	1,112	ha	900	ha	333	ha	270
Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland		Umpqua Cascades Section	171	ha	148	ha	51	ha	290
Late Seral Forest (>30 inch DBH)		Columbian Cascades Section	120,622	ha	74,997	ha	60311	ha	124
Late Seral Forest (>30 inch DBH)		Middle Oregon Cascades Section	203,426	ha	111,120	ha	101713	ha	109
Late Seral Forest (>30 inch DBH)		Mount Rainier Section	47,318	ha	31,475	ha	23659	ha	133
Late Seral Forest (>30 inch DBH)		Umpqua Cascades Section	143,621	ha	78,881	ha	71810	ha	110
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland		Middle Oregon Cascades Section	1,975	ha	611	ha	592	ha	103
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland		Umpqua Cascades Section	83,228	ha	37,378	ha	24969	ha	150
Mediterranean California Mesic Mixed Conifer Forest and Woodland		Columbian Cascades Section	203	ha	117	ha	61	ha	192
Mediterranean California Mesic Mixed Conifer Forest and Woodland		Middle Oregon Cascades Section	2,438	ha	1,302	ha	731	ha	178
Mediterranean California Mesic Mixed Conifer Forest and Woodland		Umpqua Cascades Section	278,054	ha	134,484	ha	83416	ha	161
Mediterranean California Red Fir Forest and Woodland		Middle Oregon Cascades Section	19	ha	18	ha	6	ha	300
Mediterranean California Red Fir Forest and Woodland		Umpqua Cascades Section	45,413	ha	20,800	ha	13624	ha	153
Mediterranean California Subalpine Meadow		Umpqua Cascades Section	1,470	ha	1,394	ha	441	ha	316
Middle Oregon Cascades Lower Forest and Woodland		Middle Oregon Cascades Section	786,765	ha	310,076	ha	236029	ha	131
Middle Oregon Cascades Upper Forest and Woodland		Middle Oregon Cascades Section	287,307	ha	206,170	ha	86192	ha	239
Mount Rainier Lower Forest and Woodland		Mount Rainier Section	418,034	ha	149,355	ha	125410	ha	119
Mount Rainier Upper Forest and Woodland		Mount Rainier Section	211,066	ha	152,779	ha	63320	ha	241

Habitat Type

Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
North Pacific Avalanche Chute Shrubland		Columbian Cascades Section	11 ha	10 ha	3 ha	333
North Pacific Avalanche Chute Shrubland		Mount Rainier Section	210 ha	147 ha	63 ha	233
North Pacific Avalanche Chute Shrubland		Umpqua Cascades Section	207 ha	160 ha	62 ha	258
North Pacific Broadleaf Landslide Forest and Shrubland		Columbian Cascades Section	2,846 ha	1,651 ha	854 ha	193
North Pacific Broadleaf Landslide Forest and Shrubland		Middle Oregon Cascades Section	4,523 ha	3,553 ha	1357 ha	262
North Pacific Broadleaf Landslide Forest and Shrubland		Mount Rainier Section	39 ha	31 ha	12 ha	258
North Pacific Broadleaf Landslide Forest and Shrubland		Umpqua Cascades Section	360 ha	204 ha	108 ha	189
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Columbian Cascades Section	64 ha	64 ha	19 ha	337
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Middle Oregon Cascades Section	204 ha	200 ha	61 ha	328
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Mount Rainier Section	4,754 ha	4,754 ha	1426 ha	333
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Umpqua Cascades Section	62 ha	55 ha	18 ha	306
North Pacific Hardwood - Conifer Swamp		Columbian Cascades Section	46 ha	23 ha	14 ha	164
North Pacific Hardwood - Conifer Swamp		Mount Rainier Section	8,518 ha	3,798 ha	2555 ha	149
North Pacific Hypermaritime Shrub and Herbaceous Headland		Columbian Cascades Section	71 ha	22 ha	21 ha	105
North Pacific Hypermaritime Shrub and Herbaceous Headland		Middle Oregon Cascades Section	13 ha	5 ha	4 ha	125
North Pacific Hypermaritime Shrub and Herbaceous Headland		Mount Rainier Section	439 ha	312 ha	132 ha	236
North Pacific Hypermaritime Shrub and Herbaceous Headland		Umpqua Cascades Section	2 ha	0 ha		
North Pacific Lowland Riparian Forest and Shrubland		Columbian Cascades Section	1 ha	0 ha		
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Columbian Cascades Section	335,489 ha	130,725 ha	100647 ha	130
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Middle Oregon Cascades Section	632,053 ha	256,287 ha	189616 ha	135
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Mount Rainier Section	245,470 ha	84,869 ha	73641 ha	115
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Umpqua Cascades Section	45,506 ha	20,343 ha	13652 ha	149
North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest		Columbian Cascades Section	246,448 ha	80,364 ha	73934 ha	109
North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest		Middle Oregon Cascades Section	69,647 ha	20,687 ha	20894 ha	99
North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest		Mount Rainier Section	94,692 ha	34,652 ha	28408 ha	122
North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest		Umpqua Cascades Section	90,906 ha	45,148 ha	27272 ha	166
North Pacific Montane Grassland		Columbian Cascades Section	393 ha	235 ha	118 ha	199
North Pacific Montane Grassland		Mount Rainier Section	606 ha	322 ha	182 ha	177
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Columbian Cascades Section	5,324 ha	3,094 ha	1597 ha	194

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Mount Rainier Section	1,939 ha	1,347 ha	582 ha	231
North Pacific Montane, Massive Bedrock, Cliff and Talus		Columbian Cascades Section	12,825 ha	8,270 ha	3848 ha	215
North Pacific Montane, Massive Bedrock, Cliff and Talus		Middle Oregon Cascades Section	3,022 ha	1,599 ha	907 ha	176
North Pacific Montane, Massive Bedrock, Cliff and Talus		Mount Rainier Section	13,922 ha	10,790 ha	4177 ha	258
North Pacific Montane, Massive Bedrock, Cliff and Talus		Umpqua Cascades Section	776 ha	594 ha	233 ha	255
North Pacific Mountain Hemlock Forest		Columbian Cascades Section	44,630 ha	29,850 ha	13389 ha	223
North Pacific Mountain Hemlock Forest		Middle Oregon Cascades Section	118,583 ha	99,392 ha	35575 ha	279
North Pacific Mountain Hemlock Forest		Mount Rainier Section	46,610 ha	37,293 ha	13983 ha	267
North Pacific Mountain Hemlock Forest		Umpqua Cascades Section	71,556 ha	48,241 ha	21467 ha	225
North Pacific Western Hemlock-Silver Fir Forest		Columbian Cascades Section	311,915 ha	178,909 ha	93574 ha	191
North Pacific Western Hemlock-Silver Fir Forest		Middle Oregon Cascades Section	167,585 ha	106,004 ha	50276 ha	211
North Pacific Western Hemlock-Silver Fir Forest		Mount Rainier Section	174,881 ha	101,111 ha	52464 ha	193
North Pacific Western Hemlock-Silver Fir Forest		Umpqua Cascades Section	34,504 ha	17,200 ha	10351 ha	166
North Pacific Wooded Lava Flows		Columbian Cascades Section	17,221 ha	15,279 ha	5166 ha	296
North Pacific Wooded Lava Flows		Middle Oregon Cascades Section	70 ha	62 ha	21 ha	295
North Pacific Wooded Lava Flows		Umpqua Cascades Section	594 ha	581 ha	178 ha	326
Northern California Mesic Subalpine Woodland		Columbian Cascades Section	2,676 ha	1,732 ha	803 ha	216
Northern California Mesic Subalpine Woodland		Middle Oregon Cascades Section	2,331 ha	2,084 ha	699 ha	298
Northern California Mesic Subalpine Woodland		Mount Rainier Section	2,671 ha	2,535 ha	801 ha	316
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Columbian Cascades Section	2,842 ha	1,755 ha	853 ha	206
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Middle Oregon Cascades Section	9,582 ha	2,836 ha	2875 ha	99
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Mount Rainier Section	330 ha	216 ha	99 ha	218
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Umpqua Cascades Section	8,054 ha	3,511 ha	2416 ha	145
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Umpqua Cascades Section	332 ha	155 ha	100 ha	155
Northern Rocky Mountain Subalpine Dry Grassland		Columbian Cascades Section	2,567 ha	1,732 ha	770 ha	225
Northern Rocky Mountain Subalpine Dry Grassland		Mount Rainier Section	997 ha	673 ha	299 ha	225
Northern Rocky Mountain Subalpine Dry Parkland		Columbian Cascades Section	4,701 ha	3,675 ha	1410 ha	261
Northern Rocky Mountain Subalpine Dry Parkland		Mount Rainier Section	33,717 ha	32,735 ha	10115 ha	324
Rocky Mountain Alpine Dwarf-Shrubland		Middle Oregon Cascades Section	9 ha	9 ha	3 ha	300
Rocky Mountain Lodgepole Pine Forest		Columbian Cascades Section	3,457 ha	1,646 ha	1037 ha	159
Rocky Mountain Lodgepole Pine Forest		Middle Oregon Cascades Section	145 ha	130 ha	43 ha	302
Rocky Mountain Lodgepole Pine Forest		Mount Rainier Section	353 ha	353 ha	106 ha	333
Rocky Mountain Lodgepole Pine Forest		Umpqua Cascades Section	9,790 ha	8,854 ha	2937 ha	301

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Columbian Cascades Section	1,127	ha	422	ha	338	ha	125
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Mount Rainier Section	229	ha	168	ha	69	ha	243
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Umpqua Cascades Section	10	ha	10	ha	3	ha	333
Temperate Pacific Freshwater Emergent Marsh		Umpqua Cascades Section	291	ha	291	ha	87	ha	334
Umpqua Cascades Lower Forest and Woodland		Umpqua Cascades Section	556,454	ha	264,574	ha	166936	ha	158
Umpqua Cascades Upper Forest and Woodland		Umpqua Cascades Section	174,906	ha	100,996	ha	52472	ha	192
Species									
Amphibians									
Cascade Torrent Salamander	*Rhyacotriton cascadae*	Columbian Cascades Section	58	occ	37	occ	37	occ	100
Cascade Torrent Salamander	*Rhyacotriton cascadae*	Middle Oregon Cascades Section	6	occ	3	occ	4	occ	75
Cascade Torrent Salamander	*Rhyacotriton cascadae*	Mount Rainier Section	15	occ	10	occ	9	occ	111
Cascade Torrent Salamander	*Rhyacotriton cascadae*	West Cascades Ecoregion	79	occ	50	occ	50	occ	100
Cascades Frog	*Rana cascadae*	Columbian Cascades Section	22	occ	15	occ	5	occ	300
Cascades Frog	*Rana cascadae*	Middle Oregon Cascades Section	35	occ	26	occ	7	occ	371
Cascades Frog	*Rana cascadae*	Umpqua Cascades Section	65	occ	38	occ	13	occ	292
Cascades Frog	*Rana cascadae*	West Cascades Ecoregion	122	occ	79	occ	25	occ	316
Clouded Salamander	*Aneides ferreus*	Middle Oregon Cascades Section	10	occ	8	occ	7	occ	114
Clouded Salamander	*Aneides ferreus*	Umpqua Cascades Section	6	occ	6	occ	6	occ	100
Clouded Salamander	*Aneides ferreus*	West Cascades Ecoregion	16	occ	14	occ	13	occ	108
Coastal Tailed Frog	*Ascaphus truei*	Columbian Cascades Section	30	occ	19	occ	3	occ	633
Coastal Tailed Frog	*Ascaphus truei*	Middle Oregon Cascades Section	39	occ	29	occ	5	occ	580
Coastal Tailed Frog	*Ascaphus truei*	Umpqua Cascades Section	44	occ	25	occ	5	occ	500
Coastal Tailed Frog	*Ascaphus truei*	West Cascades Ecoregion	113	occ	73	occ	13	occ	562
Cope's Giant Salamander	*Dicamptodon copei*	Columbian Cascades Section	24	occ	17	occ	15	occ	113
Cope's Giant Salamander	*Dicamptodon copei*	Mount Rainier Section	14	occ	9	occ	10	occ	90
Cope's Giant Salamander	*Dicamptodon copei*	West Cascades Ecoregion	38	occ	26	occ	25	occ	104
Foothill Yellow-legged Frog	*Rana boylii*	Middle Oregon Cascades Section	2	occ	2	occ	2	occ	100
Foothill Yellow-legged Frog	*Rana boylii*	Umpqua Cascades Section	9	occ	5	occ	5	occ	100
Foothill Yellow-legged Frog	*Rana boylii*	West Cascades Ecoregion	11	occ	7	occ	7	occ	100
Larch Mountain Salamander	*Plethodon larselli*	Columbian Cascades Section	50	occ	39	occ	37	occ	105
Larch Mountain Salamander	*Plethodon larselli*	Mount Rainier Section	17	occ	13	occ	13	occ	100
Larch Mountain Salamander	*Plethodon larselli*	West Cascades Ecoregion	67	occ	52	occ	50	occ	104
Oregon Slender Salamander	*Batrachoseps wrightorum*	Columbian Cascades Section	22	occ	18	occ	21	occ	86
Oregon Slender Salamander	*Batrachoseps wrightorum*	Middle Oregon Cascades Section	32	occ	30	occ	29	occ	103
Oregon Slender Salamander	*Batrachoseps wrightorum*	West Cascades Ecoregion	54	occ	48	occ	50	occ	96

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Oregon Spotted Frog	*Rana pretiosa*	Columbian Cascades Section	2 occ	2 occ	1 occ	200
Oregon Spotted Frog	*Rana pretiosa*	Middle Oregon Cascades Section	7 occ	7 occ	5 occ	140
Oregon Spotted Frog	*Rana pretiosa*	Umpqua Cascades Section	1 occ	1 occ	1 occ	100
Oregon Spotted Frog	*Rana pretiosa*	West Cascades Ecoregion	10 occ	10 occ	7 occ	143
Red-legged Frog	*Rana aurora*	Columbian Cascades Section	28 occ	19 occ	3 occ	633
Red-legged Frog	*Rana aurora*	Middle Oregon Cascades Section	64 occ	25 occ	5 occ	500
Red-legged Frog	*Rana aurora*	Umpqua Cascades Section	64 occ	31 occ	5 occ	620
Red-legged Frog	*Rana aurora*	West Cascades Ecoregion	156 occ	75 occ	13 occ	577
Southern Torrent Salamander	*Rhyacotriton variegatus*	Middle Oregon Cascades Section	8 occ	7 occ	13 occ	54
Southern Torrent Salamander	*Rhyacotriton variegatus*	Umpqua Cascades Section	1 occ	1 occ	13 occ	8
Southern Torrent Salamander	*Rhyacotriton variegatus*	West Cascades Ecoregion	9 occ	8 occ	13 occ	62
Van Dyke's Salamander	*Plethodon vandykei*	Columbian Cascades Section	7 occ	7 occ	12 occ	58
Van Dyke's Salamander	*Plethodon vandykei*	Mount Rainier Section	7 occ	6 occ	13 occ	46
Van Dyke's Salamander	*Plethodon vandykei*	West Cascades Ecoregion	14 occ	13 occ	25 occ	52
Western Toad	*Bufo boreas*	Columbian Cascades Section	10 occ	6 occ	4 occ	150
Western Toad	*Bufo boreas*	Middle Oregon Cascades Section	16 occ	13 occ	6 occ	217
Western Toad	*Bufo boreas*	Mount Rainier Section	9 occ	7 occ	3 occ	233
Western Toad	*Bufo boreas*	West Cascades Ecoregion	35 occ	26 occ	13 occ	200
<u>Birds</u>						
Bald Eagle nests	*Haliaeetus leucocephalus*	Columbian Cascades Section	25 occ	11 occ	12 occ	92
Bald Eagle nests	*Haliaeetus leucocephalus*	Middle Oregon Cascades Section	27 occ	13 occ	11 occ	118
Bald Eagle nests	*Haliaeetus leucocephalus*	Mount Rainier Section	18 occ	8 occ	9 occ	89
Bald Eagle nests	*Haliaeetus leucocephalus*	Umpqua Cascades Section	9 occ	5 occ	5 occ	100
Bald Eagle nests	*Haliaeetus leucocephalus*	West Cascades Ecoregion	79 occ	37 occ	37 occ	100
Bald Eagle winter roost area	*Haliaeetus leucocephalus*	Columbian Cascades Section	681 ha	534 ha	204 ha	262
Bald Eagle winter roost area	*Haliaeetus leucocephalus*	Middle Oregon Cascades Section	1 ha	1 ha	1 ha	100
Bald Eagle winter roost area	*Haliaeetus leucocephalus*	West Cascades Ecoregion	682 ha	535 ha	204 ha	262
Band-Tailed Pigeon	*Columba fasciata*	Columbian Cascades Section	4 occ	3 occ	4 occ	75
Band-Tailed Pigeon	*Columba fasciata*	Middle Oregon Cascades Section	6 occ	6 occ	6 occ	100
Band-Tailed Pigeon	*Columba fasciata*	Mount Rainier Section	1 occ	1 occ	1 occ	100
Band-Tailed Pigeon	*Columba fasciata*	Umpqua Cascades Section	2 occ	2 occ	2 occ	100
Band-Tailed Pigeon	*Columba fasciata*	West Cascades Ecoregion	13 occ	12 occ	13 occ	92
Black Swift	*Cypseloides niger*	Middle Oregon Cascades Section	3 occ	3 occ	6 occ	50
Black Swift	*Cypseloides niger*	Umpqua Cascades Section	4 occ	2 occ	7 occ	29
Black Swift	*Cypseloides niger*	West Cascades Ecoregion	7 occ	5 occ	13 occ	38
Bufflehead	*Bucephala albeola*	Middle Oregon Cascades Section	1 occ	1 occ	3 occ	33

West Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Bufflehead	*Bucephala albeola*	Umpqua Cascades Section	1	occ	1	occ	4	occ	25
Bufflehead	*Bucephala albeola*	West Cascades Ecoregion	2	occ	2	occ	7	occ	29
Common Loon	*Gavia immer*	Columbian Cascades Section	1,036	ha	1,036	ha	311	ha	333
Common Loon	*Gavia immer*	Mount Rainier Section	296	ha	102	ha	89	ha	115
Common Loon	*Gavia immer*	Umpqua Cascades Section	1	ha	1	ha			
Common Loon	*Gavia immer*	West Cascades Ecoregion	1,332	ha	1,138	ha	400	ha	285
Golden Eagle	*Aquila chrysaetos*	Middle Oregon Cascades Section	1	occ	1	occ	1	occ	100
Golden Eagle	*Aquila chrysaetos*	Mount Rainier Section	7	occ	5	occ	6	occ	83
Golden Eagle	*Aquila chrysaetos*	West Cascades Ecoregion	8	occ	6	occ	7	occ	86
Great Blue Heron	*Ardea herodias*	Columbian Cascades Section	5	occ	4	occ	7	occ	57
Great Blue Heron	*Ardea herodias*	Mount Rainier Section	4	occ	4	occ	6	occ	67
Great Blue Heron	*Ardea herodias*	West Cascades Ecoregion	9	occ	8	occ	13	occ	62
Great Gray Owl	*Strix nebulosa*	Middle Oregon Cascades Section	7	occ	6	occ	8	occ	75
Great Gray Owl	*Strix nebulosa*	Umpqua Cascades Section	18	occ	17	occ	17	occ	100
Great Gray Owl	*Strix nebulosa*	West Cascades Ecoregion	25	occ	23	occ	25	occ	92
Harlequin Duck foraging habitat	*Histrionicus histrionicus*	Columbian Cascades Section	63	ha	25	ha	19	ha	132
Harlequin Duck foraging habitat	*Histrionicus histrionicus*	Middle Oregon Cascades Section	100	ha	62	ha	30	ha	207
Harlequin Duck foraging habitat	*Histrionicus histrionicus*	Umpqua Cascades Section	38	ha	38	ha	11	ha	345
Harlequin Duck foraging habitat	*Histrionicus histrionicus*	West Cascades Ecoregion	200	ha	124	ha	60	ha	207
Marbled Murrelet	*Brachyramphus marmoratus*	Mount Rainier Section	32	occ	19	occ	23	occ	83
Marbled Murrelet	*Brachyramphus marmoratus*	West Cascades Ecoregion	32	occ	19	occ	23	occ	83
Northern Goshawk	*Accipiter gentilis*	Columbian Cascades Section	34	occ	21	occ	19	occ	111
Northern Goshawk	*Accipiter gentilis*	Middle Oregon Cascades Section	4	occ	2	occ	3	occ	67
Northern Goshawk	*Accipiter gentilis*	Mount Rainier Section	25	occ	15	occ	13	occ	115
Northern Goshawk	*Accipiter gentilis*	Umpqua Cascades Section	5	occ	3	occ	3	occ	100
Northern Goshawk	*Accipiter gentilis*	West Cascades Ecoregion	68	occ	41	occ	38	occ	108
Northern Spotted Owl	*Strix occidentalis caurina*	Columbian Cascades Section	186	occ	116	occ	93	occ	125
Northern Spotted Owl	*Strix occidentalis caurina*	Middle Oregon Cascades Section	889	occ	456	occ	444	occ	103
Northern Spotted Owl	*Strix occidentalis caurina*	Mount Rainier Section	60	occ	37	occ	30	occ	123
Northern Spotted Owl	*Strix occidentalis caurina*	Umpqua Cascades Section	630	occ	330	occ	315	occ	105
Northern Spotted Owl	*Strix occidentalis caurina*	West Cascades Ecoregion	1,765	occ	938	occ	882	occ	106
Peregrine Falcon	*Falco peregrinus*	Columbian Cascades Section	8	occ	6	occ	2	occ	300
Peregrine Falcon	*Falco peregrinus*	Middle Oregon Cascades Section	29	occ	19	occ	5	occ	380
Peregrine Falcon	*Falco peregrinus*	Mount Rainier Section	3	occ	1	occ	2	occ	50
Peregrine Falcon	*Falco peregrinus*	Umpqua Cascades Section	19	occ	11	occ	4	occ	275
Peregrine Falcon	*Falco peregrinus*	West Cascades Ecoregion	59	occ	37	occ	13	occ	285

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Pileated Woodpecker	*Dryocopus pileatus*	Columbian Cascades Section	1 occ	1 occ	2 occ	50
Pileated Woodpecker	*Dryocopus pileatus*	Middle Oregon Cascades Section	5 occ	5 occ	11 occ	45
Pileated Woodpecker	*Dryocopus pileatus*	West Cascades Ecoregion	6 occ	6 occ	13 occ	46
Sandhill Crane	*Grus canadensis*	Columbian Cascades Section	4 occ	3 occ	3 occ	100
Sandhill Crane	*Grus canadensis*	Middle Oregon Cascades Section	2 occ	1 occ	1 occ	100
Sandhill Crane	*Grus canadensis*	Umpqua Cascades Section	5 occ	3 occ	3 occ	100
Sandhill Crane	*Grus canadensis*	West Cascades Ecoregion	11 occ	7 occ	7 occ	100
<u>Insects</u>						
Beller's Ground Beetle	*Agonum belleri*	Columbian Cascades Section	1 occ	1 occ	25 occ	4
Beller's Ground Beetle	*Agonum belleri*	West Cascades Ecoregion	1 occ	1 occ	25 occ	4
Hatch's Scaphinotus	*Scaphinotus hatchi*	Middle Oregon Cascades Section	4 occ	2 occ	25 occ	8
Hatch's Scaphinotus	*Scaphinotus hatchi*	West Cascades Ecoregion	4 occ	2 occ	25 occ	8
Mt Hood Primitive Brachycentrid Caddisfly	*Eobrachycentrus gelidae*	Columbian Cascades Section	2 occ	2 occ	13 occ	15
Mt Hood Primitive Brachycentrid Caddisfly	*Eobrachycentrus gelidae*	Middle Oregon Cascades Section	1 occ	1 occ	6 occ	17
Mt Hood Primitive Brachycentrid Caddisfly	*Eobrachycentrus gelidae*	Umpqua Cascades Section	1 occ	1 occ	6 occ	17
Mt Hood Primitive Brachycentrid Caddisfly	*Eobrachycentrus gelidae*	West Cascades Ecoregion	4 occ	4 occ	25 occ	16
Taylor's Checkerspot, Whulge Checkerspot (USFWS name)	*Euphydryas editha taylori*	Mount Rainier Section	4 occ	4 occ	7 occ	57
Taylor's Checkerspot, Whulge Checkerspot (USFWS name)	*Euphydryas editha taylori*	West Cascades Ecoregion	4 occ	4 occ	7 occ	57
<u>Mammals</u>						
American Marten	*Martes americana*	Middle Oregon Cascades Section	3 occ	2 occ	2 occ	100
American Marten	*Martes americana*	Umpqua Cascades Section	25 occ	14 occ	11 occ	127
American Marten	*Martes americana*	West Cascades Ecoregion	28 occ	16 occ	7 occ	229
Bat Roost/Hibernacula		Columbian Cascades Section	1 occ	1 occ	13 occ	8
Bat Roost/Hibernacula		West Cascades Ecoregion	1 occ	1 occ	13 occ	8
Fisher	*Martes pennanti*	Columbian Cascades Section	1 occ	1 occ	1 occ	100
Fisher	*Martes pennanti*	Umpqua Cascades Section	12 occ	11 occ	12 occ	92
Fisher	*Martes pennanti*	West Cascades Ecoregion	13 occ	12 occ	13 occ	92
Fringed Myotis	*Myotis thysanodes*	Columbian Cascades Section	2 occ	2 occ	1 occ	200
Fringed Myotis	*Myotis thysanodes*	Middle Oregon Cascades Section	16 occ	4 occ	4 occ	100
Fringed Myotis	*Myotis thysanodes*	Umpqua Cascades Section	9 occ	3 occ	2 occ	150
Fringed Myotis	*Myotis thysanodes*	West Cascades Ecoregion	27 occ	9 occ	7 occ	129
Long-Legged Myotis	*Myotis volans*	Middle Oregon Cascades Section	1 occ	0 occ	1 occ	0
Long-Legged Myotis	*Myotis volans*	Umpqua Cascades Section	18 occ	13 occ	12 occ	108
Long-Legged Myotis	*Myotis volans*	West Cascades Ecoregion	19 occ	13 occ	13 occ	100
Mountain Goat	*Oreamos americana*	Mount Rainier Section	2,465 ha	2,465 ha	843 ha	292
Mountain Goat	*Oreamos americana*	West Cascades Ecoregion	2,465 ha	2,465 ha	843 ha	292

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Oregon Red Tree Vole	*Arborimus longicaudus*	Columbian Cascades Section	4	occ	3	occ	2	occ	150
Oregon Red Tree Vole	*Arborimus longicaudus*	Middle Oregon Cascades Section	145	occ	69	occ	13	occ	531
Oregon Red Tree Vole	*Arborimus longicaudus*	Umpqua Cascades Section	95	occ	48	occ	10	occ	480
Oregon Red Tree Vole	*Arborimus longicaudus*	West Cascades Ecoregion	244	occ	119	occ	25	occ	476
Ringtail	*Bassariscus astutus*	Middle Oregon Cascades Section	2	occ	2	occ	1	occ	200
Ringtail	*Bassariscus astutus*	Umpqua Cascades Section	26	occ	14	occ	6	occ	233
Ringtail	*Bassariscus astutus*	West Cascades Ecoregion	28	occ	16	occ	7	occ	229
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Columbian Cascades Section	6	occ	5	occ	2	occ	250
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Middle Oregon Cascades Section	24	occ	8	occ	7	occ	114
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Umpqua Cascades Section	18	occ	12	occ	4	occ	300
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	West Cascades Ecoregion	48	occ	25	occ	13	occ	192
Western Gray Squirrel	*Sciurus griseus*	Columbian Cascades Section	50	ha	41	ha	15	ha	273
Western Gray Squirrel	*Sciurus griseus*	West Cascades Ecoregion	50	ha	41	ha	15	ha	273
Mollusks									
Columbia Oregonian	*Cryptomastix hendersoni*	Columbian Cascades Section	3	occ	3	occ	25	occ	12
Columbia Oregonian	*Cryptomastix hendersoni*	West Cascades Ecoregion	3	occ	3	occ	25	occ	12
Crater Lake Tightcoil	*Pristiloma arcticum crateris*	Umpqua Cascades Section	3	occ	1	occ	13	occ	8
Crater Lake Tightcoil	*Pristiloma arcticum crateris*	West Cascades Ecoregion	3	occ	1	occ	13	occ	8
Malone Jumping-slug	*Hemphillia malonei*	Columbian Cascades Section	136	occ	77	occ	23	occ	335
Malone Jumping-slug	*Hemphillia malonei*	Mount Rainier Section	2	occ	0	occ	2	occ	0
Malone Jumping-slug	*Hemphillia malonei*	West Cascades Ecoregion	138	occ	77	occ	25	occ	308
Oregon Megomphix	*Megomphix hemphilli*	Columbian Cascades Section	25	occ	13	occ	3	occ	433
Oregon Megomphix	*Megomphix hemphilli*	Middle Oregon Cascades Section	124	occ	37	occ	16	occ	231
Oregon Megomphix	*Megomphix hemphilli*	Umpqua Cascades Section	42	occ	16	occ	6	occ	267
Oregon Megomphix	*Megomphix hemphilli*	West Cascades Ecoregion	191	occ	66	occ	25	occ	264
Pacific Sideband	*Monadenia fidelis celeuthia*	Umpqua Cascades Section	2	occ	2	occ	7	occ	29
Pacific Sideband	*Monadenia fidelis celeuthia*	West Cascades Ecoregion	2	occ	2	occ	7	occ	29
Non-Vascular Plants									
Brachydontium olympicum	*Brachydontium olympicum*	Columbian Cascades Section	1	occ	1	occ	13	occ	8
Brachydontium olympicum	*Brachydontium olympicum*	West Cascades Ecoregion	1	occ	1	occ	13	occ	8
Bruchia bolanderi	*Bruchia bolanderi*	Columbian Cascades Section	1	occ	1	occ	3	occ	33
Bruchia bolanderi	*Bruchia bolanderi*	Middle Oregon Cascades Section	1	occ	1	occ	4	occ	25
Bruchia bolanderi	*Bruchia bolanderi*	Umpqua Cascades Section	2	occ	2	occ	6	occ	33
Bruchia bolanderi	*Bruchia bolanderi*	West Cascades Ecoregion	4	occ	4	occ	13	occ	31
Chiloscyphus gemmiparus	*Chiloscyphus gemmiparus*	Middle Oregon Cascades Section	1	occ	1	occ	13	occ	8
Chiloscyphus gemmiparus	*Chiloscyphus gemmiparus*	West Cascades Ecoregion	1	occ	1	occ	13	occ	8

West Cascades Targets and Goals Summary

Habitat Type Level of Biological Organization Taxon Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Giant Polypore Fungus	*Oxyporus nobilissimus*	Columbian Cascades Section	2 occ	2 occ	2 occ	100
Giant Polypore Fungus	*Oxyporus nobilissimus*	Middle Oregon Cascades Section	14 occ	11 occ	23 occ	48
Lecanora pringlei	*Lecanora pringlei*	Columbian Cascades Section	2 occ	2 occ	50 occ	4
Lecanora pringlei	*Lecanora pringlei*	West Cascades Ecoregion	2 occ	2 occ	50 occ	4
liverwort Scapania gymnostomophila	*Scapania gymnostomophila*	Columbian Cascades Section	1 occ	1 occ	7 occ	14
liverwort Scapania gymnostomophila	*Scapania gymnostomophila*	West Cascades Ecoregion	1 occ	1 occ	7 occ	14
Lobaria linita	*Lobaria linita*	Middle Oregon Cascades Section	2 occ	2 occ	3 occ	67
Lobaria linita	*Lobaria linita*	Mount Rainier Section	3 occ	3 occ	4 occ	75
Lobaria linita	*Lobaria linita*	West Cascades Ecoregion	5 occ	5 occ	7 occ	71
Marsupella emarginata var. aquatica	*Marsupella emarginata var. aquatica*	Middle Oregon Cascades Section	3 occ	3 occ	25 occ	12
Marsupella emarginata var. aquatica	*Marsupella emarginata var. aquatica*	West Cascades Ecoregion	3 occ	3 occ	25 occ	12
Nephroma occultum	*Nephroma occultum*	Columbian Cascades Section	1 occ	1 occ	2 occ	50
Nephroma occultum	*Nephroma occultum*	Middle Oregon Cascades Section	6 occ	5 occ	23 occ	22
Nephroma occultum	*Nephroma occultum*	West Cascades Ecoregion	7 occ	6 occ	25 occ	24
Pilophorus nigricaulis	*Pilophorus nigricaulis*	Mount Rainier Section	2 occ	2 occ	7 occ	29
Pilophorus nigricaulis	*Pilophorus nigricaulis*	West Cascades Ecoregion	2 occ	2 occ	7 occ	29
Pseudocyphellaria rainierensis	*Pseudocyphellaria rainierensis*	Columbian Cascades Section	2 occ	1 occ	17 occ	6
Pseudocyphellaria rainierensis	*Pseudocyphellaria rainierensis*	Mount Rainier Section	1 occ	1 occ	8 occ	13
Pseudocyphellaria rainierensis	*Pseudocyphellaria rainierensis*	West Cascades Ecoregion	3 occ	2 occ	25 occ	8
Scapania obscura	*Scapania obscura*	Middle Oregon Cascades Section	1 occ	1 occ	7 occ	14
Scapania obscura	*Scapania obscura*	West Cascades Ecoregion	1 occ	1 occ	7 occ	14
Schofieldia monticola	*Schofieldia monticola*	Middle Oregon Cascades Section	2 occ	2 occ	13 occ	15
Schofieldia monticola	*Schofieldia monticola*	West Cascades Ecoregion	2 occ	2 occ	13 occ	15
Stereocaulon spathuliferum	*Stereocaulon spathuliferum*	Middle Oregon Cascades Section	1 occ	1 occ	13 occ	8
Stereocaulon spathuliferum	*Stereocaulon spathuliferum*	West Cascades Ecoregion	1 occ	1 occ	13 occ	8
Tholurna dissimilis	*Tholurna dissimilis*	Columbian Cascades Section	2 occ	2 occ	5 occ	40
Tholurna dissimilis	*Tholurna dissimilis*	Mount Rainier Section	1 occ	1 occ	2 occ	50
Tholurna dissimilis	*Tholurna dissimilis*	West Cascades Ecoregion	3 occ	3 occ	7 occ	43
Trematodon boasii	*Trematodon boasii*	Middle Oregon Cascades Section	1 occ	1 occ	13 occ	8
Trematodon boasii	*Trematodon boasii*	West Cascades Ecoregion	1 occ	1 occ	13 occ	8
Umbilicaria lambii	*Umbilicaria lambii*	Mount Rainier Section	1 occ	1 occ	13 occ	8
Umbilicaria lambii	*Umbilicaria lambii*	West Cascades Ecoregion	1 occ	1 occ	13 occ	8
<u>Reptiles</u>						
California Mountain Kingsnake	*Lampropeltis zonata*	Umpqua Cascades Section	4 occ	3 occ	7 occ	43
California Mountain Kingsnake	*Lampropeltis zonata*	West Cascades Ecoregion	4 occ	3 occ	7 occ	43
Sharptail Snake	*Contia tenuis*	Middle Oregon Cascades Section	1 occ	1 occ	3 occ	33

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Sharptail Snake	*Contia tenuis*	Umpqua Cascades Section	2 occ	2 occ	4 occ	50
Sharptail Snake	*Contia tenuis*	West Cascades Ecoregion	3 occ	3 occ	7 occ	43
Western Pond Turtle	*Emys marmorata*	Middle Oregon Cascades Section	56 occ	17 occ	7 occ	243
Western Pond Turtle	*Emys marmorata*	Umpqua Cascades Section	39 occ	19 occ	3 occ	633
Western Pond Turtle	*Emys marmorata*	West Cascades Ecoregion	95 occ	36 occ	13 occ	277
<u>Vascular Plants</u>						
Adder's Tongue	*Ophioglossum pusillum*	Columbian Cascades Section	1 occ	1 occ	2 occ	50
Adder's Tongue	*Ophioglossum pusillum*	Middle Oregon Cascades Section	6 occ	6 occ	9 occ	67
Adder's Tongue	*Ophioglossum pusillum*	Umpqua Cascades Section	1 occ	0 occ	2 occ	0
Adder's Tongue	*Ophioglossum pusillum*	West Cascades Ecoregion	8 occ	7 occ	13 occ	54
Alaska Large Awn Sedge	*Carex macrochaeta*	Columbian Cascades Section	3 occ	3 occ	7 occ	43
Alaska Large Awn Sedge	*Carex macrochaeta*	West Cascades Ecoregion	3 occ	3 occ	7 occ	43
Alpine Gentian	*Gentiana newberryi*	Middle Oregon Cascades Section	1 occ	1 occ	25 occ	4
Alpine Gentian	*Gentiana newberryi*	West Cascades Ecoregion	1 occ	1 occ	25 occ	4
Barrett's Beardtongue	*Penstemon barrettiae*	Columbian Cascades Section	2 occ	2 occ	25 occ	8
Barrett's Beardtongue	*Penstemon barrettiae*	West Cascades Ecoregion	2 occ	2 occ	25 occ	8
Bellinger's meadowfoam	*Limnanthes floccosa ssp. bellingeriana*	Umpqua Cascades Section	9 occ	9 occ	25 occ	36
Bellinger's meadowfoam	*Limnanthes floccosa ssp. bellingeriana*	West Cascades Ecoregion	9 occ	9 occ	25 occ	36
Brewer Reedgrass	*Calamagrostis breweri*	Columbian Cascades Section	1 occ	1 occ	12 occ	8
Brewer Reedgrass	*Calamagrostis breweri*	Middle Oregon Cascades Section	1 occ	1 occ	13 occ	8
Brewer Reedgrass	*Calamagrostis breweri*	West Cascades Ecoregion	2 occ	2 occ	25 occ	8
Bristly-stemmed Sidalcea	*Sidalcea hirtipes*	Columbian Cascades Section	2 occ	2 occ	17 occ	12
Bristly-stemmed Sidalcea	*Sidalcea hirtipes*	Mount Rainier Section	1 occ	1 occ	8 occ	13
Bristly-stemmed Sidalcea	*Sidalcea hirtipes*	West Cascades Ecoregion	3 occ	3 occ	25 occ	12
Broad-fruit Mariposa	*Calochortus nitidus*	Umpqua Cascades Section	1 occ	0 occ	25 occ	0
Broad-fruit Mariposa	*Calochortus nitidus*	West Cascades Ecoregion	1 occ	0 occ	25 occ	0
California Globe-mallow	*Iliamna latibracteata*	Middle Oregon Cascades Section	1 occ	1 occ	2 occ	50
California Globe-mallow	*Iliamna latibracteata*	Umpqua Cascades Section	15 occ	14 occ	23 occ	61
California Globe-mallow	*Iliamna latibracteata*	West Cascades Ecoregion	16 occ	14 occ	25 occ	56
Cascade Fleabane	*Erigeron cascadensis*	Middle Oregon Cascades Section	12 occ	11 occ	33 occ	33
Cascade Fleabane	*Erigeron cascadensis*	Umpqua Cascades Section	6 occ	5 occ	17 occ	29
Cascade Fleabane	*Erigeron cascadensis*	West Cascades Ecoregion	18 occ	16 occ	50 occ	32
Cliff Douglasia	*Douglasia laevigata*	Columbian Cascades Section	1 occ	1 occ	8 occ	13
Cliff Douglasia	*Douglasia laevigata*	Middle Oregon Cascades Section	3 occ	3 occ	17 occ	18
Cliff Douglasia	*Douglasia laevigata*	West Cascades Ecoregion	4 occ	4 occ	25 occ	16
Cliff Indian-paintbrush	*Castilleja rupicola*	Columbian Cascades Section	1 occ	1 occ	25 occ	4

West Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Cliff Indian-paintbrush	*Castilleja rupicola*	Middle Oregon Cascades Section	1	occ	1	occ	25	occ	4
Cliff Indian-paintbrush	*Castilleja rupicola*	West Cascades Ecoregion	2	occ	2	occ	50	occ	4
Cold-water Corydalis	*Corydalis caseana ssp. aquae-gelidae*	Columbian Cascades Section	69	occ	46	occ	47	occ	98
Cold-water Corydalis	*Corydalis caseana ssp. aquae-gelidae*	Middle Oregon Cascades Section	4	occ	3	occ	3	occ	100
Cold-water Corydalis	*Corydalis caseana ssp. aquae-gelidae*	West Cascades Ecoregion	73	occ	49	occ	50	occ	98
Coyote Thistle	*Eryngium petiolatum*	Columbian Cascades Section	1	occ	0	occ	25	occ	0
Coyote Thistle	*Eryngium petiolatum*	West Cascades Ecoregion	1	occ	0	occ	25	occ	0
Cusick's Mallow	*Sidalcea cusickii*	Middle Oregon Cascades Section	16	occ	15	occ	21	occ	71
Cusick's Mallow	*Sidalcea cusickii*	Umpqua Cascades Section	3	occ	3	occ	4	occ	75
Cusick's Mallow	*Sidalcea cusickii*	West Cascades Ecoregion	19	occ	18	occ	25	occ	72
Deer-cabbage	*Fauria crista-galli*	Middle Oregon Cascades Section	1	occ	1	occ	13	occ	8
Deer-cabbage	*Fauria crista-galli*	West Cascades Ecoregion	1	occ	1	occ	13	occ	8
Diffuse Stickseed	*Hackelia diffusa var. diffusa*	Columbian Cascades Section	2	occ	2	occ	13	occ	15
Diffuse Stickseed	*Hackelia diffusa var. diffusa*	West Cascades Ecoregion	2	occ	2	occ	13	occ	15
Fringed Grass-of-parnassus	*Parnassia fimbriata var. hoodiana*	Columbian Cascades Section	2	occ	2	occ	38	occ	5
Fringed Grass-of-parnassus	*Parnassia fimbriata var. hoodiana*	West Cascades Ecoregion	2	occ	2	occ	50	occ	4
Golden Alpine Draba	*Draba aureola*	Middle Oregon Cascades Section	4	occ	4	occ	50	occ	8
Golden Alpine Draba	*Draba aureola*	West Cascades Ecoregion	4	occ	4	occ	50	occ	8
Goldthread	*Coptis trifolia*	Columbian Cascades Section	2	occ	2	occ	17	occ	12
Goldthread	*Coptis trifolia*	West Cascades Ecoregion	2	occ	2	occ	25	occ	8
Greene's Hawkweed	*Hieracium greenei*	Middle Oregon Cascades Section	1	occ	1	occ	7	occ	14
Greene's Hawkweed	*Hieracium greenei*	Umpqua Cascades Section	6	occ	5	occ	18	occ	28
Greene's Hawkweed	*Hieracium greenei*	West Cascades Ecoregion	7	occ	6	occ	25	occ	24
Hells Canyon Rock Cress	*Arabis hastatula*	Middle Oregon Cascades Section	5	occ	5	occ	25	occ	20
Hells Canyon Rock Cress	*Arabis hastatula*	West Cascades Ecoregion	5	occ	5	occ	25	occ	20
Howell's Bentgrass	*Agrostis howellii*	Columbian Cascades Section	6	occ	6	occ	21	occ	29
Howell's Bentgrass	*Agrostis howellii*	Middle Oregon Cascades Section	1	occ	1	occ	4	occ	25
Howell's Bentgrass	*Agrostis howellii*	West Cascades Ecoregion	7	occ	7	occ	25	occ	28
Howell's Fleabane	*Erigeron howellii*	Columbian Cascades Section	17	occ	17	occ	50	occ	34
Howell's Fleabane	*Erigeron howellii*	West Cascades Ecoregion	17	occ	17	occ	50	occ	34
Indian Rice	*Fritillaria camschatcensis*	Columbian Cascades Section	1	occ	1	occ	13	occ	8
Indian Rice	*Fritillaria camschatcensis*	West Cascades Ecoregion	1	occ	1	occ	13	occ	8
Klamath Gooseberry	*Ribes inerme var. klamathense*	Umpqua Cascades Section	5	occ	4	occ	25	occ	16
Klamath Gooseberry	*Ribes inerme var. klamathense*	West Cascades Ecoregion	5	occ	4	occ	25	occ	16
Long-bearded Hawkweed	*Hieracium longiberbe*	Columbian Cascades Section	13	occ	13	occ	25	occ	52

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Long-bearded Hawkweed	*Hieracium longiberbe*	West Cascades Ecoregion	13 occ	13 occ	25 occ	52
Loose-flowered Bluegrass	*Poa laxiflora*	Columbian Cascades Section	5 occ	4 occ	2 occ	200
Loose-flowered Bluegrass	*Poa laxiflora*	Middle Oregon Cascades Section	1 occ	1 occ	11 occ	9
Loose-flowered Bluegrass	*Poa laxiflora*	West Cascades Ecoregion	6 occ	4 occ	13 occ	31
Merriam Alumroot	*Heuchera merriamii*	Middle Oregon Cascades Section	1 occ	1 occ	25 occ	4
Merriam Alumroot	*Heuchera merriamii*	West Cascades Ecoregion	1 occ	1 occ	25 occ	4
Mount Rainier Lousewort	*Pedicularis rainierensis*	Mount Rainier Section	25 occ	24 occ	25 occ	96
Mount Rainier Lousewort	*Pedicularis rainierensis*	West Cascades Ecoregion	25 occ	24 occ	25 occ	96
Mountain Moonwort	*Botrychium montanum*	Columbian Cascades Section	1 occ	1 occ	3 occ	33
Mountain Moonwort	*Botrychium montanum*	Middle Oregon Cascades Section	3 occ	3 occ	10 occ	30
Mountain Moonwort	*Botrychium montanum*	West Cascades Ecoregion	4 occ	4 occ	13 occ	31
Mt. Mazama Collomia	*Collomia mazama*	Umpqua Cascades Section	64 occ	32 occ	25 occ	128
Mt. Mazama Collomia	*Collomia mazama*	West Cascades Ecoregion	64 occ	31 occ	25 occ	124
Mt. Shasta Arnica	*Arnica viscosa*	Umpqua Cascades Section	2 occ	2 occ	25 occ	8
Mt. Shasta Arnica	*Arnica viscosa*	West Cascades Ecoregion	2 occ	2 occ	25 occ	8
North Umpqua Kalmiopsis	*Kalmiopsis fragrans*	Umpqua Cascades Section	7 occ	6 occ	50 occ	12
North Umpqua Kalmiopsis	*Kalmiopsis fragrans*	West Cascades Ecoregion	7 occ	6 occ	50 occ	12
Northern Bladderwort	*Utricularia ochroleuca*	Columbian Cascades Section	2 occ	2 occ	13 occ	15
Northern Bladderwort	*Utricularia ochroleuca*	West Cascades Ecoregion	2 occ	2 occ	13 occ	15
Northern Cinquefoil	*Potentilla villosa*	Middle Oregon Cascades Section	1 occ	1 occ	13 occ	8
Northern Cinquefoil	*Potentilla villosa*	West Cascades Ecoregion	1 occ	1 occ	13 occ	8
Northern Spleenwort	*Asplenium septentrionale*	Umpqua Cascades Section	6 occ	6 occ	13 occ	46
Northern Spleenwort	*Asplenium septentrionale*	West Cascades Ecoregion	6 occ	6 occ	13 occ	46
Obscure Indian-paintbrush	*Castilleja cryptantha*	Mount Rainier Section	20 occ	20 occ	25 occ	80
Obscure Indian-paintbrush	*Castilleja cryptantha*	West Cascades Ecoregion	20 occ	20 occ	25 occ	80
Oregon Bolandra	*Bolandra oregana*	Columbian Cascades Section	17 occ	15 occ	13 occ	115
Oregon Bolandra	*Bolandra oregana*	West Cascades Ecoregion	17 occ	15 occ	13 occ	115
Oregon Fleabane	*Erigeron oreganus*	Columbian Cascades Section	10 occ	10 occ	25 occ	40
Oregon Fleabane	*Erigeron oreganus*	West Cascades Ecoregion	10 occ	10 occ	25 occ	40
Oregon Sullivantia	*Sullivantia oregana*	Columbian Cascades Section	12 occ	12 occ	38 occ	32
Oregon Sullivantia	*Sullivantia oregana*	West Cascades Ecoregion	12 occ	12 occ	38 occ	32
Pale Blue-eyed Grass	*Sisyrinchium sarmentosum*	Columbian Cascades Section	9 occ	8 occ	13 occ	62
Pale Blue-eyed Grass	*Sisyrinchium sarmentosum*	West Cascades Ecoregion	9 occ	8 occ	25 occ	32
Rosy Lewisia	*Lewisia columbiana var. columbiana*	Columbian Cascades Section	4 occ	4 occ	18 occ	22
Rosy Lewisia	*Lewisia columbiana var. columbiana*	Middle Oregon Cascades Section	1 occ	1 occ	5 occ	20
Rosy Lewisia	*Lewisia columbiana var. columbiana*	Umpqua Cascades Section	6 occ	5 occ	27 occ	19

West Cascades Targets and Goals Summary

Habitat Type Level of Biological Organization Taxon Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Rosy Lewisia	*Lewisia columbiana var. columbiana*	West Cascades Ecoregion	11 occ	10 occ	50 occ	20
Sickle-pod Rockcress	*Arabis sparsiflora var. atrorubens*	Columbian Cascades Section	1 occ	1 occ	25 occ	4
Sickle-pod Rockcress	*Arabis sparsiflora var. atrorubens*	West Cascades Ecoregion	1 occ	1 occ	25 occ	4
Slender Nemacladus	*Nemacladus capillaris*	Umpqua Cascades Section	1 occ	1 occ	25 occ	4
Slender Nemacladus	*Nemacladus capillaris*	West Cascades Ecoregion	1 occ	1 occ	25 occ	4
Small Twisted-stalk	*Streptopus streptopoides*	Columbian Cascades Section	50 occ	38 occ	25 occ	152
Small Twisted-stalk	*Streptopus streptopoides*	West Cascades Ecoregion	50 occ	38 occ	25 occ	152
Spring Phacelia	*Phacelia verna*	Middle Oregon Cascades Section	3 occ	3 occ	3 occ	100
Spring Phacelia	*Phacelia verna*	Umpqua Cascades Section	26 occ	20 occ	22 occ	91
Spring Phacelia	*Phacelia verna*	West Cascades Ecoregion	29 occ	23 occ	25 occ	92
Strickland's Tauschia	*Tauschia stricklandii*	Columbian Cascades Section	2 occ	2 occ	25 occ	8
Strickland's Tauschia	*Tauschia stricklandii*	West Cascades Ecoregion	2 occ	2 occ	25 occ	8
Tall Bugbane	*Cimicifuga elata*	Columbian Cascades Section	25 occ	9 occ	6 occ	150
Tall Bugbane	*Cimicifuga elata*	Middle Oregon Cascades Section	67 occ	27 occ	15 occ	180
Tall Bugbane	*Cimicifuga elata*	Umpqua Cascades Section	21 occ	10 occ	4 occ	250
Tall Bugbane	*Cimicifuga elata*	West Cascades Ecoregion	113 occ	47 occ	25 occ	188
Thompson Mistmaiden	*Romanzoffia thompsonii*	Middle Oregon Cascades Section	37 occ	30 occ	25 occ	120
Thompson Mistmaiden	*Romanzoffia thompsonii*	Umpqua Cascades Section	23 occ	20 occ	25 occ	80
Thompson Mistmaiden	*Romanzoffia thompsonii*	West Cascades Ecoregion	60 occ	50 occ	50 occ	100
Umpqua Green Gentian	*Frasera umpquaensis*	Middle Oregon Cascades Section	3 occ	3 occ	2 occ	150
Umpqua Green Gentian	*Frasera umpquaensis*	Umpqua Cascades Section	29 occ	24 occ	23 occ	104
Umpqua Green Gentian	*Frasera umpquaensis*	West Cascades Ecoregion	32 occ	28 occ	25 occ	112
Umpqua Mariposa-lily	*Calochortus umpquaensis*	Umpqua Cascades Section	13 occ	12 occ	50 occ	24
Umpqua Mariposa-lily	*Calochortus umpquaensis*	West Cascades Ecoregion	13 occ	12 occ	50 occ	24
Weak Bluegrass	*Poa marcida*	Columbian Cascades Section	34 occ	32 occ	25 occ	128
Weak Bluegrass	*Poa marcida*	West Cascades Ecoregion	34 occ	32 occ	25 occ	128
Whitney's Haplopappus	*Hazardia whitneyi var. discoidea*	Umpqua Cascades Section	15 occ	13 occ	25 occ	52
Whitney's Haplopappus	*Hazardia whitneyi var. discoidea*	West Cascades Ecoregion	15 occ	13 occ	25 occ	52
Willamette Valley Larkspur	*Delphinium oreganum*	Columbian Cascades Section	2 occ	2 occ	3 occ	67
Willamette Valley Larkspur	*Delphinium oreganum*	Middle Oregon Cascades Section	4 occ	3 occ	4 occ	75
Willamette Valley Larkspur	*Delphinium oreganum*	West Cascades Ecoregion	6 occ	5 occ	7 occ	71
Yellow-star Mariposa Lily	*Calochortus monophyllus*	Umpqua Cascades Section	1 occ	1 occ	7 occ	14
Yellow-star Mariposa Lily	*Calochortus monophyllus*	West Cascades Ecoregion	1 occ	1 occ	7 occ	14

Freshwater

Species

Fishes

West Cascades Targets and Goals Summary

Habitat Type

Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Bull Trout - Coastal and Puget Sound	*Salvelinus confluentus pop. 3*	Puget Sound EDU	7,349	km	3,900	km			
Bull Trout - Coastal and Puget Sound habitat	*Salvelinus confluentus pop. 3*	Puget Sound EDU	9,862	score	5,148	scor	4931	score	104
Bull Trout - Hood River RU	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	56	km	49	km			
Bull Trout - Hood River RU habitat	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	74	score	65	scor	37	score	176
Bull Trout - Lower Columbia River RU	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	64	km	44	km			
Bull Trout - Lower Columbia River RU habitat	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	147	score	82	scor	74	score	111
Bull Trout - Willamette River RU	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	96	km	64	km			
Bull Trout - Willamette River RU	*Salvelinus confluentus pop. 2*	Willamette EDU	504	km	362	km			
Bull Trout - Willamette River RU habitat	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	126	score	86	scor	63	score	137
Bull Trout - Willamette River RU habitat	*Salvelinus confluentus pop. 2*	Willamette EDU	843	score	592	scor	420	score	141
Chinook - Lower Columbia River	*Oncorhynchus tshawytscha pop. 1*	Lower Columbia EDU	1,667	km	1,036	km			
Chinook - Lower Columbia River habitat	*Oncorhynchus tshawytscha pop. 1*	Lower Columbia EDU	2,994	score	1,959	scor	1496	score	131
Chinook - Middle Columbia River Spring Run	*Oncorhynchus tshawytscha pop. 19*	Lower Columbia EDU	299	km	180	km			
Chinook - Middle Columbia River Spring Run habitat	*Oncorhynchus tshawytscha pop. 19*	Lower Columbia EDU	827	score	523	scor	413	score	127
Chinook - Puget Sound	*Oncorhynchus tshawytscha pop. 15*	Puget Sound EDU	2,284	km	1,196	km			
Chinook - Puget Sound habitat	*Oncorhynchus tshawytscha pop. 15*	Puget Sound EDU	3,290	score	2,080	scor	1644	score	127
Chinook Salmon - Lower Columbia River Fall Run	*Oncorhynchus tshawytscha pop. 22*	Lower Columbia EDU	124	km	34	km			
Chinook Salmon - Lower Columbia River Fall Run habitat	*Oncorhynchus tshawytscha pop. 22*	Lower Columbia EDU	153	score	40	scor	76	score	53
Chinook Salmon - Lower Columbia River Spring Run	*Oncorhynchus tshawytscha pop. 21*	Lower Columbia EDU	1	km	1	km			
Chinook Salmon - Lower Columbia River Spring Run habitat	*Oncorhynchus tshawytscha pop. 21*	Lower Columbia EDU	2	score	2	scor	1	score	200
Chinook Salmon - Southern Oregon/Northern California Coast Fall Run	*Oncorhynchus tshawytscha pop. 26*	Rogue-Umpqua EDU	849	km	415	km			
Chinook Salmon - Southern Oregon/Northern California Coast Fall Run habitat	*Oncorhynchus tshawytscha pop. 26*	Rogue-Umpqua EDU	1,063	score	518	scor	530	score	98
Chinook Salmon - Upper Willamette River Spring Run	*Oncorhynchus tshawytscha pop. 23*	Willamette EDU	1,739	km	983	km			
Chinook Salmon - Upper Willamette River Spring Run habitat	*Oncorhynchus tshawytscha pop. 23*	Willamette EDU	1,939	score	1,163	scor	968	score	120
Chinook Salmon - Washington Coast habitat	*Onchorhynchus tshawytscha*	Puget Sound EDU	533	score	337	scor	266	score	127
Chum Salmon - Columbia River	*Oncorhynchus keta pop. 3*	Lower Columbia EDU	567	km	352	km			
Chum Salmon - Columbia River habitat	*Oncorhynchus keta pop. 3*	Lower Columbia EDU	2,479	score	1,564	scor	1240	score	126
Chum Salmon - Hood Canal summer run	*Onchorhynchus keta pop. 2*	Puget Sound EDU	284	km	163	km			
Chum Salmon - Hood Canal summer run habitat	*Onchorhynchus keta pop. 2*	Puget Sound EDU	1,414	score	817	scor	706	score	116
Chum Salmon - Pacific Coast	*Onchorhynchus keta pop. 5*	Puget Sound EDU	2,724	km	1,737	km			
Chum Salmon - Pacific Coast habitat	*Onchorhynchus keta pop. 5*	Puget Sound EDU	13,593	score	8,667	scor	6796	score	128
Chum Salmon - Puget Sound/Straight of Georgia	*Onchorhynchus keta pop.4*	Puget Sound EDU	136	km	75	km			
Chum Salmon - Puget Sound/Straight of Georgia habitat	*Onchorhynchus keta pop.4*	Puget Sound EDU	676	score	376	scor	338	score	111
Coastal Cutthroat Trout	*Oncorhynchus clarki clarki*	Rogue-Umpqua EDU	28	km	28	km			
Coastal Cutthroat Trout - Puget Sound	*Oncorhynchus clarki clarki pop. 7*	Puget Sound EDU	5,631	km	2,951	km			

West Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Coastal Cutthroat Trout - Puget Sound habitat	*Oncorhynchus clarki clarki pop. 7*	Puget Sound EDU	28,151	score	14,798	scor	14075	score	105
Coastal Cutthroat Trout habitat	*Oncorhynchus clarki clarki*	Rogue-Umpqua EDU	419	score	419	scor	210	score	200
Coho Salmon - Lower Columbia River/SW Washington Coast	*Oncorhynchus kisutch pop. 1*	Lower Columbia EDU	3,581	km	2,029	km			
Coho Salmon - Lower Columbia River/SW Washington Coast habitat	*Oncorhynchus kisutch pop. 1*	Lower Columbia EDU	7,650	score	4,307	scor	3824	score	113
Coho Salmon - Olympic Peninsula	*Onchorhynchus kisutch pop. 6*	Puget Sound EDU	280	km	154	km			
Coho Salmon - Olympic Peninsula habitat	*Onchorhynchus kisutch pop. 6*	Puget Sound EDU	1,395	score	767	scor	698	score	110
Coho Salmon - Oregon Coast	*Oncorhynchus kisutch pop. 3*	Rogue-Umpqua EDU	2,644	km	1,393	km			
Coho Salmon - Oregon Coast - Eonum Overflow Record	*Oncorhynchus kisutch pop. 3*	Rogue-Umpqua EDU	217	km	117	km			
Coho Salmon - Oregon Coast - Eonum Overflow Record habitat	*Oncorhynchus kisutch pop. 3*	Rogue-Umpqua EDU	223	score	130	scor	112	score	116
Coho Salmon - Oregon Coast habitat	*Oncorhynchus kisutch pop. 3*	Rogue-Umpqua EDU	3,307	score	1,740	scor	1654	score	105
Coho Salmon - Puget Sound/Straight of Georgia	*Onchorhynchus kisutch pop. 5*	Puget Sound EDU	7,171	km	4,143	km			
Coho Salmon - Puget Sound/Straight of Georgia habitat	*Onchorhynchus kisutch pop. 5*	Puget Sound EDU	34,869	score	20,149	scor	17434	score	116
Coho Salmon - Southern Oregon/Northern California Coast	*Oncorhynchus kisutch pop. 2*	Rogue-Umpqua EDU	1,558	km	839	km			
Coho Salmon - Southern Oregon/Northern California Coast habitat	*Oncorhynchus kisutch pop. 2*	Rogue-Umpqua EDU	1,683	score	898	scor	842	score	107
Cutthroat Trout - Southwestern Washington/Columbia River	*Oncorhynchus clarki clarki pop. 2*	Lower Columbia EDU	2,236	km	1,300	km			
Cutthroat Trout - Southwestern Washington/Columbia River habitat	*Oncorhynchus clarki clarki pop. 2*	Lower Columbia EDU	11,149	score	6,495	scor	5574	score	117
Green Sturgeon	*Acipenser medirostris*	Rogue-Umpqua EDU	56	km	50	km			
Green Sturgeon habitat	*Acipenser medirostris*	Rogue-Umpqua EDU	70	score	62	scor	21	score	295
Mountain sucker	*Catostomus platyrhynchus*	Lower Columbia EDU	1	occ	1	occ			
Olympic Mudminnow habitat	*Novumbra hubbsi*	Puget Sound EDU	22	ha	22	ha	11	ha	200
Oregon Chub habitat	*Oregonichthys crameri*	Willamette EDU	394	ha	369	ha	197	ha	187
Pacific Lamprey habitat	*Lampetra tridentata*	Lower Columbia EDU	46	ha	43	ha	14	ha	307
Pacific Lamprey habitat	*Lampetra tridentata*	Puget Sound EDU	50	ha	41	ha	15	ha	273
Pacific Lamprey habitat	*Lampetra tridentata*	Rogue-Umpqua EDU	1	ha	1	ha			
Pacific Lamprey habitat	*Lampetra tridentata*	Willamette EDU	4	ha	4	ha	1	ha	400
Pink Salmon - Even-year	*Onchorhynchus gorbuscha*	Puget Sound EDU	100	km	97	km			
Pink Salmon - Even-year habitat	*Onchorhynchus gorbuscha*	Puget Sound EDU	499	score	485	scor	250	score	194
Pink Salmon - Odd-year	*Onchorhynchus gorbuscha*	Lower Columbia EDU	170	km	158	km			
Pink Salmon - Odd-year	*Onchorhynchus gorbuscha*	Puget Sound EDU	2,002	km	1,094	km			
Pink Salmon - Odd-year habitat	*Onchorhynchus gorbuscha*	Lower Columbia EDU	846	score	788	scor	423	score	186
Pink Salmon - Odd-year habitat	*Onchorhynchus gorbuscha*	Puget Sound EDU	9,637	score	5,249	scor	4818	score	109
River Lamprey habitat	*Lampetra ayresi*	Puget Sound EDU	6	ha	6	ha	2	ha	300
Salish Sucker	*Catostomus Sp 4*	Puget Sound EDU	13	occ	13	occ	4	occ	325
Sand Roller	*Percopsis transmontana*	Lower Columbia EDU	1	occ	1	occ			

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Sockeye Salmon - Baker River	*Onchorhynchus nerka pop. 5*	Puget Sound EDU	62	km	31	km			
Sockeye Salmon - Baker River habitat	*Onchorhynchus nerka pop. 5*	Puget Sound EDU	310	score	155	scor	155	score	100
Steelhead - Klamath Mountains Province Summer Run	*Oncorhynchus mykiss pop. 24*	Rogue-Umpqua EDU	1,499	km	787	km			
Steelhead - Klamath Mountains Province Summer Run habitat	*Oncorhynchus mykiss pop. 24*	Rogue-Umpqua EDU	1,757	score	897	scor	878	score	102
Steelhead - Klamath Mountains Province Winter Run	*Oncorhynchus mykiss pop. 25*	Rogue-Umpqua EDU	1,847	km	1,010	km			
Steelhead - Klamath Mountains Province Winter Run habitat	*Oncorhynchus mykiss pop. 25*	Rogue-Umpqua EDU	2,140	score	1,141	scor	1069	score	107
Steelhead - Lower Columbia	*Oncorhynchus mykiss (pops.14, 26 & 27)*	Lower Columbia EDU	3,494	km	2,090	km			
Steelhead - Lower Columbia habitat	*Oncorhynchus mykiss (pops.14, 26 & 27)*	Lower Columbia EDU	8,103	score	5,353	scor	4050	score	132
Steelhead - Middle Columbia habitat pops. 17, 28 & 29	*Oncorhynchus mykiss (pops. 17, 28 & 29)*	Lower Columbia EDU	2,702	score	1,830	scor	1351	score	135
Steelhead - Middle Columbia pops. 17, 28 & 29	*Oncorhynchus mykiss (pops. 17, 28 & 29)*	Lower Columbia EDU	638	km	388	km			
Steelhead - Olympic Peninsula	*Onchorhynchus mykiss*	Puget Sound EDU	248	km	126	km			
Steelhead - Olympic Peninsula habitat	*Onchorhynchus mykiss*	Puget Sound EDU	1,237	score	626	scor	618	score	101
Steelhead - Oregon Coast Summer Run	*Oncorhynchus mykiss pop. 30*	Rogue-Umpqua EDU	503	km	313	km			
Steelhead - Oregon Coast Summer Run habitat	*Oncorhynchus mykiss pop. 30*	Rogue-Umpqua EDU	603	score	391	scor	302	score	129
Steelhead - Oregon Coast Winter Run	*Oncorhynchus mykiss pop. 31*	Rogue-Umpqua EDU	4,261	km	2,298	km			
Steelhead - Oregon Coast Winter Run habitat	*Oncorhynchus mykiss pop. 31*	Rogue-Umpqua EDU	4,847	score	2,634	scor	2424	score	109
Steelhead - Puget Sound	*Onchorhynchus mykiss*	Puget Sound EDU	4,629	km	2,652	km			
Steelhead - Puget Sound habitat	*Onchorhynchus mykiss*	Puget Sound EDU	23,103	score	13,233	scor	11552	score	115
Steelhead - Southwest Washington	*Oncorhynchus mykiss*	Lower Columbia EDU	744	km	311	km			
Steelhead - Southwest Washington habitat	*Oncorhynchus mykiss*	Lower Columbia EDU	3,595	score	1,558	scor	1798	score	87
Steelhead - Upper Willamette River Winter Run	*Oncorhynchus mykiss pop. 33*	Willamette EDU	2,304	km	1,122	km			
Steelhead - Upper Willamette River Winter Run habitat	*Oncorhynchus mykiss pop. 33*	Willamette EDU	2,494	score	1,290	scor	1244	score	104
Tui Chub	*Gila bicolor*	Lower Columbia EDU	1	occ	1	occ			
Umpqua Dace habitat	*Rhinichthys evermanni*	Rogue-Umpqua EDU	60,399	ha	27,137	ha	30200	ha	90
Umpqua Oregon Chub habitat	*Oregonichthys kalawatseti*	Rogue-Umpqua EDU	9	ha	7	ha	4	ha	175
Western Brook Lamprey habitat	*Lamptera richardsoni*	Lower Columbia EDU	202	ha	145	ha	61	ha	238
Western Brook Lamprey habitat	*Lamptera richardsoni*	Puget Sound EDU	707	ha	653	ha	212	ha	308
White Sturgeon habitat - Columbia River	*Acipenser transmontanus*	Lower Columbia EDU	3	ha	3	ha	1	ha	300
Mollusks									
Columbia Oregonian	*Cryptomastix hendersoni*	Lower Columbia EDU	3	occ	3	occ	22	occ	14
Shortface Lanx	*Fisherola nuttalli*	Lower Columbia EDU	1	occ	1	occ	13	occ	8
Vascular Plants									
Blunt-leaved pondweed	*Potamogeton obtusifolius*	Puget Sound EDU	16	ha	13	ha	5	ha	260
Leafy Pondweed habitat	*Potamogeton foliosus*	Puget Sound EDU	53	ha	47	ha	16	ha	294
Water Lobelia	*Lobelia dortmanna*	Puget Sound EDU	7	occ	7	occ	13	occ	54

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Freshwater Ecological Systems Class 1									
(109) Headwaters, volcanics, mid/high-elevation, mod/high-gradient		Lower Columbia EDU	50	occ	29	occ	15	occ	193
(138) Small tributaries, basalt, low-elevation, mixed-gradient		Lower Columbia EDU	12	occ	7	occ	4	occ	175
(192) Estuary tributaries, siltstone, low-elevation, mixed-gradient		Lower Columbia EDU	5	occ	1	occ	1	occ	100
(2) Headwaters, basalt, mid-elevation, mod/high-gradient		Lower Columbia EDU	72	occ	32	occ	22	occ	145
(21) Small tributaries, outwash, low-elevation, low-gradient		Lower Columbia EDU	19	occ	11	occ	6	occ	183
(226) Headwaters, shale, mid-elevation, moderate-gradient		Lower Columbia EDU	6	occ	2	occ	2	occ	100
(39) Headwaters, granitic, high-elevation, high-gradient		Lower Columbia EDU	7	occ	7	occ	2	occ	350
(55) Headwaters, basalt, mid-elevation, mixed-gradient		Lower Columbia EDU	42	occ	18	occ	13	occ	138
(6) Headwaters, basalt, mid-elevation, very high-gradient		Lower Columbia EDU	30	occ	12	occ	9	occ	133
(88) Headwaters, volcanics, mid-elevation, varied-gradient		Lower Columbia EDU	15	occ	5	occ	4	occ	125
(904) Headwaters, sandstone, low-elevation, varied gradient		Lower Columbia EDU	36	occ	15	occ	11	occ	136
(905) Headwaters , basalt, high-elevation, mod/high-gradient		Lower Columbia EDU	104	occ	62	occ	31	occ	200
(907) Headwaters, basalt, mid-elevation, high-gradient		Lower Columbia EDU	73	occ	32	occ	22	occ	145
(911) Eastside headwaters, basalt, mid-elevation, high-gradient		Lower Columbia EDU	40	occ	17	occ	12	occ	142
(920) Small tributaries, alluvial, low-elevation, low/mod-gradient		Lower Columbia EDU	11	occ	5	occ	3	occ	167
Cascade foothills headwaters - glacial drift and alluvium , low to mid elevation, mixed gradient		Puget Sound EDU	18	occ	9	occ	5	occ	180
Cascade foothills headwaters - glacial drift, mid elevations, mixed gradient		Puget Sound EDU	11	occ	4	occ	3	occ	133
Cascade headwaters - glacial, high elevation, moderate gradient		Willamette EDU	7	occ	7	occ	2	occ	350
Cascade headwaters - volcanics, high elevation, moderate gradient		Willamette EDU	22	occ	15	occ	7	occ	214
Cascade headwaters - volcanics, high elevation, steep gradient		Willamette EDU	26	occ	22	occ	8	occ	275
Cascade headwaters - volcanics, mid elevation, moderate gradient		Willamette EDU	67	occ	26	occ	20	occ	130
Cascade headwaters - volcanics, mid to high elevation		Willamette EDU	101	occ	56	occ	30	occ	187
Cascade tributaries - sedimentary, mid elevation, steep gradient		Willamette EDU	13	occ	4	occ	4	occ	100
Cascades headwaters - basalt and volcanics, high elevation, moderate to high gradient, glacier influenced		Puget Sound EDU	24	occ	17	occ	7	occ	243
Cascades headwaters - granitic, high elevation, moderate to high gradient		Puget Sound EDU	3	occ	2	occ	1	occ	200
Cascades headwaters - mafic, mid elevation, mixed gradient		Puget Sound EDU	28	occ	15	occ	8	occ	188
Cascades headwaters - sandstone, mid to high elevation, moderate to high gradient		Puget Sound EDU	6	occ	2	occ	2	occ	100

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Cascades headwaters, sedimentary, mid elevation		Puget Sound EDU	19 occ	8 occ	6 occ	133
Cascades tributary headwaters - granitic, low to mid elevation		Puget Sound EDU	28 occ	9 occ	8 occ	113
Coast Range headwaters - volcanics, mid elevation		Willamette EDU	13 occ	3 occ	4 occ	75
Coast Range small rivers - sedimentary, low to mid elevation		Willamette EDU	33 occ	9 occ	10 occ	90
Coast Range tributaries - shales, mid elevation, moderate gradient		Willamette EDU	11 occ	2 occ	3 occ	67
Foothills tributaries - basalt, low to mid elevation		Willamette EDU	37 occ	9 occ	11 occ	82
Fraser/Nooksack coastal plain - sandstone, low elevation, low gradient		Puget Sound EDU	11 occ	3 occ	3 occ	100
Hood Canal coastal streams		Puget Sound EDU	8 occ	3 occ	2 occ	150
Juan de Fuca coastal streams - sandstone , low to mid elevation, moderate gradient		Puget Sound EDU	17 occ	9 occ	5 occ	180
Low elevation, basalt with non-basalt volcanics and sediments, mod stream gradient		Rogue-Umpqua EDU	10 occ	3 occ	3 occ	100
Low elevation, sediments or alluvium, variable stream gradient		Rogue-Umpqua EDU	116 occ	50 occ	35 occ	143
Low -mid elevation, serpentine with sediment, mod-high stream gradient		Rogue-Umpqua EDU	33 occ	19 occ	10 occ	190
Low-mid elevation, granitics with non-basalt volcanics and sediments, variable stream gradient		Rogue-Umpqua EDU	63 occ	31 occ	19 occ	163
Low-mid elevation, granitics with sediments and serpentine, mod-high stream gradient		Rogue-Umpqua EDU	53 occ	31 occ	16 occ	194
Low-mid elevation, mixed geology (sediments, granitics, non-basalt volcanics), mod-high stream gradient		Rogue-Umpqua EDU	25 occ	14 occ	7 occ	200
Low-mid elevation, sediments, mod-high stream gradients		Rogue-Umpqua EDU	48 occ	18 occ	14 occ	129
Low-mid elevation, serpentine with sediment and granitics, mod-high stream gradients		Rogue-Umpqua EDU	20 occ	11 occ	6 occ	183
Mid elevation, basalt with sediments, mod-high stream gradient		Rogue-Umpqua EDU	12 occ	4 occ	4 occ	100
Mid elevation, non-basalt volcanics, mod-high stream gradients		Rogue-Umpqua EDU	18 occ	7 occ	5 occ	140
Mid elevation, sediments, alluvium and serpentine, variable stream gradient		Rogue-Umpqua EDU	5 occ	4 occ	1 occ	400
Mid-high elevation, basalts and non-basalt volcanics, non-basalt with significant glacial influence, mod-high stream gradient		Rogue-Umpqua EDU	12 occ	6 occ	4 occ	150
Mid-high elevation, non-basalt volcanics with sedimants, mod-high stream gradients		Rogue-Umpqua EDU	15 occ	13 occ	4 occ	325
Mid-high elevation, sediments, mod-high stream gradients		Rogue-Umpqua EDU	43 occ	22 occ	13 occ	169
Mod-high elevation, basalt with non-basalt volcanics, mod stream gradients		Rogue-Umpqua EDU	8 occ	5 occ	2 occ	250
Nooksack coastal plain headwaters - glacial drift and outwash, low elevation, low to moderate gradient		Puget Sound EDU	13 occ	8 occ	4 occ	200
North Cascades - mafic , mid elevation, mixed gradient		Puget Sound EDU	17 occ	10 occ	5 occ	200
North Cascades headwaters - granitic , mid to high elevation, moderate to high gradient		Puget Sound EDU	119 occ	37 occ	36 occ	103

West Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
North Cascades headwaters - mostly volcanic, mid to high elevation, moderate to high gradient		Puget Sound EDU	13 occ	4 occ	4 occ	100
Northern Cascades headwaters - sandstone, moderate to high elevation, moderate to high gradient		Puget Sound EDU	29 occ	10 occ	9 occ	111
Olympics headwaters - sandstone, mid to high elevation, moderate to high gradient		Puget Sound EDU	24 occ	7 occ	7 occ	100
Olympics rainshadow coastal headwaters		Puget Sound EDU	8 occ	2 occ	2 occ	100
Olympics rainshadow coastal headwaters - mafic, mid elevation, moderate to high gradient		Puget Sound EDU	27 occ	8 occ	8 occ	100
Puget lowland headwaters north - glacial drift, low elevation, low to moderate gradient		Puget Sound EDU	21 occ	6 occ	6 occ	100
Puget lowland headwaters south - glacial drift, low elevation, low gradient		Puget Sound EDU	29 occ	14 occ	9 occ	156
Puget lowland headwaters west - glacial drift, low elevation, low to moderate gradient		Puget Sound EDU	49 occ	25 occ	15 occ	167
Puget uplands and islands headwaters - glacial drift, low to mid elevation, low to moderate gradient		Puget Sound EDU	76 occ	37 occ	23 occ	161
Valley plain tributaries - alluvium and lakeplain, low elevation, low gradient		Willamette EDU	80 occ	25 occ	24 occ	104
Valley/foothill tributaries - volcanics, mid elevation 1.4	*Valley/foothill tributaries - volcanics, mid elevation*	Willamette EDU	11 occ	1 occ	3 occ	33
Valley/foothill tributaries - volcanics, mid elevation 1.6	*Valley/foothill tributaries - volcanics, mid elevation*	Willamette EDU	38 occ	15 occ	11 occ	136
<u>Communities</u>						
Columbia Plateau Vernal Pool Community	*Columbia Plateau Vernal Pool*	Lower Columbia EDU	2 occ	2 occ	2 occ	100
North Pacific Bog and Fen Community	*North Pacific Bog and Fen*	Lower Columbia EDU	23 occ	16 occ	11 occ	145
North Pacific Bog and Fen Community	*North Pacific Bog and Fen*	Puget Sound EDU	17 occ	15 occ	8 occ	188
North Pacific Bog and Fen Community	*North Pacific Bog and Fen*	Rogue-Umpqua EDU	7 occ	7 occ	3 occ	233
North Pacific Bog and Fen Community	*North Pacific Bog and Fen*	Willamette EDU	18 occ	18 occ	9 occ	200
North Pacific Hardwood-Conifer Swamp Community	*North Pacific Hardwood-Conifer Swamp*	Willamette EDU	2 occ	2 occ	2 occ	100
North Pacific Shrub Swamp Community	*North Pacific Shrub Swamp*	Lower Columbia EDU	9 occ	8 occ	4 occ	200
North Pacific Shrub Swamp Community	*North Pacific Shrub Swamp*	Puget Sound EDU	7 occ	6 occ	3 occ	200
North Pacific Shrub Swamp Community	*North Pacific Shrub Swamp*	Rogue-Umpqua EDU	6 occ	6 occ	3 occ	200
North Pacific Shrub Swamp Community	*North Pacific Shrub Swamp*	Willamette EDU	10 occ	10 occ	5 occ	200
Northern Columbia Plateau Basalt Pothole Ponds Community	*Northern Columbia Plateau Basalt Pothole Ponds*	Lower Columbia EDU	3 occ	3 occ	3 occ	100
Temperate Pacific Freshwater Aquatic Bed Community	*Temperate Pacific Freshwater Aquatic Bed*	Lower Columbia EDU	2 occ	2 occ	2 occ	100
Temperate Pacific Freshwater Aquatic Bed Community	*Temperate Pacific Freshwater Aquatic Bed*	Rogue-Umpqua EDU	2 occ	2 occ	2 occ	100
Temperate Pacific Freshwater Emergent Marsh Community	*Temperate Pacific Freshwater Emergent Marsh*	Lower Columbia EDU	6 occ	3 occ	3 occ	100
Temperate Pacific Freshwater Emergent Marsh Community	*Temperate Pacific Freshwater Emergent Marsh*	Puget Sound EDU	1 occ	1 occ	1 occ	100

West Cascades Targets and Goals Summary

Habitat Type Level of Biological Organization Taxon Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Temperate Pacific Freshwater Emergent Marsh Community	*Temperate Pacific Freshwater Emergent Marsh*	Rogue-Umpqua EDU	7 occ	7 occ	3 occ	233
Temperate Pacific Freshwater Emergent Marsh Community	*Temperate Pacific Freshwater Emergent Marsh*	Willamette EDU	9 occ	9 occ	4 occ	225
Temperate Pacific Montane Wet Meadow Community	*Temperate Pacific Montane Wet Meadow*	Lower Columbia EDU	9 occ	5 occ	4 occ	125
Temperate Pacific Montane Wet Meadow Community	*Temperate Pacific Montane Wet Meadow*	Willamette EDU	1 occ	1 occ	1 occ	100

Appendix 8H - East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
<u>Terrestrial</u>									
<u>Terrestrial Ecological Systems</u>									
California Central Valley Mixed Oak Savanna		Modoc Plateau Section	2,412	ha	464	ha	482	ha	96
California Central Valley Mixed Oak Savanna		Upper Klamath Basin Section	290	ha	103	ha	58	ha	178
California Lower Montane Pine-Oak Woodland and Savanna		Modoc Plateau Section	8	ha	8	ha	2	ha	400
California Lower Montane Pine-Oak Woodland and Savanna		Upper Klamath Basin Section	586	ha	396	ha	117	ha	338
California Montane Woodland and Chaparral		Modoc Plateau Section	59,298	ha	14,451	ha	11860	ha	122
California Montane Woodland and Chaparral		Upper Klamath Basin Section	19,199	ha	4,547	ha	3840	ha	118
Columbia Basin Foothill Riparian Woodland and Shrubland		Eastside Oak Section	1,330	ha	350	ha	266	ha	132
Columbia Basin Foothill Riparian Woodland and Shrubland		Pumice and Pine Section	116	ha	116	ha	23	ha	504
Columbia Basin Foothill Riparian Woodland and Shrubland		Upper Klamath Basin Section	131	ha	53	ha	26	ha	204
Columbia Basin Foothill Riparian Woodland and Shrubland		Wenatchee Section	560	ha	167	ha	112	ha	149
Columbia Basin Foothill Riparian Woodland and Shrubland		Yakima Section	2,053	ha	577	ha	411	ha	140
Columbia Plateau Low Sagebrush Steppe		Modoc Plateau Section	23,031	ha	8,873	ha	6909	ha	128
Columbia Plateau Low Sagebrush Steppe		Pumice and Pine Section	6,405	ha	2,434	ha	1921	ha	127
Columbia Plateau Low Sagebrush Steppe		Upper Klamath Basin Section	87,703	ha	41,748	ha	26311	ha	159
Columbia Plateau Scabland Shrubland		Eastside Oak Section	17,210	ha	6,510	ha	5163	ha	126
Columbia Plateau Scabland Shrubland		Pumice and Pine Section	125	ha	125	ha	38	ha	329
Columbia Plateau Scabland Shrubland		Wenatchee Section	67	ha	27	ha	20	ha	135
Columbia Plateau Steppe and Grassland		Eastside Oak Section	786	ha	378	ha	157	ha	241
Columbia Plateau Steppe and Grassland		Pumice and Pine Section	2,821	ha	315	ha	564	ha	56
Columbia Plateau Steppe and Grassland		Upper Klamath Basin Section	48	ha	45	ha	10	ha	450
Columbia Plateau Steppe and Grassland		Wenatchee Section	3,786	ha	2,353	ha	757	ha	311
Columbia Plateau Steppe and Grassland		Yakima Section	387	ha	44	ha	77	ha	57
Columbia Plateau Vernal Pool		Pumice and Pine Section	44	ha	44	ha	13	ha	338
Columbia Plateau Vernal Pool		Upper Klamath Basin Section	2,059	ha	2,001	ha	618	ha	324
Columbia Plateau Western Juniper Woodland and Savanna		Eastside Oak Section	7,805	ha	5,148	ha	2341	ha	220
Columbia Plateau Western Juniper Woodland and Savanna		Modoc Plateau Section	195,380	ha	64,473	ha	58614	ha	110
Columbia Plateau Western Juniper Woodland and Savanna		Pumice and Pine Section	19,429	ha	5,958	ha	5829	ha	102
Columbia Plateau Western Juniper Woodland and Savanna		Upper Klamath Basin Section	215,608	ha	88,076	ha	64683	ha	136
East Cascades Mesic Montane Conifer Forest		Eastside Oak Section	23,622	ha	15,910	ha	7087	ha	224
East Cascades Mesic Montane Conifer Forest		Modoc Plateau Section	3,304	ha	1,506	ha	991	ha	152
East Cascades Mesic Montane Conifer Forest		Pumice and Pine Section	57,459	ha	28,436	ha	17238	ha	165
East Cascades Mesic Montane Conifer Forest		Upper Klamath Basin Section	765	ha	428	ha	230	ha	186
East Cascades Mesic Montane Conifer Forest		Wenatchee Section	25,679	ha	9,068	ha	7704	ha	118

East Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
East Cascades Mesic Montane Conifer Forest		Yakima Section	41,406	ha	16,371	ha	12422	ha	132
East Cascades Oak-Pine Forest and Woodland		Eastside Oak Section	37,892	ha	17,439	ha	11368	ha	153
East Cascades Oak-Pine Forest and Woodland		Pumice and Pine Section	119	ha	87	ha	36	ha	242
East Cascades Oak-Pine Forest and Woodland		Yakima Section	8,374	ha	3,428	ha	2512	ha	136
Eastside Oak Shrub Steppe and Montane Forest and Woodland		Eastside Oak Section	564,869	ha	271,525	ha	169461	ha	160
Inter-Mountain Basins Active and Stabilized Dunes		Upper Klamath Basin Section	2	ha	0	ha			
Inter-Mountain Basins Big Sagebrush Steppe		Eastside Oak Section	16,263	ha	4,582	ha	4879	ha	94
Inter-Mountain Basins Big Sagebrush Steppe		Modoc Plateau Section	508,586	ha	159,034	ha	152576	ha	104
Inter-Mountain Basins Big Sagebrush Steppe		Pumice and Pine Section	28,895	ha	7,697	ha	8669	ha	89
Inter-Mountain Basins Big Sagebrush Steppe		Upper Klamath Basin Section	162,237	ha	50,284	ha	48671	ha	103
Inter-Mountain Basins Big Sagebrush Steppe		Wenatchee Section	47,378	ha	15,701	ha	14214	ha	110
Inter-Mountain Basins Big Sagebrush Steppe		Yakima Section	59,856	ha	24,720	ha	17957	ha	138
Inter-Mountain Basins Greasewood Flat		Pumice and Pine Section	18	ha	18	ha	5	ha	360
Inter-Mountain Basins Mixed Salt Desert Scrub		Modoc Plateau Section	3	ha	3	ha	1	ha	300
Inter-Mountain Basins Montane Sagebrush Steppe		Eastside Oak Section	882	ha	290	ha	176	ha	165
Inter-Mountain Basins Montane Sagebrush Steppe		Modoc Plateau Section	8,365	ha	4,076	ha	1673	ha	244
Inter-Mountain Basins Montane Sagebrush Steppe		Pumice and Pine Section	9,909	ha	2,705	ha	1982	ha	136
Inter-Mountain Basins Montane Sagebrush Steppe		Upper Klamath Basin Section	26,939	ha	8,353	ha	5388	ha	155
Inter-Mountain Basins Montane Sagebrush Steppe		Wenatchee Section	28,160	ha	12,070	ha	5632	ha	214
Inter-Mountain Basins Montane Sagebrush Steppe		Yakima Section	13,268	ha	8,130	ha	2654	ha	306
Inter-Mountain Basins Mountain Mahogany Woodland		Modoc Plateau Section	6,856	ha	1,832	ha	1371	ha	134
Inter-Mountain Basins Mountain Mahogany Woodland		Pumice and Pine Section	166	ha	90	ha	33	ha	273
Inter-Mountain Basins Mountain Mahogany Woodland		Upper Klamath Basin Section	4,368	ha	1,812	ha	874	ha	207
Inter-Mountain Basins Semi-Desert Grassland		Modoc Plateau Section	18,660	ha	7,060	ha	5598	ha	126
Inter-Mountain Basins Semi-Desert Grassland		Upper Klamath Basin Section	27,611	ha	13,585	ha	8283	ha	164
Inter-Mountain Basins Semi-Desert Shrub-Steppe		Modoc Plateau Section	1,363	ha	685	ha	409	ha	167
Inter-Mountain Basins Semi-Desert Shrub-Steppe		Pumice and Pine Section	1,033	ha	362	ha	310	ha	117
Inter-Mountain Basins Semi-Desert Shrub-Steppe		Upper Klamath Basin Section	4,218	ha	1,703	ha	1265	ha	135
Late Seral Forest (>20 inch DBH)		Eastside Oak Section	69,336	ha	42,840	ha	34668	ha	124
Late Seral Forest (>20 inch DBH)		Modoc Plateau Section	25,425	ha	16,012	ha	12712	ha	126
Late Seral Forest (>20 inch DBH)		Pumice and Pine Section	71,499	ha	38,341	ha	35749	ha	107
Late Seral Forest (>20 inch DBH)		Upper Klamath Basin Section	68,264	ha	36,754	ha	34132	ha	108
Late Seral Forest (>20 inch DBH)		Wenatchee Section	39,622	ha	24,188	ha	19811	ha	122
Late Seral Forest (>20 inch DBH)		Yakima Section	42,024	ha	22,013	ha	21012	ha	105
Mediterranean California Alpine Dry Tundra		Modoc Plateau Section	6,250	ha	4,535	ha	1250	ha	363

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland		Modoc Plateau Section	46,462	ha	15,155	ha	13938	ha	109
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland		Pumice and Pine Section	162	ha	120	ha	49	ha	245
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland		Upper Klamath Basin Section	14,928	ha	6,286	ha	4478	ha	140
Mediterranean California Mesic Mixed Conifer Forest and Woodland		Modoc Plateau Section	255,185	ha	111,296	ha	76556	ha	145
Mediterranean California Mesic Mixed Conifer Forest and Woodland		Pumice and Pine Section	34,939	ha	21,690	ha	10482	ha	207
Mediterranean California Mesic Mixed Conifer Forest and Woodland		Upper Klamath Basin Section	141,595	ha	63,251	ha	42478	ha	149
Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland		Modoc Plateau Section	2,323	ha	661	ha	697	ha	95
Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland		Upper Klamath Basin Section	3,095	ha	1,945	ha	929	ha	209
Mediterranean California Red Fir Forest and Woodland		Modoc Plateau Section	15,111	ha	6,888	ha	4533	ha	152
Mediterranean California Red Fir Forest and Woodland		Pumice and Pine Section	11,282	ha	6,432	ha	3385	ha	190
Mediterranean California Red Fir Forest and Woodland		Upper Klamath Basin Section	33,280	ha	20,905	ha	9984	ha	209
Mediterranean California Subalpine Meadow		Pumice and Pine Section	349	ha	206	ha	105	ha	196
Mediterranean California Subalpine Meadow		Upper Klamath Basin Section	2,635	ha	2,419	ha	790	ha	306
Modoc Plateau Montane Forest and Woodland		Modoc Plateau Section	737,188	ha	279,918	ha	221156	ha	127
North Pacific Avalanche Chute Shrubland		Eastside Oak Section	3,980	ha	895	ha	796	ha	112
North Pacific Avalanche Chute Shrubland		Upper Klamath Basin Section	128	ha	128	ha	26	ha	492
North Pacific Avalanche Chute Shrubland		Wenatchee Section	213	ha	205	ha	43	ha	477
North Pacific Avalanche Chute Shrubland		Yakima Section	1,499	ha	1,366	ha	300	ha	455
North Pacific Broadleaf Landslide Forest and Shrubland		Eastside Oak Section	4,630	ha	2,738	ha	926	ha	296
North Pacific Broadleaf Landslide Forest and Shrubland		Pumice and Pine Section	4,401	ha	1,288	ha	880	ha	146
North Pacific Broadleaf Landslide Forest and Shrubland		Upper Klamath Basin Section	484	ha	254	ha	97	ha	262
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Eastside Oak Section	872	ha	401	ha	262	ha	153
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Pumice and Pine Section	27	ha	27	ha	8	ha	338
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Upper Klamath Basin Section	10	ha	10	ha	3	ha	333
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Wenatchee Section	9,340	ha	8,540	ha	2802	ha	305
North Pacific Dry and Mesic Alpine Dwarf-Shrubland, fellfield and Meadow		Yakima Section	182	ha	129	ha	55	ha	235
North Pacific Hardwood - Conifer Swamp		Wenatchee Section	12,083	ha	9,708	ha	2417	ha	402
North Pacific Hardwood - Conifer Swamp		Yakima Section	5,369	ha	2,409	ha	1074	ha	224
North Pacific Hypermaritime Shrub and Herbaceous Headland		Eastside Oak Section	78	ha	78	ha	24	ha	325
North Pacific Hypermaritime Shrub and Herbaceous Headland		Pumice and Pine Section	73	ha	23	ha	22	ha	105

East Cascades Targets and Goals Summary

Habitat Type

Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
North Pacific Hypermaritime Shrub and Herbaceous Headland		Upper Klamath Basin Section	17	ha	17	ha	5	ha	340
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Eastside Oak Section	51,951	ha	37,160	ha	15585	ha	238
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Pumice and Pine Section	27,979	ha	13,511	ha	8394	ha	161
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Upper Klamath Basin Section	4	ha	4	ha	1	ha	400
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Wenatchee Section	20,489	ha	13,598	ha	6147	ha	221
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest		Yakima Section	28,989	ha	14,065	ha	8697	ha	162
North Pacific Maritime Mesic Parkland		Wenatchee Section	3	ha	3	ha	1	ha	300
North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest		Eastside Oak Section	5,722	ha	5,000	ha	1717	ha	291
North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest		Wenatchee Section	1,186	ha	789	ha	356	ha	222
North Pacific Maritime Mesic-Wet Douglas-fir - Western Hemlock Forest		Yakima Section	1,651	ha	619	ha	495	ha	125
North Pacific Montane Grassland		Eastside Oak Section	201	ha	116	ha	60	ha	193
North Pacific Montane Grassland		Modoc Plateau Section	2	ha	2	ha	1	ha	200
North Pacific Montane Grassland		Pumice and Pine Section	28	ha	28	ha	9	ha	311
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Eastside Oak Section	60	ha	60	ha	12	ha	500
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Modoc Plateau Section	685	ha	374	ha	137	ha	273
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Pumice and Pine Section	2,512	ha	637	ha	502	ha	127
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Upper Klamath Basin Section	1,123	ha	501	ha	225	ha	223
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Wenatchee Section	13,122	ha	10,425	ha	2624	ha	397
North Pacific Montane Riparian Woodland and Shrubland CES204.866		Yakima Section	2,429	ha	1,262	ha	486	ha	260
North Pacific Montane Riparian Woodland and Shrubland CES204.869		Pumice and Pine Section	382	ha	143	ha	76	ha	188
North Pacific Montane, Massive Bedrock, Cliff and Talus		Eastside Oak Section	2,089	ha	1,613	ha	418	ha	386
North Pacific Montane, Massive Bedrock, Cliff and Talus		Modoc Plateau Section	36	ha	32	ha	7	ha	457
North Pacific Montane, Massive Bedrock, Cliff and Talus		Pumice and Pine Section	494	ha	442	ha	99	ha	446
North Pacific Montane, Massive Bedrock, Cliff and Talus		Upper Klamath Basin Section	489	ha	455	ha	98	ha	464
North Pacific Montane, Massive Bedrock, Cliff and Talus		Wenatchee Section	31,779	ha	25,341	ha	6356	ha	399
North Pacific Montane, Massive Bedrock, Cliff and Talus		Yakima Section	19,644	ha	13,611	ha	3929	ha	346
North Pacific Mountain Hemlock Forest		Eastside Oak Section	30,114	ha	20,804	ha	9034	ha	230
North Pacific Mountain Hemlock Forest		Modoc Plateau Section	730	ha	427	ha	219	ha	195
North Pacific Mountain Hemlock Forest		Pumice and Pine Section	96,316	ha	77,122	ha	28895	ha	267

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
North Pacific Mountain Hemlock Forest		Upper Klamath Basin Section	17,089	ha	16,035	ha	5127	ha	313
North Pacific Mountain Hemlock Forest		Wenatchee Section	104,719	ha	84,509	ha	31416	ha	269
North Pacific Mountain Hemlock Forest		Yakima Section	53,792	ha	38,725	ha	16137	ha	240
North Pacific Western Hemlock-Silver Fir Forest		Eastside Oak Section	60,231	ha	40,537	ha	18069	ha	224
North Pacific Western Hemlock-Silver Fir Forest		Pumice and Pine Section	19,359	ha	6,694	ha	5808	ha	115
North Pacific Western Hemlock-Silver Fir Forest		Wenatchee Section	31,313	ha	23,852	ha	9394	ha	254
North Pacific Western Hemlock-Silver Fir Forest		Yakima Section	36,428	ha	21,445	ha	10928	ha	196
North Pacific Wooded Lava Flows		Eastside Oak Section	4,858	ha	4,856	ha	1457	ha	333
North Pacific Wooded Lava Flows		Modoc Plateau Section	11,138	ha	6,548	ha	3341	ha	196
North Pacific Wooded Lava Flows		Pumice and Pine Section	29,384	ha	19,433	ha	8815	ha	220
North Pacific Wooded Lava Flows		Upper Klamath Basin Section	4,673	ha	2,454	ha	1402	ha	175
Northern and Central California Dry-Mesic Chaparral		Upper Klamath Basin Section	868	ha	739	ha	174	ha	425
Northern California Mesic Subalpine Woodland		Eastside Oak Section	981	ha	790	ha	294	ha	269
Northern California Mesic Subalpine Woodland		Modoc Plateau Section	5	ha	5	ha	2	ha	250
Northern California Mesic Subalpine Woodland		Upper Klamath Basin Section	760	ha	455	ha	228	ha	200
Northern California Mesic Subalpine Woodland		Wenatchee Section	92,779	ha	49,968	ha	27834	ha	180
Northern California Mesic Subalpine Woodland		Yakima Section	23,310	ha	9,497	ha	6993	ha	136
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Eastside Oak Section	187,311	ha	74,721	ha	56193	ha	133
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Modoc Plateau Section	87	ha	33	ha	26	ha	127
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Pumice and Pine Section	11,199	ha	2,892	ha	3360	ha	86
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Upper Klamath Basin Section	146	ha	62	ha	44	ha	141
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Wenatchee Section	132,346	ha	59,836	ha	39704	ha	151
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Yakima Section	101,296	ha	30,280	ha	30389	ha	100
Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland		Eastside Oak Section	831	ha	512	ha	166	ha	308
Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland		Modoc Plateau Section	33	ha	33	ha	7	ha	471
Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland		Pumice and Pine Section	261	ha	70	ha	52	ha	135
Northern Rocky Mountain Lower Montane Mesic Deciduous Shrubland		Yakima Section	505	ha	505	ha	101	ha	500
Northern Rocky Mountain Montane Grassland		Eastside Oak Section	1,454	ha	666	ha	291	ha	229
Northern Rocky Mountain Montane Grassland		Pumice and Pine Section	338	ha	275	ha	68	ha	404
Northern Rocky Mountain Montane Grassland		Wenatchee Section	8,550	ha	7,050	ha	1710	ha	412
Northern Rocky Mountain Montane Grassland		Yakima Section	1,289	ha	893	ha	258	ha	346

East Cascades Targets and Goals Summary

Habitat Type

Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Eastside Oak Section	89,305 ha	37,268 ha	26791 ha	139
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Modoc Plateau Section	380,638 ha	127,143 ha	114191 ha	111
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Pumice and Pine Section	467,915 ha	140,299 ha	140374 ha	100
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Upper Klamath Basin Section	499,056 ha	159,287 ha	149717 ha	106
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Wenatchee Section	32,697 ha	18,150 ha	9809 ha	185
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna		Yakima Section	92,791 ha	38,443 ha	27837 ha	138
Northern Rocky Mountain Subalpine Dry Grassland		Eastside Oak Section	295 ha	223 ha	59 ha	378
Northern Rocky Mountain Subalpine Dry Grassland		Wenatchee Section	4,566 ha	3,030 ha	913 ha	332
Northern Rocky Mountain Subalpine Dry Grassland		Yakima Section	938 ha	86 ha	188 ha	46
Northern Rocky Mountain Subalpine Dry Parkland		Eastside Oak Section	14,445 ha	5,168 ha	4333 ha	119
Northern Rocky Mountain Subalpine Dry Parkland		Wenatchee Section	54,762 ha	50,098 ha	16429 ha	305
Northern Rocky Mountain Subalpine Dry Parkland		Yakima Section	11,904 ha	6,356 ha	3571 ha	178
Northern Rocky Mountain Western Larch Woodland		Pumice and Pine Section	104 ha	62 ha	31 ha	200
Pumice and Pine Shrub Steppe and Montane Forest and Woodland		Pumice and Pine Section	1,062,283 ha	401,706 ha	318685 ha	126
Rocky Mountain Alpine Dwarf-Shrubland		Pumice and Pine Section	488 ha	469 ha	98 ha	479
Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Modoc Plateau Section	9,735 ha	5,036 ha	2921 ha	172
Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Pumice and Pine Section	1,226 ha	438 ha	368 ha	119
Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland		Upper Klamath Basin Section	2,191 ha	1,104 ha	657 ha	168
Rocky Mountain Lodgepole Pine Forest		Eastside Oak Section	1,827 ha	870 ha	548 ha	159
Rocky Mountain Lodgepole Pine Forest		Pumice and Pine Section	221,445 ha	69,836 ha	66433 ha	105
Rocky Mountain Lodgepole Pine Forest		Upper Klamath Basin Section	139,369 ha	64,444 ha	41811 ha	154
Rocky Mountain Montane Aspen Forest and Woodland		Modoc Plateau Section	2,746 ha	1,647 ha	549 ha	300
Rocky Mountain Montane Aspen Forest and Woodland		Pumice and Pine Section	196 ha	111 ha	39 ha	285
Rocky Mountain Montane Aspen Forest and Woodland		Upper Klamath Basin Section	37 ha	35 ha	7 ha	500
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Eastside Oak Section	10,285 ha	3,874 ha	3086 ha	126
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Pumice and Pine Section	3,444 ha	2,348 ha	1033 ha	227
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Upper Klamath Basin Section	21 ha	21 ha	6 ha	350
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Wenatchee Section	613 ha	300 ha	184 ha	163
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland		Yakima Section	14,517 ha	4,145 ha	4355 ha	95

East Cascades Targets and Goals Summary

Habitat Type Level of Biological Organization Taxon Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland		Modoc Plateau Section	2,891	ha	1,886	ha	578	ha	326
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland		Pumice and Pine Section	312	ha	206	ha	62	ha	332
Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland		Upper Klamath Basin Section	93	ha	80	ha	19	ha	421
Rocky Mountain Subalpine-Montane Riparian Woodland		Eastside Oak Section	2	ha	0	ha			
Rocky Mountain Subalpine-Montane Riparian Woodland		Wenatchee Section	2,103	ha	1,580	ha	421	ha	375
Rocky Mountain Subalpine-Montane Riparian Woodland		Yakima Section	72	ha	19	ha	14	ha	136
Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland		Modoc Plateau Section	24,709	ha	15,681	ha	7413	ha	212
Temperate Pacific Freshwater Emergent Marsh		Eastside Oak Section	204	ha	204	ha	41	ha	498
Temperate Pacific Freshwater Emergent Marsh		Pumice and Pine Section	337	ha	137	ha	67	ha	204
Temperate Pacific Freshwater Emergent Marsh		Upper Klamath Basin Section	19,817	ha	15,747	ha	3963	ha	397
Temperate Pacific Freshwater Emergent Marsh		Yakima Section	49	ha	49	ha	10	ha	490
Temperate Pacific Montane Wet Meadow		Eastside Oak Section	440	ha	316	ha	88	ha	359
Temperate Pacific Montane Wet Meadow		Modoc Plateau Section	31,417	ha	10,917	ha	6283	ha	174
Temperate Pacific Montane Wet Meadow		Pumice and Pine Section	4,515	ha	2,409	ha	903	ha	267
Temperate Pacific Montane Wet Meadow		Upper Klamath Basin Section	50,640	ha	30,212	ha	10128	ha	298
Temperate Pacific Montane Wet Meadow		Wenatchee Section	14,464	ha	5,266	ha	2893	ha	182
Temperate Pacific Montane Wet Meadow		Yakima Section	3,048	ha	760	ha	610	ha	125
Upper Klamath Basin Forest and Woodland		Upper Klamath Basin Section	1,168,567	ha	463,887	ha	350570	ha	132
Wenatchee Shrub Steppe and Montane Forest and Woodland		Wenatchee Section	451,196	ha	261,708	ha	135359	ha	193
Yakima Shrub Steppe and Montane Forest and Woodland		Yakima Section	515,808	ha	235,539	ha	154743	ha	152
Species									
Amphibians									
Cascade Torrent Salamander	*Rhyacotriton cascadae*	East Cascades Ecoregion	5	occ	4	occ	7	occ	57
Cascade Torrent Salamander	*Rhyacotriton cascadae*	Eastside Oak Section	5	occ	4	occ	7	occ	57
Cascades Frog	*Rana cascadae*	East Cascades Ecoregion	98	occ	78	occ	7	occ	1114
Cascades Frog	*Rana cascadae*	Eastside Oak Section	46	occ	34	occ	4	occ	850
Cascades Frog	*Rana cascadae*	Pumice and Pine Section	35	occ	29	occ	2	occ	1450
Cascades Frog	*Rana cascadae*	Upper Klamath Basin Section	17	occ	15	occ	1	occ	1500
Coastal Tailed Frog	*Ascaphus truei*	East Cascades Ecoregion	20	occ	14	occ	13	occ	108
Coastal Tailed Frog	*Ascaphus truei*	Eastside Oak Section	11	occ	7	occ	7	occ	100
Coastal Tailed Frog	*Ascaphus truei*	Pumice and Pine Section	9	occ	7	occ	6	occ	117
Columbia Spotted Frog	*Rana luteiventris*	East Cascades Ecoregion	1	occ	0	occ	25	occ	0
Columbia Spotted Frog	*Rana luteiventris*	Modoc Plateau Section	1	occ	0	occ	25	occ	0
Cope's Giant Salamander	*Dicamptodon copei*	East Cascades Ecoregion	18	occ	16	occ	7	occ	229

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Cope's Giant Salamander	*Dicamptodon copei*	Eastside Oak Section	18	occ	16	occ	7	occ	229
Larch Mountain Salamander	*Plethodon larselli*	East Cascades Ecoregion	15	occ	12	occ	7	occ	171
Larch Mountain Salamander	*Plethodon larselli*	Eastside Oak Section	13	occ	11	occ	5	occ	220
Larch Mountain Salamander	*Plethodon larselli*	Wenatchee Section	1	occ	1	occ	1	occ	100
Larch Mountain Salamander	*Plethodon larselli*	Yakima Section	1	occ	0	occ	1	occ	0
Oregon Slender Salamander	*Batrachoseps wrightorum*	East Cascades Ecoregion	14	occ	12	occ	7	occ	171
Oregon Slender Salamander	*Batrachoseps wrightorum*	Eastside Oak Section	13	occ	11	occ	6	occ	183
Oregon Slender Salamander	*Batrachoseps wrightorum*	Pumice and Pine Section	1	occ	1	occ	1	occ	100
Oregon Spotted Frog	*Rana pretiosa*	East Cascades Ecoregion	27	occ	26	occ	25	occ	104
Oregon Spotted Frog	*Rana pretiosa*	Eastside Oak Section	5	occ	5	occ	5	occ	100
Oregon Spotted Frog	*Rana pretiosa*	Pumice and Pine Section	16	occ	15	occ	14	occ	107
Oregon Spotted Frog	*Rana pretiosa*	Upper Klamath Basin Section	6	occ	6	occ	6	occ	100
Red-legged Frog	*Rana aurora*	East Cascades Ecoregion	11	occ	10	occ	7	occ	143
Red-legged Frog	*Rana aurora*	Eastside Oak Section	8	occ	7	occ	4	occ	175
Red-legged Frog	*Rana aurora*	Pumice and Pine Section	2	occ	2	occ	2	occ	100
Red-legged Frog	*Rana aurora*	Upper Klamath Basin Section	1	occ	1	occ	1	occ	100
Western Toad	*Bufo boreas*	East Cascades Ecoregion	43	occ	27	occ	13	occ	208
Western Toad	*Bufo boreas*	Eastside Oak Section	9	occ	6	occ	3	occ	200
Western Toad	*Bufo boreas*	Pumice and Pine Section	7	occ	3	occ	2	occ	150
Western Toad	*Bufo boreas*	Upper Klamath Basin Section	16	occ	14	occ	4	occ	350
Western Toad	*Bufo boreas*	Wenatchee Section	8	occ	3	occ	3	occ	100
Western Toad	*Bufo boreas*	Yakima Section	3	occ	1	occ	1	occ	100
Birds									
American White Pelican	*Pelecanus erythrorhynchos*	East Cascades Ecoregion	13	occ	12	occ	13	occ	92
American White Pelican	*Pelecanus erythrorhynchos*	Modoc Plateau Section	4	occ	4	occ	4	occ	100
American White Pelican	*Pelecanus erythrorhynchos*	Pumice and Pine Section	3	occ	2	occ	3	occ	67
American White Pelican	*Pelecanus erythrorhynchos*	Upper Klamath Basin Section	6	occ	6	occ	6	occ	100
Bald Eagle nests	*Haliaeetus leucocephalus*	East Cascades Ecoregion	265	occ	135	occ	105	occ	129
Bald Eagle nests	*Haliaeetus leucocephalus*	Eastside Oak Section	16	occ	14	occ	20	occ	70
Bald Eagle nests	*Haliaeetus leucocephalus*	Modoc Plateau Section	46	occ	22	occ	25	occ	88
Bald Eagle nests	*Haliaeetus leucocephalus*	Pumice and Pine Section	57	occ	32	occ	20	occ	160
Bald Eagle nests	*Haliaeetus leucocephalus*	Upper Klamath Basin Section	138	occ	63	occ	35	occ	180
Bald Eagle nests	*Haliaeetus leucocephalus*	Wenatchee Section	5	occ	3	occ	5	occ	60
Bald Eagle nests	*Haliaeetus leucocephalus*	Yakima Section	3	occ	1	occ	3	occ	33
Bald Eagle winter roost area	*Haliaeetus leucocephalus*	East Cascades Ecoregion	468	ha	209	ha	140	ha	149
Bald Eagle winter roost area	*Haliaeetus leucocephalus*	Pumice and Pine Section	50	ha	50	ha	15	ha	333

East Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Bald Eagle winter roost area	*Haliaeetus leucocephalus*	Upper Klamath Basin Section	1	ha	0	ha	1	ha	0
Bald Eagle winter roost area	*Haliaeetus leucocephalus*	Wenatchee Section	417	ha	159	ha	125	ha	127
Band-Tailed Pigeon	*Columba fasciata*	East Cascades Ecoregion	1	occ	1	occ	7	occ	14
Band-Tailed Pigeon	*Columba fasciata*	Eastside Oak Section	1	occ	1	occ	7	occ	14
Black Swift	*Cypseloides niger*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Black Swift	*Cypseloides niger*	Eastside Oak Section	1	occ	1	occ	13	occ	8
Black-Backed Woodpecker	*Picoides arcticus*	East Cascades Ecoregion	12	occ	11	occ	13	occ	85
Black-Backed Woodpecker	*Picoides arcticus*	Pumice and Pine Section	6	occ	5	occ	7	occ	71
Black-Backed Woodpecker	*Picoides arcticus*	Upper Klamath Basin Section	6	occ	6	occ	6	occ	100
Bufflehead	*Bucephala albeola*	East Cascades Ecoregion	5	occ	5	occ	13	occ	38
Bufflehead	*Bucephala albeola*	Pumice and Pine Section	4	occ	4	occ	10	occ	40
Bufflehead	*Bucephala albeola*	Upper Klamath Basin Section	1	occ	1	occ	3	occ	33
Common Loon foraging habitat	*Gavia immer*	East Cascades Ecoregion	158	ha	56	ha	48	ha	117
Common Loon foraging habitat	*Gavia immer*	Eastside Oak Section	18	ha	18	ha	5	ha	360
Common Loon foraging habitat	*Gavia immer*	Pumice and Pine Section	38	ha	38	ha	11	ha	345
Common Loon foraging habitat	*Gavia immer*	Wenatchee Section	102	ha	0	ha	31	ha	0
Golden Eagle	*Aquila chrysaetos*	East Cascades Ecoregion	49	occ	38	occ	38	occ	100
Golden Eagle	*Aquila chrysaetos*	Eastside Oak Section	5	occ	5	occ	3	occ	167
Golden Eagle	*Aquila chrysaetos*	Modoc Plateau Section	1	occ	1	occ	2	occ	50
Golden Eagle	*Aquila chrysaetos*	Pumice and Pine Section	6	occ	5	occ	4	occ	125
Golden Eagle	*Aquila chrysaetos*	Upper Klamath Basin Section	4	occ	3	occ	3	occ	100
Golden Eagle	*Aquila chrysaetos*	Wenatchee Section	21	occ	15	occ	17	occ	88
Golden Eagle	*Aquila chrysaetos*	Yakima Section	12	occ	9	occ	9	occ	100
Gray Flycatcher	*Empidonax wrightii*	East Cascades Ecoregion	1	occ	0	occ	13	occ	0
Gray Flycatcher	*Empidonax wrightii*	Eastside Oak Section	1	occ	0	occ	13	occ	0
Great Blue Heron	*Ardea herodias*	East Cascades Ecoregion	11	occ	10	occ	13	occ	77
Great Blue Heron	*Ardea herodias*	Eastside Oak Section	2	occ	2	occ	3	occ	67
Great Blue Heron	*Ardea herodias*	Modoc Plateau Section	3	occ	3	occ	4	occ	75
Great Blue Heron	*Ardea herodias*	Pumice and Pine Section	3	occ	3	occ	3	occ	100
Great Blue Heron	*Ardea herodias*	Upper Klamath Basin Section	1	occ	1	occ	2	occ	50
Great Blue Heron	*Ardea herodias*	Wenatchee Section	1	occ	1	occ	2	occ	50
Great Blue Heron	*Ardea herodias*	Yakima Section	1	occ	1	occ	50	occ	2
Great Gray Owl	*Strix nebulosa*	East Cascades Ecoregion	14	occ	11	occ	25	occ	44
Great Gray Owl	*Strix nebulosa*	Pumice and Pine Section	4	occ	2	occ	8	occ	25
Great Gray Owl	*Strix nebulosa*	Upper Klamath Basin Section	10	occ	9	occ	17	occ	53
Harlequin Duck foraging habitat	*Histrionicus histrionicus*	East Cascades Ecoregion	10	ha	10	ha	9	ha	111

East Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Harlequin Duck foraging habitat	*Histrionicus histrionicus*	Eastside Oak Section	10	ha	10	ha	9	ha	111
Lewis's Woodpecker	*Melanerpes lewis*	East Cascades Ecoregion	35	occ	28	occ	35	occ	80
Lewis's Woodpecker	*Melanerpes lewis*	Eastside Oak Section	31	occ	24	occ	31	occ	77
Lewis's Woodpecker	*Melanerpes lewis*	Upper Klamath Basin Section	4	occ	4	occ	4	occ	100
Northern Goshawk	*Accipiter gentilis*	East Cascades Ecoregion	275	occ	125	occ	38	occ	329
Northern Goshawk	*Accipiter gentilis*	Eastside Oak Section	25	occ	15	occ	4	occ	375
Northern Goshawk	*Accipiter gentilis*	Modoc Plateau Section	51	occ	10	occ	7	occ	143
Northern Goshawk	*Accipiter gentilis*	Pumice and Pine Section	22	occ	9	occ	3	occ	300
Northern Goshawk	*Accipiter gentilis*	Upper Klamath Basin Section	29	occ	16	occ	4	occ	400
Northern Goshawk	*Accipiter gentilis*	Wenatchee Section	73	occ	41	occ	10	occ	410
Northern Goshawk	*Accipiter gentilis*	Yakima Section	75	occ	34	occ	10	occ	340
Northern Spotted Owl	*Strix occidentalis caurina*	East Cascades Ecoregion	467	occ	277	occ	234	occ	118
Northern Spotted Owl	*Strix occidentalis caurina*	Eastside Oak Section	138	occ	80	occ	69	occ	116
Northern Spotted Owl	*Strix occidentalis caurina*	Pumice and Pine Section	88	occ	48	occ	44	occ	109
Northern Spotted Owl	*Strix occidentalis caurina*	Upper Klamath Basin Section	106	occ	75	occ	53	occ	142
Northern Spotted Owl	*Strix occidentalis caurina*	Wenatchee Section	64	occ	35	occ	32	occ	109
Northern Spotted Owl	*Strix occidentalis caurina*	Yakima Section	71	occ	39	occ	36	occ	108
Northern Waterthrush	*Seiurus noveboracensis*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Northern Waterthrush	*Seiurus noveboracensis*	Pumice and Pine Section	1	occ	1	occ	13	occ	8
Peregrine Falcon	*Falco peregrinus*	East Cascades Ecoregion	16	occ	15	occ	7	occ	214
Peregrine Falcon	*Falco peregrinus*	Eastside Oak Section	7	occ	7	occ	2	occ	350
Peregrine Falcon	*Falco peregrinus*	Pumice and Pine Section	1	occ	1	occ	1	occ	100
Peregrine Falcon	*Falco peregrinus*	Upper Klamath Basin Section	2	occ	2	occ	1	occ	200
Peregrine Falcon	*Falco peregrinus*	Wenatchee Section	2	occ	2	occ	1	occ	200
Peregrine Falcon	*Falco peregrinus*	Yakima Section	4	occ	3	occ	2	occ	150
Pileated Woodpecker	*Dryocopus pileatus*	East Cascades Ecoregion	7	occ	7	occ	13	occ	54
Pileated Woodpecker	*Dryocopus pileatus*	Eastside Oak Section	1	occ	1	occ	2	occ	50
Pileated Woodpecker	*Dryocopus pileatus*	Pumice and Pine Section	1	occ	1	occ	2	occ	50
Pileated Woodpecker	*Dryocopus pileatus*	Upper Klamath Basin Section	5	occ	5	occ	9	occ	56
Red-necked Grebe	*Podiceps grisegena*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Red-necked Grebe	*Podiceps grisegena*	Upper Klamath Basin Section	1	occ	1	occ	13	occ	8
Sandhill Crane	*Grus canadensis*	East Cascades Ecoregion	879	occ	397	occ	264	occ	150
Sandhill Crane	*Grus canadensis*	Eastside Oak Section	4	occ	4	occ	1	occ	400
Sandhill Crane	*Grus canadensis*	Modoc Plateau Section	513	occ	155	occ	153	occ	101
Sandhill Crane	*Grus canadensis*	Pumice and Pine Section	37	occ	27	occ	12	occ	225
Sandhill Crane	*Grus canadensis*	Upper Klamath Basin Section	325	occ	211	occ	97	occ	218

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Swainson's hawk	*Buteo swainsoni*	East Cascades Ecoregion	109	occ	52	occ	25	occ	208
Swainson's hawk	*Buteo swainsoni*	Modoc Plateau Section	12	occ	1	occ	9	occ	11
Swainson's hawk	*Buteo swainsoni*	Upper Klamath Basin Section	97	occ	51	occ	16	occ	319
Tricolored Blackbird	*Agelaius tricolor*	East Cascades Ecoregion	11	occ	11	occ	13	occ	85
Tricolored Blackbird	*Agelaius tricolor*	Modoc Plateau Section	6	occ	6	occ	7	occ	86
Tricolored Blackbird	*Agelaius tricolor*	Upper Klamath Basin Section	5	occ	5	occ	6	occ	83
Western Snowy Plover	*Charadrius alexandrinus nivosus*	East Cascades Ecoregion	2	occ	2	occ	7	occ	29
Western Snowy Plover	*Charadrius alexandrinus nivosus*	Upper Klamath Basin Section	2	occ	2	occ	7	occ	29
White-Faced Ibis	*Plegadis chihi*	East Cascades Ecoregion	4	occ	4	occ	13	occ	31
White-Faced Ibis	*Plegadis chihi*	Modoc Plateau Section	2	occ	2	occ	7	occ	29
White-Faced Ibis	*Plegadis chihi*	Upper Klamath Basin Section	2	occ	2	occ	6	occ	33
White-Headed Woodpecker	*Picoides albolarvatus*	East Cascades Ecoregion	24	occ	19	occ	17	occ	112
White-Headed Woodpecker	*Picoides albolarvatus*	Eastside Oak Section	2	occ	1	occ	2	occ	50
White-Headed Woodpecker	*Picoides albolarvatus*	Pumice and Pine Section	1	occ	1	occ	1	occ	100
White-Headed Woodpecker	*Picoides albolarvatus*	Upper Klamath Basin Section	5	occ	5	occ	3	occ	167
White-Headed Woodpecker	*Picoides albolarvatus*	Wenatchee Section	6	occ	5	occ	5	occ	100
White-Headed Woodpecker	*Picoides albolarvatus*	Yakima Section	10	occ	8	occ	6	occ	133
Williamson's Sapsucker	*Sphyrapicus thyroideus*	East Cascades Ecoregion	4	occ	3	occ	13	occ	23
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Eastside Oak Section	1	occ	1	occ	3	occ	33
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Pumice and Pine Section	2	occ	1	occ	7	occ	14
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Upper Klamath Basin Section	1	occ	1	occ	3	occ	33
Willow Flycatcher	*Empidonax traillii*	East Cascades Ecoregion	6	occ	3	occ	13	occ	23
Willow Flycatcher	*Empidonax traillii*	Modoc Plateau Section	6	occ	3	occ	13	occ	23
Yellow Rail foraging habitat	*Coturnicops noveboracensis*	East Cascades Ecoregion	11,247	ha	9,765	ha	3374	ha	289
Yellow Rail foraging habitat	*Coturnicops noveboracensis*	Pumice and Pine Section	35	ha	35	ha	11	ha	318
Yellow Rail foraging habitat	*Coturnicops noveboracensis*	Upper Klamath Basin Section	11,212	ha	9,730	ha	3364	ha	289
Yellow Rail nests	*Coturnicops noveboracensis*	East Cascades Ecoregion	30	occ	14	occ	13	occ	108
Yellow Rail nests	*Coturnicops noveboracensis*	Pumice and Pine Section	1	occ	1	occ	1	occ	100
Yellow Rail nests	*Coturnicops noveboracensis*	Upper Klamath Basin Section	29	occ	13	occ	12	occ	108
Insects									
Hatch's Scaphinotus	*Scaphinotus hatchi*	East Cascades Ecoregion	1	occ	1	occ	25	occ	4
Hatch's Scaphinotus	*Scaphinotus hatchi*	Pumice and Pine Section	1	occ	1	occ	25	occ	4
Mammals									
American Marten	*Martes americana*	East Cascades Ecoregion	40	occ	34	occ	13	occ	262
American Marten	*Martes americana*	Modoc Plateau Section	4	occ	3	occ	2	occ	150
American Marten	*Martes americana*	Pumice and Pine Section	17	occ	17	occ	5	occ	340

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
American Marten	*Martes americana*	Upper Klamath Basin Section	19	occ	14	occ	6	occ	233
Bat Roost/Hibernacula		East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Bat Roost/Hibernacula		Eastside Oak Section	1	occ	0	occ	13	occ	0
Bighorn Sheep	*Ovis canadensis*	East Cascades Ecoregion	41,120	ha	29,244	ha	12336	ha	237
Bighorn Sheep	*Ovis canadensis*	Wenatchee Section	10,864	ha	7,537	ha	3259	ha	231
Bighorn Sheep	*Ovis canadensis*	Yakima Section	30,256	ha	21,707	ha	9077	ha	239
California Wolverine	*Gulo gulo*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
California Wolverine	*Gulo gulo*	Modoc Plateau Section	1	occ	1	occ	13	occ	8
Fisher	*Martes pennanti*	East Cascades Ecoregion	4	occ	4	occ	13	occ	31
Fisher	*Martes pennanti*	Pumice and Pine Section	1	occ	1	occ	3	occ	33
Fisher	*Martes pennanti*	Upper Klamath Basin Section	3	occ	3	occ	10	occ	30
Fringed Myotis	*Myotis thysanodes*	East Cascades Ecoregion	17	occ	13	occ	13	occ	100
Fringed Myotis	*Myotis thysanodes*	Pumice and Pine Section	1	occ	1	occ	1	occ	100
Fringed Myotis	*Myotis thysanodes*	Upper Klamath Basin Section	16	occ	12	occ	12	occ	100
Long-Legged Myotis	*Myotis volans*	East Cascades Ecoregion	20	occ	16	occ	13	occ	123
Long-Legged Myotis	*Myotis volans*	Modoc Plateau Section	5	occ	4	occ	4	occ	100
Long-Legged Myotis	*Myotis volans*	Upper Klamath Basin Section	15	occ	12	occ	9	occ	133
Mountain Goat	*Oreamos americana*	East Cascades Ecoregion	33,510	ha	23,311	ha	10053	ha	232
Mountain Goat	*Oreamos americana*	Wenatchee Section	26,321	ha	20,708	ha	7896	ha	262
Mountain Goat	*Oreamos americana*	Yakima Section	7,189	ha	2,603	ha	2157	ha	121
Pygmy Rabbit	*Brachylagus idahoensis*	East Cascades Ecoregion	2	occ	1	occ	13	occ	8
Pygmy Rabbit	*Brachylagus idahoensis*	Pumice and Pine Section	1	occ	1	occ	7	occ	14
Pygmy Rabbit	*Brachylagus idahoensis*	Upper Klamath Basin Section	1	occ	1	occ	6	occ	17
Ringtail	*Bassariscus astutus*	East Cascades Ecoregion	3	occ	3	occ	7	occ	43
Ringtail	*Bassariscus astutus*	Upper Klamath Basin Section	3	occ	3	occ	7	occ	43
Sierra Nevada Red Fox	*Vulpes vulpes necator*	East Cascades Ecoregion	3	occ	3	occ	25	occ	12
Sierra Nevada Red Fox	*Vulpes vulpes necator*	Modoc Plateau Section	3	occ	3	occ	25	occ	12
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	East Cascades Ecoregion	11	occ	10	occ	13	occ	77
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Modoc Plateau Section	1	occ	0	occ	3	occ	0
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Pumice and Pine Section	8	occ	8	occ	7	occ	114
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Upper Klamath Basin Section	2	occ	2	occ	3	occ	67
Western Gray Squirrel	*Sciurus griseus*	East Cascades Ecoregion	24,398	ha	14,999	ha	7319	ha	205
Western Gray Squirrel	*Sciurus griseus*	Eastside Oak Section	21,702	ha	14,225	ha	6511	ha	218
Western Gray Squirrel	*Sciurus griseus*	Wenatchee Section	1,915	ha	494	ha	574	ha	86
Western Gray Squirrel	*Sciurus griseus*	Yakima Section	782	ha	280	ha	234	ha	120
<u>Mollusks</u>									

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Chelan mountainsnail	*Oreohelix sp.1*	East Cascades Ecoregion	14	occ	13	occ	50	occ	26
Chelan mountainsnail	*Oreohelix sp.1*	Wenatchee Section	14	occ	13	occ	50	occ	26
Crater Lake Tightcoil	*Pristiloma arcticum crateris*	East Cascades Ecoregion	16	occ	15	occ	25	occ	60
Crater Lake Tightcoil	*Pristiloma arcticum crateris*	Pumice and Pine Section	16	occ	15	occ	25	occ	60
Terrestrial Slug Prophysaon sp. 1	*Prophysaon sp. 1*	East Cascades Ecoregion	6	occ	6	occ	50	occ	12
Terrestrial Slug Prophysaon sp. 1	*Prophysaon sp. 1*	Upper Klamath Basin Section	6	occ	6	occ	50	occ	12
<u>Non-Vascular Plants</u>									
Calliergon trifarium	*Calliergon trifarium*	East Cascades Ecoregion	3	occ	3	occ	7	occ	43
Calliergon trifarium	*Calliergon trifarium*	Upper Klamath Basin Section	3	occ	3	occ	7	occ	43
Lecanora pringlei	*Lecanora pringlei*	East Cascades Ecoregion	1	occ	0	occ	7	occ	0
Lecanora pringlei	*Lecanora pringlei*	Eastside Oak Section	1	occ	0	occ	7	occ	0
Nardia japonica	*Nardia japonica*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Nardia japonica	*Nardia japonica*	Eastside Oak Section	1	occ	1	occ	13	occ	8
<u>Reptiles</u>									
California Mountain Kingsnake	*Lampropeltis zonata*	East Cascades Ecoregion	8	occ	7	occ	13	occ	54
California Mountain Kingsnake	*Lampropeltis zonata*	Eastside Oak Section	5	occ	4	occ	8	occ	50
California Mountain Kingsnake	*Lampropeltis zonata*	Upper Klamath Basin Section	3	occ	3	occ	5	occ	60
Western Pond Turtle	*Emys marmorata*	Eastside Oak Section	3	occ	2	occ	3	occ	67
Western Pond Turtle	*Emys marmorata*	Modoc Plateau Section	1	occ	0	occ	1	occ	0
Western Pond Turtle	*Emys marmorata*	Upper Klamath Basin Section	19	occ	10	occ	9	occ	111
<u>Vascular Plants</u>									
Adder's Tongue	*Ophioglossum pusillum*	East Cascades Ecoregion	2	occ	2	occ	13	occ	15
Adder's Tongue	*Ophioglossum pusillum*	Eastside Oak Section	1	occ	1	occ	6	occ	17
Adder's Tongue	*Ophioglossum pusillum*	Wenatchee Section	1	occ	1	occ	7	occ	14
Alpine Gentian	*Gentiana newberryi*	East Cascades Ecoregion	20	occ	20	occ	25	occ	80
Alpine Gentian	*Gentiana newberryi*	Pumice and Pine Section	12	occ	12	occ	15	occ	80
Alpine Gentian	*Gentiana newberryi*	Upper Klamath Basin Section	8	occ	8	occ	10	occ	80
Ames Milk-vetch	*Astragalus pulsiferae var. suksdorfii*	East Cascades Ecoregion	35	occ	15	occ	13	occ	115
Ames Milk-vetch	*Astragalus pulsiferae var. suksdorfii*	Eastside Oak Section	2	occ	2	occ	1	occ	200
Ames Milk-vetch	*Astragalus pulsiferae var. suksdorfii*	Modoc Plateau Section	33	occ	13	occ	12	occ	108
Applegate's Milk-vetch	*Astragalus applegatei*	East Cascades Ecoregion	7	occ	4	occ	50	occ	8
Applegate's Milk-vetch	*Astragalus applegatei*	Upper Klamath Basin Section	7	occ	4	occ	50	occ	8
Ash Creek ivesia	*Ivesia paniculata*	East Cascades Ecoregion	19	occ	18	occ	50	occ	36
Ash Creek ivesia	*Ivesia paniculata*	Modoc Plateau Section	19	occ	18	occ	50	occ	36
Ash Valley milk-vetch	*Astragalus anxius*	East Cascades Ecoregion	6	occ	6	occ	50	occ	12
Ash Valley milk-vetch	*Astragalus anxius*	Modoc Plateau Section	6	occ	6	occ	50	occ	12

East Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Baker's Globe-mallow	*Iliamna bakeri*	East Cascades Ecoregion	46	occ	25	occ	25	occ	100
Baker's Globe-mallow	*Iliamna bakeri*	Modoc Plateau Section	23	occ	13	occ	12	occ	108
Baker's Globe-mallow	*Iliamna bakeri*	Pumice and Pine Section	5	occ	3	occ	3	occ	100
Baker's Globe-mallow	*Iliamna bakeri*	Upper Klamath Basin Section	18	occ	9	occ	10	occ	90
Barrett's Beardtongue	*Penstemon barrettiae*	East Cascades Ecoregion	11	occ	10	occ	25	occ	40
Barrett's Beardtongue	*Penstemon barrettiae*	Eastside Oak Section	11	occ	10	occ	25	occ	40
Bellinger's meadowfoam	*Limnanthes floccosa ssp. bellingeriana*	East Cascades Ecoregion	18	occ	16	occ	25	occ	64
Bellinger's meadowfoam	*Limnanthes floccosa ssp. bellingeriana*	Modoc Plateau Section	1	occ	1	occ	2	occ	50
Bellinger's meadowfoam	*Limnanthes floccosa ssp. bellingeriana*	Upper Klamath Basin Section	17	occ	15	occ	23	occ	65
Blue Alpine Phacelia	*Phacelia sericea var. ciliosa*	East Cascades Ecoregion	6	occ	6	occ	13	occ	46
Blue Alpine Phacelia	*Phacelia sericea var. ciliosa*	Modoc Plateau Section	6	occ	6	occ	13	occ	46
Blue-leaved Penstemon	*Penstemon glaucinus*	East Cascades Ecoregion	55	occ	49	occ	50	occ	98
Blue-leaved Penstemon	*Penstemon glaucinus*	Modoc Plateau Section	23	occ	20	occ	20	occ	100
Blue-leaved Penstemon	*Penstemon glaucinus*	Pumice and Pine Section	10	occ	9	occ	10	occ	90
Blue-leaved Penstemon	*Penstemon glaucinus*	Upper Klamath Basin Section	22	occ	20	occ	20	occ	100
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	East Cascades Ecoregion	31	occ	26	occ	25	occ	104
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	Modoc Plateau Section	28	occ	23	occ	22	occ	105
Boggs Lake hedge-hyssop	*Gratiola heterosepala*	Upper Klamath Basin Section	3	occ	3	occ	3	occ	100
Brewer's Cliff-brake	*Pellaea breweri*	East Cascades Ecoregion	5	occ	5	occ	13	occ	38
Brewer's Cliff-brake	*Pellaea breweri*	Wenatchee Section	5	occ	5	occ	13	occ	38
Broad-seed rockcress	*Arabis platysperma var. platysperma*	East Cascades Ecoregion	2	occ	2	occ	25	occ	8
Broad-seed rockcress	*Arabis platysperma var. platysperma*	Upper Klamath Basin Section	2	occ	2	occ	25	occ	8
Cascade Rockcress	*Arabis furcata*	East Cascades Ecoregion	20	occ	20	occ	25	occ	80
Cascade Rockcress	*Arabis furcata*	Eastside Oak Section	19	occ	19	occ	23	occ	83
Cascade Rockcress	*Arabis furcata*	Pumice and Pine Section	1	occ	1	occ	2	occ	50
Chelan Rockmat	*Petrophyton cinerascens*	East Cascades Ecoregion	5	occ	5	occ	50	occ	10
Chelan Rockmat	*Petrophyton cinerascens*	Wenatchee Section	5	occ	5	occ	50	occ	10
Coyote Thistle	*Eryngium petiolatum*	East Cascades Ecoregion	2	occ	2	occ	25	occ	8
Coyote Thistle	*Eryngium petiolatum*	Eastside Oak Section	2	occ	2	occ	25	occ	8
Crater Lake Rockcress	*Arabis suffrutescens var. horizontalis*	East Cascades Ecoregion	7	occ	7	occ	25	occ	28
Crater Lake Rockcress	*Arabis suffrutescens var. horizontalis*	Upper Klamath Basin Section	7	occ	7	occ	25	occ	28
Diffuse Stickseed	*Hackelia diffusa var. diffusa*	East Cascades Ecoregion	4	occ	4	occ	13	occ	31
Diffuse Stickseed	*Hackelia diffusa var. diffusa*	Eastside Oak Section	4	occ	4	occ	13	occ	31
Ephemeral Monkeyflower	*Mimulus evanescens*	East Cascades Ecoregion	11	occ	9	occ	13	occ	69

East Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Ephemeral Monkeyflower	*Mimulus evanescens*	Modoc Plateau Section	9	occ	8	occ	10	occ	80
Ephemeral Monkeyflower	*Mimulus evanescens*	Upper Klamath Basin Section	2	occ	1	occ	3	occ	33
Estes' Artemisia	*Artemisia ludoviciana ssp. estesii*	East Cascades Ecoregion	5	occ	5	occ	50	occ	10
Estes' Artemisia	*Artemisia ludoviciana ssp. estesii*	Pumice and Pine Section	5	occ	5	occ	50	occ	10
Felwort	*Swertia perennis*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Felwort	*Swertia perennis*	Wenatchee Section	1	occ	1	occ	13	occ	8
Few-flowered Collinsia	*Collinsia sparsiflora var. bruceae*	East Cascades Ecoregion	4	occ	4	occ	50	occ	8
Few-flowered Collinsia	*Collinsia sparsiflora var. bruceae*	Eastside Oak Section	4	occ	4	occ	50	occ	8
Fringed Campion	*Silene nuda ssp. insectivora*	East Cascades Ecoregion	48	occ	28	occ	25	occ	112
Fringed Campion	*Silene nuda ssp. insectivora*	Upper Klamath Basin Section	48	occ	28	occ	25	occ	112
Fuzzytongue Penstemon	*Penstemon eriantherus var. whitedii*	East Cascades Ecoregion	3	occ	3	occ	7	occ	43
Fuzzytongue Penstemon	*Penstemon eriantherus var. whitedii*	Wenatchee Section	3	occ	3	occ	7	occ	43
Gooseberry-leaved Alumroot	*Heuchera grossulariifolia var. tenuifolia*	East Cascades Ecoregion	18	occ	15	occ	13	occ	115
Gooseberry-leaved Alumroot	*Heuchera grossulariifolia var. tenuifolia*	Eastside Oak Section	18	occ	15	occ	13	occ	115
Green Wild Buckwheat	*Eriogonum umbellatum var. glaberrimum*	East Cascades Ecoregion	3	occ	3	occ	50	occ	6
Green Wild Buckwheat	*Eriogonum umbellatum var. glaberrimum*	Modoc Plateau Section	3	occ	3	occ	50	occ	6
Green-tinged Indian Paintbrush	*Castilleja chlorotica*	East Cascades Ecoregion	151	occ	65	occ	50	occ	130
Green-tinged Indian Paintbrush	*Castilleja chlorotica*	Modoc Plateau Section	16	occ	13	occ	7	occ	186
Green-tinged Indian Paintbrush	*Castilleja chlorotica*	Pumice and Pine Section	90	occ	34	occ	29	occ	117
Green-tinged Indian Paintbrush	*Castilleja chlorotica*	Upper Klamath Basin Section	45	occ	18	occ	14	occ	129
Hall Sedge	*Carex halliana*	East Cascades Ecoregion	7	occ	7	occ	50	occ	14
Hall Sedge	*Carex halliana*	Modoc Plateau Section	6	occ	6	occ	42	occ	14
Hall Sedge	*Carex halliana*	Upper Klamath Basin Section	1	occ	1	occ	8	occ	13
Hood River Milk-vetch	*Astragalus hoodianus*	East Cascades Ecoregion	3	occ	3	occ	25	occ	12
Hood River Milk-vetch	*Astragalus hoodianus*	Eastside Oak Section	3	occ	3	occ	25	occ	12
Hoover's Desert-parsley	*Lomatium tuberosum*	East Cascades Ecoregion	1	occ	0	occ	7	occ	0
Hoover's Desert-parsley	*Lomatium tuberosum*	Yakima Section	1	occ	0	occ	7	occ	0
Hoover's Tauschia	*Tauschia hooveri*	East Cascades Ecoregion	7	occ	4	occ	13	occ	31
Hoover's Tauschia	*Tauschia hooveri*	Yakima Section	7	occ	4	occ	13	occ	31
Howell Milk-vetch	*Astragalus howellii*	East Cascades Ecoregion	7	occ	7	occ	25	occ	28
Howell Milk-vetch	*Astragalus howellii*	Eastside Oak Section	7	occ	7	occ	25	occ	28
Howell's Thelypody	*Thelypodium howellii ssp. howellii*	East Cascades Ecoregion	2	occ	2	occ	25	occ	8
Howell's Thelypody	*Thelypodium howellii ssp. howellii*	Modoc Plateau Section	2	occ	2	occ	25	occ	8
Howell's triteleia	*Triteleia grandiflora var. howellii*	East Cascades Ecoregion	2	occ	0	occ	13	occ	0
Howell's triteleia	*Triteleia grandiflora var. howellii*	Upper Klamath Basin Section	2	occ	0	occ	13	occ	0

East Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Lesser Panicled Sedge	*Carex diandra*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Lesser Panicled Sedge	*Carex diandra*	Modoc Plateau Section	1	occ	1	occ	13	occ	8
Liddon Sedge	*Carex petasata*	East Cascades Ecoregion	1	occ	1	occ	7	occ	14
Liddon Sedge	*Carex petasata*	Modoc Plateau Section	1	occ	1	occ	7	occ	14
Little Bluestem	*Schizachyrium scoparium var. scoparium*	East Cascades Ecoregion	2	occ	2	occ	13	occ	15
Little Bluestem	*Schizachyrium scoparium var. scoparium*	Wenatchee Section	2	occ	2	occ	13	occ	15
Loesel's Twayblade	*Liparis loeselii*	East Cascades Ecoregion	1	occ	0	occ	13	occ	0
Loesel's Twayblade	*Liparis loeselii*	Eastside Oak Section	1	occ	0	occ	13	occ	0
Long-bearded Sego Lily	*Calochortus longebarbatus var. longebarbatus*	East Cascades Ecoregion	165	occ	59	occ	50	occ	118
Long-bearded Sego Lily	*Calochortus longebarbatus var. longebarbatus*	Eastside Oak Section	13	occ	10	occ	4	occ	250
Long-bearded Sego Lily	*Calochortus longebarbatus var. longebarbatus*	Modoc Plateau Section	67	occ	18	occ	20	occ	90
Long-bearded Sego Lily	*Calochortus longebarbatus var. longebarbatus*	Pumice and Pine Section	2	occ	1	occ	1	occ	100
Long-bearded Sego Lily	*Calochortus longebarbatus var. longebarbatus*	Upper Klamath Basin Section	83	occ	30	occ	25	occ	120
Long-sepal Globemallow	*Iliamna longisepala*	East Cascades Ecoregion	65	occ	50	occ	50	occ	100
Long-sepal Globemallow	*Iliamna longisepala*	Wenatchee Section	61	occ	48	occ	46	occ	104
Long-sepal Globemallow	*Iliamna longisepala*	Yakima Section	4	occ	2	occ	4	occ	50
Marigold Navarretia	*Navarretia tagetina*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Marigold Navarretia	*Navarretia tagetina*	Eastside Oak Section	1	occ	1	occ	13	occ	8
Modoc bedstraw	*Galium glabrescens ssp. modocense*	East Cascades Ecoregion	13	occ	12	occ	50	occ	24
Modoc bedstraw	*Galium glabrescens ssp. modocense*	Modoc Plateau Section	13	occ	12	occ	50	occ	24
Mountain Moonwort	*Botrychium montanum*	East Cascades Ecoregion	6	occ	6	occ	13	occ	46
Mountain Moonwort	*Botrychium montanum*	Eastside Oak Section	6	occ	6	occ	13	occ	46
Mt. Mazama Collomia	*Collomia mazama*	East Cascades Ecoregion	10	occ	10	occ	25	occ	40
Mt. Mazama Collomia	*Collomia mazama*	Upper Klamath Basin Section	10	occ	10	occ	25	occ	40
Newberry Cinquefoil	*Potentilla newberryi*	East Cascades Ecoregion	10	occ	10	occ	25	occ	40
Newberry Cinquefoil	*Potentilla newberryi*	Modoc Plateau Section	1	occ	1	occ	3	occ	33
Newberry Cinquefoil	*Potentilla newberryi*	Upper Klamath Basin Section	9	occ	9	occ	22	occ	41
Northern Daisy	*Trimorpha acris var. debilis*	East Cascades Ecoregion	2	occ	2	occ	25	occ	8
Northern Daisy	*Trimorpha acris var. debilis*	Modoc Plateau Section	2	occ	2	occ	25	occ	8
Northern Spleenwort	*Asplenium septentrionale*	East Cascades Ecoregion	16	occ	13	occ	13	occ	100
Northern Spleenwort	*Asplenium septentrionale*	Upper Klamath Basin Section	16	occ	13	occ	13	occ	100
Obscure Buttercup	*Ranunculus glaberrimus var. reconditus*	East Cascades Ecoregion	2	occ	2	occ	13	occ	15
Obscure Buttercup	*Ranunculus glaberrimus var. reconditus*	Eastside Oak Section	2	occ	2	occ	13	occ	15

East Cascades Targets and Goals Summary

Habitat Type
Level of Biological Organization

Taxon Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Obscure Indian-paintbrush	*Castilleja cryptantha*	East Cascades Ecoregion	2	occ	2	occ	25	occ	8
Obscure Indian-paintbrush	*Castilleja cryptantha*	Yakima Section	2	occ	2	occ	25	occ	8
Oregon Bolandra	*Bolandra oregana*	East Cascades Ecoregion	6	occ	6	occ	13	occ	46
Oregon Bolandra	*Bolandra oregana*	Eastside Oak Section	6	occ	6	occ	13	occ	46
Oregon Checker-mallow	*Sidalcea oregana var. calva*	East Cascades Ecoregion	4	occ	4	occ	50	occ	8
Oregon Checker-mallow	*Sidalcea oregana var. calva*	Wenatchee Section	4	occ	4	occ	50	occ	8
Oregon Fleabane	*Erigeron oreganus*	East Cascades Ecoregion	5	occ	5	occ	25	occ	20
Oregon Fleabane	*Erigeron oreganus*	Eastside Oak Section	5	occ	5	occ	25	occ	20
Oregon Semaphore Grass	*Lophochlaena oregona*	East Cascades Ecoregion	4	occ	4	occ	25	occ	16
Oregon Semaphore Grass	*Lophochlaena oregona*	Modoc Plateau Section	4	occ	4	occ	25	occ	16
Oregon Sullivantia	*Sullivantia oregana*	East Cascades Ecoregion	6	occ	6	occ	12	occ	50
Oregon Sullivantia	*Sullivantia oregana*	Eastside Oak Section	6	occ	6	occ	12	occ	50
Pale Alpine-forget-me-not	*Eritrichium nanum var. elongatum*	East Cascades Ecoregion	2	occ	2	occ	13	occ	15
Pale Alpine-forget-me-not	*Eritrichium nanum var. elongatum*	Wenatchee Section	2	occ	2	occ	13	occ	15
Pale Blue-eyed Grass	*Sisyrinchium sarmentosum*	East Cascades Ecoregion	7	occ	7	occ	25	occ	28
Pale Blue-eyed Grass	*Sisyrinchium sarmentosum*	Eastside Oak Section	7	occ	7	occ	25	occ	28
Pasqueflower	*Anemone nuttalliana*	East Cascades Ecoregion	4	occ	4	occ	13	occ	31
Pasqueflower	*Anemone nuttalliana*	Wenatchee Section	3	occ	3	occ	9	occ	33
Pasqueflower	*Anemone nuttalliana*	Yakima Section	1	occ	1	occ	4	occ	25
Peck's Milk-vetch	*Astragalus peckii*	East Cascades Ecoregion	23	occ	17	occ	25	occ	68
Peck's Milk-vetch	*Astragalus peckii*	Pumice and Pine Section	14	occ	10	occ	15	occ	67
Peck's Milk-vetch	*Astragalus peckii*	Upper Klamath Basin Section	9	occ	7	occ	10	occ	70
Peck's Penstemon	*Penstemon peckii*	East Cascades Ecoregion	62	occ	40	occ	50	occ	80
Peck's Penstemon	*Penstemon peckii*	Pumice and Pine Section	62	occ	40	occ	50	occ	80
Peculiar Moonwort	*Botrychium paradoxum*	East Cascades Ecoregion	2	occ	1	occ	13	occ	8
Peculiar Moonwort	*Botrychium paradoxum*	Wenatchee Section	2	occ	1	occ	13	occ	8
Playa Phacelia	*Phacelia inundata*	East Cascades Ecoregion	4	occ	4	occ	25	occ	16
Playa Phacelia	*Phacelia inundata*	Modoc Plateau Section	2	occ	2	occ	12	occ	17
Playa Phacelia	*Phacelia inundata*	Upper Klamath Basin Section	2	occ	2	occ	13	occ	15
Profuse-flowered Pogogyne	*Pogogyne floribunda*	East Cascades Ecoregion	54	occ	51	occ	50	occ	102
Profuse-flowered Pogogyne	*Pogogyne floribunda*	Modoc Plateau Section	37	occ	35	occ	34	occ	103
Profuse-flowered Pogogyne	*Pogogyne floribunda*	Upper Klamath Basin Section	17	occ	16	occ	16	occ	100
Prostrate Buckwheat	*Eriogonum prociduum*	East Cascades Ecoregion	28	occ	25	occ	25	occ	100
Prostrate Buckwheat	*Eriogonum prociduum*	Modoc Plateau Section	27	occ	25	occ	24	occ	104
Prostrate Buckwheat	*Eriogonum prociduum*	Upper Klamath Basin Section	1	occ	0	occ	1	occ	0
Pumice Grape Fern	*Botrychium pumicola*	East Cascades Ecoregion	189	occ	55	occ	50	occ	110

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Pumice Grape Fern	*Botrychium pumicola*	Pumice and Pine Section	147	occ	41	occ	38	occ	108
Pumice Grape Fern	*Botrychium pumicola*	Upper Klamath Basin Section	42	occ	14	occ	12	occ	117
Red-Root Yampah	*Perideridia erythrorhiza*	East Cascades Ecoregion	1	occ	1	occ	50	occ	2
Red-Root Yampah	*Perideridia erythrorhiza*	Upper Klamath Basin Section	1	occ	1	occ	50	occ	2
Rigid Peavine	*Lathyrus rigidus*	East Cascades Ecoregion	1	occ	0	occ	7	occ	0
Rigid Peavine	*Lathyrus rigidus*	Modoc Plateau Section	1	occ	0	occ	7	occ	0
Ross' Avens	*Geum rossii var. depressum*	East Cascades Ecoregion	2	occ	2	occ	50	occ	4
Ross' Avens	*Geum rossii var. depressum*	Wenatchee Section	2	occ	2	occ	50	occ	4
Scribner Grass	*Scribneria bolanderi*	East Cascades Ecoregion	13	occ	12	occ	25	occ	48
Scribner Grass	*Scribneria bolanderi*	Eastside Oak Section	13	occ	12	occ	25	occ	48
Seely's Silene	*Silene seelyi*	East Cascades Ecoregion	20	occ	17	occ	50	occ	34
Seely's Silene	*Silene seelyi*	Wenatchee Section	20	occ	17	occ	50	occ	34
Shasta buckwheat	*Eriogonum pyrolifolium var. pyrolifolium*	East Cascades Ecoregion	3	occ	3	occ	13	occ	23
Shasta buckwheat	*Eriogonum pyrolifolium var. pyrolifolium*	Modoc Plateau Section	1	occ	1	occ	4	occ	25
Shasta buckwheat	*Eriogonum pyrolifolium var. pyrolifolium*	Upper Klamath Basin Section	2	occ	2	occ	9	occ	22
Shockley's Ivesia	*Ivesia shockleyi*	East Cascades Ecoregion	1	occ	1	occ	7	occ	14
Shockley's Ivesia	*Ivesia shockleyi*	Modoc Plateau Section	1	occ	1	occ	7	occ	14
Short-podded Thelypodium	*Thelypodium brachycarpum*	East Cascades Ecoregion	4	occ	4	occ	25	occ	16
Short-podded Thelypodium	*Thelypodium brachycarpum*	Upper Klamath Basin Section	4	occ	4	occ	25	occ	16
Showy Stickseed	*Hackelia venusta*	East Cascades Ecoregion	4	occ	4	occ	50	occ	8
Showy Stickseed	*Hackelia venusta*	Wenatchee Section	4	occ	4	occ	50	occ	8
Sickle-pod Rockcress	*Arabis sparsiflora var. atrorubens*	East Cascades Ecoregion	15	occ	14	occ	25	occ	56
Sickle-pod Rockcress	*Arabis sparsiflora var. atrorubens*	Eastside Oak Section	15	occ	14	occ	25	occ	56
Sierra Cliff-brake	*Pellaea brachyptera*	East Cascades Ecoregion	5	occ	5	occ	13	occ	38
Sierra Cliff-brake	*Pellaea brachyptera*	Wenatchee Section	5	occ	5	occ	13	occ	38
Sierra Onion	*Allium campanulatum*	East Cascades Ecoregion	16	occ	15	occ	50	occ	30
Sierra Onion	*Allium campanulatum*	Eastside Oak Section	4	occ	4	occ	13	occ	31
Sierra Onion	*Allium campanulatum*	Modoc Plateau Section	4	occ	4	occ	12	occ	33
Sierra Onion	*Allium campanulatum*	Upper Klamath Basin Section	8	occ	7	occ	25	occ	28
Siskiyou False Hellebore	*Veratrum insolitum*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Siskiyou False Hellebore	*Veratrum insolitum*	Eastside Oak Section	1	occ	1	occ	13	occ	8
Slender Orcutt Grass	*Orcuttia tenuis*	East Cascades Ecoregion	16	occ	16	occ	25	occ	64
Slender Orcutt Grass	*Orcuttia tenuis*	Modoc Plateau Section	16	occ	16	occ	25	occ	64
Smoky Mountain Sedge	*Carex proposita*	East Cascades Ecoregion	7	occ	7	occ	13	occ	54
Smoky Mountain Sedge	*Carex proposita*	Wenatchee Section	7	occ	7	occ	13	occ	54

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Soldier Meadow Cinquefoil	*Potentilla basaltica*	East Cascades Ecoregion	2	occ	2	occ	50	occ	4
Soldier Meadow Cinquefoil	*Potentilla basaltica*	Modoc Plateau Section	2	occ	2	occ	50	occ	4
Strawberry Saxifrage	*Saxifragopsis fragarioides*	East Cascades Ecoregion	4	occ	4	occ	13	occ	31
Strawberry Saxifrage	*Saxifragopsis fragarioides*	Wenatchee Section	4	occ	4	occ	13	occ	31
Strict Blue-eyed-grass	*Sisyrinchium montanum*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Strict Blue-eyed-grass	*Sisyrinchium montanum*	Wenatchee Section	1	occ	1	occ	13	occ	8
Suksdorf's Desert-parsley	*Lomatium suksdorfii*	East Cascades Ecoregion	31	occ	30	occ	50	occ	60
Suksdorf's Desert-parsley	*Lomatium suksdorfii*	Eastside Oak Section	31	occ	30	occ	50	occ	60
Swamp Gentian	*Gentiana douglasiana*	East Cascades Ecoregion	2	occ	2	occ	13	occ	15
Swamp Gentian	*Gentiana douglasiana*	Yakima Section	2	occ	2	occ	13	occ	15
Talus Collomia	*Collomia debilis var. larsenii*	East Cascades Ecoregion	2	occ	2	occ	25	occ	8
Talus Collomia	*Collomia debilis var. larsenii*	Modoc Plateau Section	1	occ	1	occ	13	occ	8
Talus Collomia	*Collomia debilis var. larsenii*	Pumice and Pine Section	1	occ	1	occ	12	occ	8
Thompson's Clover	*Trifolium thompsonii*	East Cascades Ecoregion	7	occ	7	occ	13	occ	54
Thompson's Clover	*Trifolium thompsonii*	Wenatchee Section	7	occ	7	occ	13	occ	54
Thompson's Pincushion	*Chaenactis thompsonii*	East Cascades Ecoregion	30	occ	23	occ	50	occ	46
Thompson's Pincushion	*Chaenactis thompsonii*	Wenatchee Section	28	occ	23	occ	46	occ	50
Thompson's Pincushion	*Chaenactis thompsonii*	Yakima Section	2	occ	0	occ	4	occ	0
Tiny-flower Phacelia	*Phacelia minutissima*	East Cascades Ecoregion	1	occ	1	occ	13	occ	8
Tiny-flower Phacelia	*Phacelia minutissima*	Yakima Section	1	occ	1	occ	13	occ	8
Tricolor Monkey-flower	*Mimulus tricolor*	East Cascades Ecoregion	5	occ	5	occ	50	occ	10
Tricolor Monkey-flower	*Mimulus tricolor*	Pumice and Pine Section	1	occ	1	occ	10	occ	10
Tricolor Monkey-flower	*Mimulus tricolor*	Upper Klamath Basin Section	4	occ	4	occ	40	occ	10
Ute Ladies' Tresses	*Spiranthes diluvialis*	East Cascades Ecoregion	3	occ	3	occ	13	occ	23
Ute Ladies' Tresses	*Spiranthes diluvialis*	Wenatchee Section	3	occ	3	occ	13	occ	23
Violet Suksdorfia	*Suksdorfia violacea*	East Cascades Ecoregion	5	occ	5	occ	25	occ	20
Violet Suksdorfia	*Suksdorfia violacea*	Eastside Oak Section	5	occ	5	occ	25	occ	20
Warner Mountain Bedstraw	*Galium serpenticum ssp. warnerense*	East Cascades Ecoregion	17	occ	15	occ	50	occ	30
Warner Mountain Bedstraw	*Galium serpenticum ssp. warnerense*	Modoc Plateau Section	17	occ	15	occ	50	occ	30
Watson's Desert-parsley	*Lomatium watsonii*	East Cascades Ecoregion	7	occ	5	occ	25	occ	20
Watson's Desert-parsley	*Lomatium watsonii*	Eastside Oak Section	2	occ	2	occ	8	occ	25
Watson's Desert-parsley	*Lomatium watsonii*	Pumice and Pine Section	5	occ	3	occ	17	occ	18
Wenatchee Larkspur	*Delphinium viridescens*	East Cascades Ecoregion	12	occ	11	occ	50	occ	22
Wenatchee Larkspur	*Delphinium viridescens*	Wenatchee Section	11	occ	10	occ	45	occ	22
Wenatchee Larkspur	*Delphinium viridescens*	Yakima Section	1	occ	1	occ	5	occ	20
Western Dwarf-bullrush	*Lipocarpha occidentalis*	East Cascades Ecoregion	1	occ	0	occ	13	occ	0

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Western Dwarf-bullrush	*Lipocarpha occidentalis*	Upper Klamath Basin Section	1	occ	0	occ	13	occ	0
White Meconella	*Meconella oregana*	East Cascades Ecoregion	11	occ	11	occ	13	occ	85
White Meconella	*Meconella oregana*	Eastside Oak Section	11	occ	11	occ	13	occ	85
<u>Freshwater</u>									
<u>Species</u>									
<u>Crustaceans</u>									
Shasta (= Placid) Crayfish	*Pacifastacus fortis*	Pit EDU	12	occ	11	occ	50	occ	22
<u>Fishes</u>									
Bigeye Marbled Sculpin	*Cottus klamathensis macrops*	Pit EDU	7	occ	5	occ	2	occ	250
Blue Chub	*Gila coerulea*	Upper Klamath EDU	2	occ	2	occ	1	occ	200
Bull Trout - Deschutes EDU River RU	*Salvelinus confluentus pop. 2*	Deschutes EDU	1,069	km	467	km			
Bull Trout - Deschutes EDU River RU habitat	*Salvelinus confluentus pop. 2*	Deschutes EDU	10,579	score	7,833	scor	5290	score	148
Bull Trout - Hood River RU	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	56	km	49	km			
Bull Trout - Hood River RU habitat	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	74	score	65	scor	37	score	176
Bull Trout - Klamath River	*Salvelinus confluentus pop. 1*	Upper Klamath EDU	539	km	295	km			
Bull Trout - Klamath River habitat	*Salvelinus confluentus pop. 1*	Upper Klamath EDU	330	score	180	scor	165	score	109
Bull Trout - Lower Columbia River RU	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	64	km	44	km			
Bull Trout - Lower Columbia River RU habitat	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	147	score	82	scor	74	score	111
Bull Trout - Middle Columbia River RU	*Salvelinus confluentus pop. 2*	Yakima-Palouse EDU	363	km	227	km			
Bull Trout - Middle Columbia River RU habitat	*Salvelinus confluentus pop. 2*	Yakima-Palouse EDU	843	score	554	scor	422	score	131
Bull Trout - Odell Lake RU	*Salvelinus confluentus pop. 2*	Deschutes EDU	38	km	38	km			
Bull Trout - Odell Lake RU habitat	*Salvelinus confluentus pop. 2*	Deschutes EDU	2,624	score	2,624	scor	1312	score	200
Bull Trout - Upper Columbia River RU	*Salvelinus confluentus pop. 2*	Okanagan EDU	2,217	km	1,749	km			
Bull Trout - Upper Columbia River RU habitat	*Salvelinus confluentus pop. 2*	Okanagan EDU	2,623	score	1,970	scor	1312	score	150
Bull Trout - Willamette River RU	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	96	km	64	km			
Bull Trout - Willamette River RU habitat	*Salvelinus confluentus pop. 2*	Lower Columbia EDU	126	score	86	scor	63	score	137
Chinook - Lower Columbia River	*Oncorhynchus tshawytscha pop. 1*	Lower Columbia EDU	1,667	km	1,036	km			
Chinook - Lower Columbia River habitat	*Oncorhynchus tshawytscha pop. 1*	Lower Columbia EDU	2,994	score	1,959	scor	1496	score	131
Chinook - Middle Columbia River Spring Run	*Oncorhynchus tshawytscha pop. 19*	Lower Columbia EDU	299	km	180	km			
Chinook - Middle Columbia River Spring Run	*Oncorhynchus tshawytscha pop. 19*	Yakima-Palouse EDU	1,123	km	566	km			
Chinook - Middle Columbia River Spring Run habitat	*Oncorhynchus tshawytscha pop. 19*	Lower Columbia EDU	827	score	523	scor	413	score	127
Chinook - Middle Columbia River Spring Run habitat	*Oncorhynchus tshawytscha pop. 19*	Yakima-Palouse EDU	4,242	score	2,354	scor	2121	score	111
Chinook - Upper Columbia Summer/Fall Run	*Oncorhynchus tshawytscha*	Okanagan EDU	901	km	531	km			
Chinook - Upper Columbia Summer/Fall Run	*Oncorhynchus tshawytscha*	Yakima-Palouse EDU	223	km	86	km			
Chinook - Upper Columbia Summer/Fall Run habitat	*Oncorhynchus tshawytscha*	Okanagan EDU	6,977	score	3,491	scor	2093	score	167
Chinook - Upper Columbia Summer/Fall Run habitat	*Oncorhynchus tshawytscha*	Yakima-Palouse EDU	1,530	score	876	scor	765	score	115

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Chinook Salmon - Lower Columbia River Fall Run	*Oncorhynchus tshawytscha pop. 22*	Lower Columbia EDU	124	km	34	km			
Chinook Salmon - Lower Columbia River Fall Run habitat	*Oncorhynchus tshawytscha pop. 22*	Lower Columbia EDU	153	score	40	scor	76	score	53
Chinook Salmon - Lower Columbia River Spring Run	*Oncorhynchus tshawytscha pop. 21*	Lower Columbia EDU	1	km	1	km			
Chinook Salmon - Lower Columbia River Spring Run habitat	*Oncorhynchus tshawytscha pop. 21*	Lower Columbia EDU	2	score	2	scor	1	score	200
Chinook Salmon - Snake River Spring/Summer	*Onchorhynchus tshawytscha*	Yakima-Palouse EDU	107	km	68	km			
Chinook Salmon - Snake River Spring/Summer habitat	*Onchorhynchus tshawytscha*	Yakima-Palouse EDU	637	score	98	scor	318	score	31
Chinook Salmon - Upper Columbia River Spring Run	*Oncorhynchus tshawytscha pop. 12*	Okanagan EDU	844	km	524	km			
Chinook Salmon - Upper Columbia River Spring Run	*Oncorhynchus tshawytscha pop. 12*	Yakima-Palouse EDU	29	km	11	km			
Chinook Salmon - Upper Columbia River Spring Run habitat	*Oncorhynchus tshawytscha pop. 12*	Okanagan EDU	9,023	score	6,185	scor	2707	score	228
Chinook Salmon - Upper Columbia River Spring Run habitat	*Oncorhynchus tshawytscha pop. 12*	Yakima-Palouse EDU	146	score	55	scor	73	score	75
Chum Salmon - Columbia River	*Oncorhynchus keta pop. 3*	Lower Columbia EDU	567	km	352	km			
Chum Salmon - Columbia River habitat	*Oncorhynchus keta pop. 3*	Lower Columbia EDU	2,479	score	1,564	scor	1240	score	126
Coho Salmon - Lower Columbia River/SW Washington Coast	*Oncorhynchus kisutch pop. 1*	Lower Columbia EDU	3,581	km	2,029	km			
Coho Salmon - Lower Columbia River/SW Washington Coast habitat	*Oncorhynchus kisutch pop. 1*	Lower Columbia EDU	7,650	score	4,307	scor	3824	score	113
Cow Head Lake tui chub habitat	*Siphateles thalassinus "Warner Basin"*	Great Basin EDU	88	ha	88	ha	27	ha	326
Cutthroat Trout - Southwestern Washington/Columbia River	*Oncorhynchus clarki clarki pop. 2*	Lower Columbia EDU	2,236	km	1,300	km			
Cutthroat Trout - Southwestern Washington/Columbia River habitat	*Oncorhynchus clarki clarki pop. 2*	Lower Columbia EDU	11,149	score	6,495	scor	5574	score	117
Eagle Lake Rainbow Trout	*Oncorhynchus mykiss aquilarum pop. 5*	Honey Lake EDU	7	km	7	km			
Eagle Lake Rainbow Trout habitat	*Oncorhynchus mykiss aquilarum pop. 5*	Honey Lake EDU	9,801	score	9,679	scor	4900	score	198
Eagle Lake tui chub habitat	*Gila bicolor ssp. 1*	Honey Lake EDU	9,801	ha	9,679	ha	4900	ha	198
Goose Lake lamprey habitat	*Lampetra tridentata ssp. 1*	Pit EDU	29,869	ha	29,603	ha	8961	ha	330
Goose Lake sucker	*Catostomus occidentalis lacusanserinus*	Pit EDU	11	occ	8	occ	6	occ	133
Goose Lake tui chub habitat	*Siphateles thalassinus*	Pit EDU	27,784	ha	27,519	ha	13892	ha	198
Hardhead	*Mylopharodon conocephalus*	Pit EDU	9	occ	5	occ	3	occ	167
Inland Redband Trout	*Oncorhynchus mykiss gairdneri*	Deschutes EDU	405	km	253	km			
Inland Redband Trout habitat	*Oncorhynchus mykiss gairdneri*	Deschutes EDU	468	score	262	scor	234	score	112
Klamath Brook Lamprey habitat	*Entosphenus (Lampetra) ssp.*	Upper Klamath EDU	2,434	ha	1,515	ha	1217	ha	124
Klamath Lake Sculpin habitat	*Cottus princeps*	Upper Klamath EDU	2	ha	2	ha	1	ha	200
Klamath largescale sucker habitat	*Catostomus snyderi*	Upper Klamath EDU	29,885	ha	29,209	ha	14942	ha	195
Klamath smallscale sucker habitat (Jenny Creek pop)	*Catostomus rimiculus pop. 1*	Upper Klamath EDU	47	ha	47	ha	24	ha	196
Lahontan redside	*Richardsonius egregius*	Honey Lake EDU	2	occ	1	occ	1	occ	100
Lahontan Tui Chub	*Siphateles obesus oregonensis*	Great Basin EDU	4	occ	2	occ	1	occ	200
Lake Chub	*Couesius plumbeus*	Okanagan EDU	2	occ	1	occ	1	occ	100
Leopard Dace	*Rhinichthys falcatus*	Yakima-Palouse EDU	5	occ	1	occ	2	occ	50

East Cascades Targets and Goals Summary

Habitat Type Level of Biological Organization Taxon Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Lost River sucker habitat	*Deltistes luxatus*	Upper Klamath EDU	40,965	ha	40,073	ha	20482	ha	196
Miller Lake Lamprey	*Entosphenus minima*	Upper Klamath EDU	6	occ	5	occ	3	occ	167
Modoc Sucker	*Catostomus microps*	Pit EDU	8	occ	6	occ	2	occ	300
Mountain sucker	*Catostomus platyrhynchus*	Lower Columbia EDU	1	occ	1	occ			
Mountain sucker	*Catostomus platyrhynchus*	Okanagan EDU	2	occ	1	occ	1	occ	100
Mountain sucker	*Catostomus platyrhynchus*	Yakima-Palouse EDU	11	occ	3	occ	3	occ	100
Pacific Lamprey habitat	*Lampetra tridentata*	Lower Columbia EDU	46	ha	43	ha	14	ha	307
Pacific Lamprey habitat	*Lampetra tridentata*	Okanagan EDU	6	ha	3	ha	2	ha	150
Pacific Lamprey habitat	*Lampetra tridentata*	Yakima-Palouse EDU	6	ha	3	ha	2	ha	150
Pink Salmon - Odd-year	*Onchorhynchus gorbuscha*	Lower Columbia EDU	170	km	158	km			
Pink Salmon - Odd-year	*Onchorhynchus gorbuscha*	Yakima-Palouse EDU	168	km	0	km			
Pink Salmon - Odd-year habitat	*Onchorhynchus gorbuscha*	Lower Columbia EDU	846	score	788	scor	423	score	186
Pink Salmon - Odd-year habitat	*Onchorhynchus gorbuscha*	Yakima-Palouse EDU	841	score	0	scor	420	score	0
Pit Roach	*Lavinia symmetricus mitrulus*	Pit EDU	14	occ	10	occ	4	occ	250
Pit Sculpin habitat	*Cottus pitensis*	Pit EDU	33,838	ha	10,809	ha	10151	ha	106
Pit-Goose Brook Lamprey	*Entosphenus (Lampetra) lethophagus*	Pit EDU	5	occ	2	occ	2	occ	100
Pygmy whitefish	*Prosopium coulteri*	Okanagan EDU	2	occ	1	occ	1	occ	100
Pygmy whitefish	*Prosopium coulteri*	Yakima-Palouse EDU	3	occ	3	occ	2	occ	150
Redband Trout - Goose Lake	*Oncorhynchus mykiss pop. 6*	Pit EDU	120	km	102	km			
Redband Trout - Goose Lake habitat	*Oncorhynchus mykiss pop. 6*	Pit EDU	27,852	score	27,585	scor	8356	score	330
Redband Trout - Jenny Creek	*Oncorhynchus mykiss pop. 2*	Upper Klamath EDU	61	km	56	km			
Redband Trout - Jenny Creek habitat	*Oncorhynchus mykiss pop. 2*	Upper Klamath EDU	3,403	score	3,101	scor	1702	score	182
Redband Trout - Klamath Basin	*Oncorhynchus mykiss pop. 19*	Upper Klamath EDU	67	km	42	km			
Redband Trout - Klamath Basin habitat	*Oncorhynchus mykiss pop. 19*	Upper Klamath EDU	87	score	55	scor	44	score	125
Redband Trout - McCloud River	*Oncorhynchus mykiss pop. 7*	Pit EDU	16	km	7	km			
Redband Trout - McCloud River habitat	*Oncorhynchus mykiss pop. 7*	Pit EDU	471	score	302	scor	236	score	128
Redband Trout - Oregon Great Basin	*Oncorhynchus mykiss pop. 18*	Great Basin EDU	41	km	26	km			
Redband Trout - Oregon Great Basin habitat	*Oncorhynchus mykiss pop. 18*	Great Basin EDU	52	score	33	scor	16	score	206
Redband Trout - Warner Valley	*Oncorhynchus mykiss pop. 4*	Great Basin EDU	33	km	32	km			
Redband Trout - Warner Valley habitat	*Oncorhynchus mykiss pop. 4*	Great Basin EDU	20,286	score	12,045	scor	10143	score	119
Rough Sculpin habitat	*Cottus asperrimus*	Pit EDU	2,554	ha	1,990	ha	1277	ha	156
Sand Roller	*Percopsis transmontana*	Lower Columbia EDU	1	occ	1	occ			
Sand Roller	*Percopsis transmontana*	Yakima-Palouse EDU	3	occ	2	occ	1	occ	200
Shortnose Sucker habitat	*Chasmistes brevirostris*	Upper Klamath EDU	77,851	ha	57,620	ha	38926	ha	148
Slender Sculpin	*Cottus tenuis*	Upper Klamath EDU	11	occ	10	occ	6	occ	167
Sockeye Salmon - Lake Wenatchee	*Onchorhynchus nerka*	Okanagan EDU	44	km	34	km			

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Sockeye Salmon - Lake Wenatchee habitat	*Onchorhynchus nerka*	Okanagan EDU	220	score	172	scor	110	score	156
Sockeye Salmon - Okanagan River	*Onchorhynchus nerka*	Okanagan EDU	21	km	14	km			
Sockeye Salmon - Okanagan River habitat	*Onchorhynchus nerka*	Okanagan EDU	107	score	68	scor	54	score	126
Steelhead - Lower Columbia	*Oncorhynchus mykiss (pops.14, 26 & 27)*	Lower Columbia EDU	3,494	km	2,090	km			
Steelhead - Lower Columbia habitat	*Oncorhynchus mykiss (pops.14, 26 & 27)*	Lower Columbia EDU	8,103	score	5,353	scor	4050	score	132
Steelhead - Middle Columbia habitat pop. 17	*Oncorhynchus mykiss pop. 17*	Yakima-Palouse EDU	3,691	score	2,254	scor	1846	score	122
Steelhead - Middle Columbia habitat pops. 17, 28 & 29	*Oncorhynchus mykiss (pops. 17, 28 & 29)*	Lower Columbia EDU	2,702	score	1,830	scor	1351	score	135
Steelhead - Middle Columbia pop. 17	*Oncorhynchus mykiss pop. 17*	Yakima-Palouse EDU	1,629	km	772	km			
Steelhead - Middle Columbia pops. 17, 28 & 29	*Oncorhynchus mykiss (pops. 17, 28 & 29)*	Lower Columbia EDU	638	km	388	km			
Steelhead - Middle Columbia River Summer Run	*Oncorhynchus mykiss pop. 28*	Deschutes EDU	776	km	496	km			
Steelhead - Middle Columbia River Summer Run habitat	*Oncorhynchus mykiss pop. 28*	Deschutes EDU	967	score	618	scor	484	score	128
Steelhead - Snake River Basin	*Oncorhynchus mykiss pop. 13*	Yakima-Palouse EDU	114	km	14	km			
Steelhead - Snake River Basin habitat	*Oncorhynchus mykiss pop. 13*	Yakima-Palouse EDU	570	score	70	scor	285	score	25
Steelhead - Southwest Washington	*Oncorhynchus mykiss*	Lower Columbia EDU	744	km	311	km			
Steelhead - Southwest Washington habitat	*Oncorhynchus mykiss*	Lower Columbia EDU	3,595	score	1,558	scor	1798	score	87
Steelhead - Upper Columbia	*Oncorhynchus mykiss pop. 12*	Okanagan EDU	1,487	km	941	km			
Steelhead - Upper Columbia habitat	*Oncorhynchus mykiss pop. 12*	Okanagan EDU	5,950	score	3,802	scor	2975	score	128
Summer Basin Tui Chub	*Gila bicolor ssp. 13*	Great Basin EDU	6	occ	6	occ	2	occ	300
Tahoe Sucker habitat	*Catostomus tahoensis*	Honey Lake EDU	1,342	ha	1,062	ha	403	ha	264
Tui Chub	*Gila bicolor*	Lower Columbia EDU	1	occ	1	occ			
Tui Chub	*Gila bicolor*	Yakima-Palouse EDU	4	occ	1	occ	1	occ	100
Umatilla dace	*Rhinichthys umatilla*	Okanagan EDU	3	occ	3	occ	1	occ	300
Umatilla dace	*Rhinichthys umatilla*	Yakima-Palouse EDU	10	occ	3	occ	3	occ	100
Warner Sucker habitat	*Catostomus warnerensis*	Great Basin EDU	56	ha	42	ha	28	ha	150
Western Brook Lamprey habitat	*Lamptera richardsoni*	Lower Columbia EDU	202	ha	145	ha	61	ha	238
Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi*	Okanagan EDU	1,271	km	840	km			
Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi*	Yakima-Palouse EDU	926	km	559	km			
Westslope Cutthroat Trout habitat	*Oncorhynchus clarki lewisi*	Okanagan EDU	6,341	score	4,196	scor	3170	score	132
Westslope Cutthroat Trout habitat	*Oncorhynchus clarki lewisi*	Yakima-Palouse EDU	4,627	score	2,795	scor	1388	score	201
White Sturgeon habitat - Columbia River	*Acipenser transmontanus*	Lower Columbia EDU	3	ha	3	ha	1	ha	300
Mollusks									
Archimedes Pyrg	*Pyrgulopsis archimedis*	Upper Klamath EDU	7	occ	6	occ	50	occ	12
California Floater	*Anodonta californiensis*	Upper Klamath EDU	1	occ	1	occ	13	occ	8
Casebeer Pebblesnail	*Fluminicola sp. 2*	Upper Klamath EDU	1	occ	1	occ	50	occ	2
Columbia Oregonian	*Cryptomastix hendersoni*	Deschutes EDU	5	occ	5	occ	3	occ	167

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Columbia Oregonian	*Cryptomastix hendersoni*	Lower Columbia EDU	3	occ	3	occ	22	occ	14
Crooked Creek Pebblesnail	*Fluminicola sp. 20*	Upper Klamath EDU	29	occ	26	occ	50	occ	52
Dall Rams-horn	*Vorticifex effusus dalli*	Upper Klamath EDU	3	occ	3	occ	50	occ	6
Diminutive Pebblesnail	*Fluminicola sp. 3*	Upper Klamath EDU	2	occ	2	occ	50	occ	4
Fall Creek Pebblesnail	*Fluminicola sp. 4*	Upper Klamath EDU	3	occ	3	occ	50	occ	6
Keene Creek Pebblesnail	*Fluminicola sp. 19*	Upper Klamath EDU	17	occ	14	occ	50	occ	28
Klamath Lake Springtail	*Pyrgulopsis sp. 9*	Upper Klamath EDU	4	occ	4	occ	50	occ	8
Klamath Pebblesnail	*Fluminicola sp. 5*	Upper Klamath EDU	15	occ	11	occ	50	occ	22
Klamath Rams-horn	*Vorticifex klamathensis klamathensis*	Upper Klamath EDU	9	occ	8	occ	50	occ	16
Klamath Rim Pebblesnail	*Fluminicola sp. 6*	Upper Klamath EDU	1	occ	1	occ	50	occ	2
Lake of the Woods Pebblesnail	*Fluminicola sp. 7*	Upper Klamath EDU	11	occ	10	occ	50	occ	20
Lined Rams-horn	*Vorticifex effusus diagonalis*	Upper Klamath EDU	5	occ	4	occ	50	occ	8
Lost River Pebblesnail	*Fluminicola sp. 8*	Upper Klamath EDU	8	occ	8	occ	50	occ	16
Lost River Springsnail	*Pyrgulopsis sp. 7*	Upper Klamath EDU	10	occ	9	occ	50	occ	18
Modoc Pebblesnail	*Fluminicola modoci*	Pit EDU	3	occ	3	occ	50	occ	6
Montane Peaclam	*Pisidium ultramontanum*	Upper Klamath EDU	5	occ	4	occ	50	occ	8
Nerite Pebblesnail	*Fluminicola sp. 11*	Upper Klamath EDU	3	occ	3	occ	50	occ	6
Odessa Pebblesnail	*Fluminicola sp. 12*	Upper Klamath EDU	4	occ	4	occ	50	occ	8
Ouxy Spring Pebblesnail	*Fluminicola sp. 13*	Upper Klamath EDU	1	occ	1	occ	50	occ	2
Scale Lanx	*Lanx klamathensis*	Upper Klamath EDU	7	occ	7	occ	50	occ	14
Shortface Lanx	*Fisherola nuttalli*	Lower Columbia EDU	1	occ	1	occ	13	occ	8
Sinitsin Rams-horn	*Vorticifex klamathensis sinitsini*	Upper Klamath EDU	2	occ	2	occ	50	occ	4
Tall Pebblesnail	*Fluminicola sp. 14*	Upper Klamath EDU	1	occ	1	occ	50	occ	2
Tiger Lily Pebblesnail	*Fluminicola sp. 15*	Upper Klamath EDU	14	occ	14	occ	50	occ	28
Toothed Pebblesnail	*Fluminicola sp. 16*	Upper Klamath EDU	2	occ	2	occ	50	occ	4
Topaz Juga	*Juga acutifilosa*	Upper Klamath EDU	2	occ	2	occ	50	occ	4
Western Ridged Mussel	*Gonidea angulata*	Upper Klamath EDU	2	occ	1	occ	13	occ	8
Wood River Pebblesnail	*Fluminicola sp. 18*	Upper Klamath EDU	11	occ	10	occ	50	occ	20
Vascular Plants									
Leafy Pondweed	*Potamogeton foliosus*	Okanagan EDU	9	occ	6	occ	7	occ	86
Leafy Pondweed	*Potamogeton foliosus*	Yakima-Palouse EDU	7	occ	4	occ	7	occ	57
Water Lobelia	*Lobelia dortmanna*	Deschutes EDU	1	occ	1	occ	13	occ	8
Freshwater Ecological Systems Class 1									
(1) Small-order tributaries - alluvial, low-elevation, mixed-gradient		Yakima-Palouse EDU	27	occ	10	occ	8	occ	125

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
(109) Headwaters, volcanics, mid/high-elevation, mod/high-gradient		Lower Columbia EDU	50	occ	29	occ	15	occ	193
(138) Small tributaries, basalt, low-elevation, mixed-gradient		Lower Columbia EDU	12	occ	7	occ	4	occ	175
(18) Channeled scablands - unconsolidated, low-elevation, low-gradient		Yakima-Palouse EDU	25	occ	8	occ	7	occ	114
(192) Estuary tributaries, siltstone, low-elevation, mixed-gradient		Lower Columbia EDU	5	occ	1	occ	1	occ	100
(2) Headwaters, basalt, mid-elevation, mod/high-gradient		Lower Columbia EDU	72	occ	32	occ	22	occ	145
(2) Yakima forested small-order tributaries - sedimentary, mid-elevation, steep gradient		Yakima-Palouse EDU	20	occ	8	occ	6	occ	133
(208) Small-order mainstem tributaries - sedimentary, low-elevation, mod/high gradient		Yakima-Palouse EDU	11	occ	4	occ	3	occ	133
(21) Small tributaries, outwash, low-elevation, low-gradient		Lower Columbia EDU	19	occ	11	occ	6	occ	183
(223) Pasco/Quincy basin small-order tributaries - sedimentary clastics, low-elevation, low-gradient		Yakima-Palouse EDU	7	occ	2	occ	2	occ	100
(226) Headwaters, shale, mid-elevation, moderate-gradient		Lower Columbia EDU	6	occ	2	occ	2	occ	100
(24) Channeled scablands - basalt, low-elevation, low-gradient		Yakima-Palouse EDU	18	occ	6	occ	5	occ	120
(39) Headwaters, granitic, high-elevation, high-gradient		Lower Columbia EDU	7	occ	7	occ	2	occ	350
(489) Small-order mainstem tributaries - loess-dominated, low-elevation, mod/high gradient		Yakima-Palouse EDU	19	occ	6	occ	6	occ	100
(5) Headwaters - basalt, mid-elevation, high-gradient		Yakima-Palouse EDU	64	occ	31	occ	19	occ	163
(55) Headwaters, basalt, mid-elevation, mixed-gradient		Lower Columbia EDU	42	occ	18	occ	13	occ	138
(6) Headwaters, basalt, mid-elevation, very high-gradient		Lower Columbia EDU	30	occ	12	occ	9	occ	133
(6) Yakima forested headwaters - volcanic, mid-elevation, steep-gradient		Yakima-Palouse EDU	42	occ	25	occ	13	occ	192
(72) Yakima forested headwaters - mixed geology, mid/high-elevation, steep-gradient		Yakima-Palouse EDU	8	occ	3	occ	2	occ	150
(725) Small-order tributaries - mixed geology, mixed-elevation, steep-gradient		Yakima-Palouse EDU	2	occ	1	occ	1	occ	100
(88) Headwaters, volcanics, mid-elevation, varied-gradient		Lower Columbia EDU	15	occ	5	occ	4	occ	125
(901) Yakima forested small-order tributaries - alluvial, low-elevation, mixed gradient		Yakima-Palouse EDU	2	occ	1	occ	1	occ	100
(902) Palouse headwaters - loess-dominated, mid-elevation, mixed-gradient		Yakima-Palouse EDU	15	occ	5	occ	4	occ	125
(904) Headwaters, sandstone, low-elevation, varied gradient		Lower Columbia EDU	36	occ	15	occ	11	occ	136
(905) Headwaters , basalt, high-elevation, mod/high-gradient		Lower Columbia EDU	104	occ	62	occ	31	occ	200
(907) Headwaters, basalt, mid-elevation, high-gradient		Lower Columbia EDU	73	occ	32	occ	22	occ	145
(911) Eastside headwaters, basalt, mid-elevation, high-gradient		Lower Columbia EDU	40	occ	17	occ	12	occ	142
(920) Small tributaries, alluvial, low-elevation, low/mod-gradient		Lower Columbia EDU	11	occ	5	occ	3	occ	167
(921) Yakima small-order tributaries - fine-clastic, low/mid-elevation, mixed gradient		Yakima-Palouse EDU	3	occ	1	occ	1	occ	100
(922) Headwaters - basalt, low/mid-elevation, mixed-gradient		Yakima-Palouse EDU	8	occ	3	occ	2	occ	150

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
(931) Headwaters - loess-dominated, low-elevation, low-gradient		Yakima-Palouse EDU	179 occ	54 occ	54 occ	100
(932) Palouse hills - loess-dominated, low-elevation, low-gradient		Yakima-Palouse EDU	46 occ	14 occ	14 occ	100
(944) Small-order tributaries - basalt, low-elevation, high-gradient		Yakima-Palouse EDU	46 occ	17 occ	14 occ	121
(949) Palouse forested headwaters - mixed geology, mid-elevation, mixed-gradient		Yakima-Palouse EDU	15 occ	4 occ	4 occ	100
(951) Small-order tributaries - loess-dominated, low-elevation, moderate-gradient		Yakima-Palouse EDU	26 occ	9 occ	8 occ	113
(952) Palouse hills small-order tributaries - loess-dominated, low-elevation, moderate-gradient		Yakima-Palouse EDU	4 occ	1 occ	1 occ	100
(963) Channeled scablands - basalt, low-elevation, moderate-gradient		Yakima-Palouse EDU	26 occ	9 occ	8 occ	113
(981) Small-order tributaries - basalt, low-elevation, high-gradient		Yakima-Palouse EDU	23 occ	8 occ	7 occ	114
(982) Small-order tributaries - basalt, low-elevation, low-mod-gradient		Yakima-Palouse EDU	37 occ	11 occ	11 occ	100
FSOK1.1		Okanagan EDU	10 occ	10 occ	3 occ	333
FSOK1.10		Okanagan EDU	13 occ	10 occ	4 occ	250
FSOK1.101		Okanagan EDU	4 occ	0 occ	1 occ	0
FSOK1.106		Okanagan EDU	18 occ	14 occ	5 occ	280
FSOK1.107		Okanagan EDU	13 occ	2 occ	4 occ	50
FSOK1.1305		Okanagan EDU	3 occ	2 occ	1 occ	200
FSOK1.145		Okanagan EDU	31 occ	12 occ	9 occ	133
FSOK1.153		Okanagan EDU	27 occ	4 occ	8 occ	50
FSOK1.188		Okanagan EDU	74 occ	19 occ	22 occ	86
FSOK1.197		Okanagan EDU	56 occ	14 occ	17 occ	82
FSOK1.236		Okanagan EDU	5 occ	1 occ	1 occ	100
FSOK1.25		Okanagan EDU	47 occ	7 occ	14 occ	50
FSOK1.275		Okanagan EDU	66 occ	24 occ	20 occ	120
FSOK1.280		Okanagan EDU	17 occ	7 occ	5 occ	140
FSOK1.295		Okanagan EDU	20 occ	7 occ	6 occ	117
FSOK1.296		Okanagan EDU	53 occ	17 occ	16 occ	106
FSOK1.3		Okanagan EDU	180 occ	55 occ	54 occ	102
FSOK1.326		Okanagan EDU	19 occ	9 occ	6 occ	150
FSOK1.4		Okanagan EDU	3 occ	1 occ	1 occ	100
FSOK1.40		Okanagan EDU	17 occ	11 occ	5 occ	220
FSOK1.403		Okanagan EDU	64 occ	15 occ	19 occ	79
FSOK1.56		Okanagan EDU	79 occ	34 occ	24 occ	142
FSOK1.57		Okanagan EDU	15 occ	4 occ	4 occ	100

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
FSOK1.6		Okanagan EDU	19 occ	16 occ	6 occ	267
FSOK1.61		Okanagan EDU	49 occ	16 occ	15 occ	107
FSOK1.80		Okanagan EDU	157 occ	49 occ	47 occ	104
FSOK1.84		Okanagan EDU	16 occ	11 occ	5 occ	220
FSOK1.99		Okanagan EDU	9 occ	1 occ	3 occ	33
Groundwater dominated, mid elevation, basalts and Mazama ash, low stream gradient		Upper Klamath EDU	2 occ	1 occ	1 occ	100
Groundwater influenced, low to mid elevation, mixed geology (volcanics and sediments or alluvium), variable stream gradient		Deschutes EDU	12 occ	6 occ	4 occ	150
Groundwater influenced, low to mid elevation, volcanics with minor glacial influence, variable stream gradient		Deschutes EDU	15 occ	6 occ	4 occ	150
Groundwater influenced, low to mid elevation, volcanics, med to high gradient		Deschutes EDU	61 occ	23 occ	18 occ	128
Groundwater influenced, mid elevation, glacially dominated geology, variable gradient		Deschutes EDU	12 occ	8 occ	4 occ	200
Groundwater influenced, mid elevation, sediments, low stream gradient		Deschutes EDU	4 occ	1 occ	1 occ	100
Groundwater influenced, mid elevation, volcanics with minor sediment inclusions, variable stream gradient		Deschutes EDU	15 occ	9 occ	4 occ	225
Groundwater influenced, mid elevation, volcanics with minor sediment inclusions, variable stream gradient, unconnected		Deschutes EDU	22 occ	8 occ	7 occ	114
Groundwater influenced, mid elevation, volcanics with significant glacial influence, med to high stream gradient		Deschutes EDU	10 occ	7 occ	3 occ	233
Groundwater influenced, mid elevation, volcanics, low stream gradient		Deschutes EDU	11 occ	2 occ	3 occ	67
Groundwater influenced, mid to high elevation, volcanics with minor glacial influence, med to high stream gradient		Deschutes EDU	15 occ	11 occ	4 occ	275
Groundwater influenced, mid to high elevation, volcanics with minor glacial influence, med to high stream gradient, unconnected		Deschutes EDU	14 occ	5 occ	4 occ	125
Low elevation, sediment or lacustrine, low stream gradient		Upper Klamath EDU	12 occ	7 occ	4 occ	175
Low-mid elevation, basalts and lacustrine, variable stream gradient		Upper Klamath EDU	8 occ	4 occ	2 occ	200
Low-mid elevation, basalts and lacustrine, variable stream gradient, unconnected		Upper Klamath EDU	2 occ	1 occ	1 occ	100
Low-mid elevation, basalts, mod-high stream gradient		Upper Klamath EDU	21 occ	9 occ	6 occ	150
Low-mid elevation, sediments and basalts, low-moderate stream gradient		Upper Klamath EDU	3 occ	1 occ	1 occ	100
Mid elevation, basalts, low-mod stream gradient		Upper Klamath EDU	96 occ	38 occ	29 occ	131
Mid elevation, basalts, low-mod stream gradient, unconnected		Upper Klamath EDU	39 occ	17 occ	12 occ	142
Mid elevation, basalts, mod-high stream gradient		Upper Klamath EDU	30 occ	13 occ	9 occ	144
Mid elevation, basalts, mod-high stream gradient, unconnectec		Upper Klamath EDU	14 occ	4 occ	4 occ	100
Mid elevation, Mazama ash and rhyolite, variable stream gradient, unconnected		Upper Klamath EDU	3 occ	3 occ	1 occ	300

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known	Captured in Porfolio	Conservation Goal	% of Goal Captured
Mid elevation, Mazama ash, low-mod stream gradient		Upper Klamath EDU	4 occ	1 occ	1 occ	100
Mid elevation, Mazama ash, low-mod stream gradient, unconnected		Upper Klamath EDU	8 occ	5 occ	2 occ	250
Mid elevation, mixed basalts and rhyolites, variable stream gradient		Upper Klamath EDU	11 occ	4 occ	3 occ	133
Mid elevation, mixed geology (rhyolites, basalts, sediments, and lacustrine), low-mod stream gradient		Upper Klamath EDU	6 occ	3 occ	2 occ	150
Mid elevation, mixed Mazama ash and basalts, low stream gradient		Upper Klamath EDU	15 occ	6 occ	4 occ	150
Mid elevation, mixed Mazama ash and basalts, low stream gradient, unconnected		Upper Klamath EDU	10 occ	4 occ	3 occ	133
Mid-high elevation, basalts, mod-high stream gradient		Upper Klamath EDU	15 occ	9 occ	4 occ	225
Mid-high elevation, basalts, mod-high stream gradient, unconnected		Upper Klamath EDU	2 occ	2 occ	1 occ	200
Surface water dominated, high elevation, alluvium and sediments, high stream gradient, unconnected		Pit EDU	2 occ	2 occ	1 occ	200
Surface water dominated, high elevation, pyroclastic silicic, variable stream gradient		Pit EDU	3 occ	3 occ	1 occ	300
Surface water dominated, high elevation, pyroclastic silicic, variable stream gradient, unconnected		Pit EDU	3 occ	2 occ	1 occ	200
Surface water dominated, low elevation, alluvium and pyroclastic silicic, low stream gradient		Pit EDU	5 occ	2 occ	1 occ	200
Surface water dominated, low elevation, pyroclastic silicic, low to mod stream gradient		Pit EDU	18 occ	9 occ	5 occ	180
Surface water dominated, low elevation, pyroclastic silicic, low to mod stream gradient, unconnected		Pit EDU	9 occ	3 occ	3 occ	100
Surface water dominated, low elevation, sediments, mod to high stream gradient		Pit EDU	15 occ	5 occ	4 occ	125
Surface water dominated, low elevation, volcanics, variable stream gradient		Deschutes EDU	53 occ	20 occ	16 occ	125
Surface water dominated, low to mid elevation, alluvium, variable stream gradient		Pit EDU	4 occ	2 occ	1 occ	200
Surface water dominated, low to mid elevation, pyroclastic silicic with some alluvium and sediments, variable stream gradient		Pit EDU	37 occ	11 occ	11 occ	100
Surface water dominated, low to mid elevation, pyroclastic silicic with some alluvium and sediments, variable stream gradient, unconnected		Pit EDU	6 occ	3 occ	2 occ	150
Surface water dominated, low to mid elevation, serpentine and intrusives, mod to high stream gradient		Pit EDU	11 occ	3 occ	3 occ	100
Surface water dominated, mid elevation, alluvium, intrusives and serpentine, mod to high stream gradient		Pit EDU	3 occ	3 occ	1 occ	300
Surface water dominated, mid elevation, alluvium, intrusives and serpentine, mod to high stream gradient, unconnected		Pit EDU	2 occ	2 occ	1 occ	200
Surface water dominated, mid elevation, mixed geology (sediments and volcanics), variable stream gradient		Deschutes EDU	4 occ	2 occ	1 occ	200

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
Surface water dominated, mid elevation, mixed geology (sediments, volcanics and alluvium), mid to high stream gradient		Deschutes EDU	16	occ	6	occ	5	occ	120
Surface water dominated, mid elevation, pyroclastic silicic geology, variable stream gradient		Pit EDU	56	occ	23	occ	17	occ	135
Surface water dominated, mid elevation, pyroclastic silicic geology, variable stream gradient, unconnected		Pit EDU	29	occ	13	occ	9	occ	144
Surface water dominated, mid elevation, pyroclastic silicic with some alluvium and sediments, low to mod stream gradient		Pit EDU	19	occ	9	occ	6	occ	150
Surface water dominated, mid elevation, pyroclastic silicic with some alluvium and sediments, low to mod stream gradient, unconnected		Pit EDU	6	occ	3	occ	2	occ	150
Surface water dominated, mid elevation, volcanics with minor sediment inclusions, high stream gradient		Deschutes EDU	49	occ	18	occ	15	occ	120
Surface water dominated, mid elevation, volcanics with minor sediment inclusions, high stream gradient, unconnected		Deschutes EDU	7	occ	2	occ	2	occ	100
Surface water dominated, mid elevation, volcanics, variable stream gradient		Deschutes EDU	85	occ	27	occ	25	occ	108
Surface water dominated, mid elevation, volcanics, variable stream gradient, unconnected		Deschutes EDU	30	occ	13	occ	9	occ	144
Surface water dominated, mid to high elevation, mixed pyroclastic silicic, alluvium, and sediments, variable stream gradient		Pit EDU	8	occ	4	occ	2	occ	200
Surface water dominated, mid to high elevation, pyroclastic silicic, mod to high stream gradient		Pit EDU	50	occ	24	occ	15	occ	160
Surface water dominated, mid to high elevation, pyroclastic silicic, mod to high stream gradient, unconnected		Pit EDU	9	occ	4	occ	3	occ	133
Surface water dominated, mid to high elevation, sediments with some alluvium and pyroclastic silicic, low to mod stream gradient		Pit EDU	3	occ	1	occ	1	occ	100
Surface water dominated, mid-elevation, sedimentary, low-mod stream gradient		Pit EDU	2	occ	2	occ	1	occ	200
Surface water dominated, mid-elevation, volcanic, low stream gradient		Pit EDU	2	occ	1	occ	1	occ	100
<u>Communities</u>									
Columbia Plateau Vernal Pool Community	*Columbia Plateau Vernal Pool*	Lower Columbia EDU	2	occ	2	occ	2	occ	100
Goose Lake Drainage Redband Trout/Lamprey Spawning Stream Community	*Goose Lake Drainage Redband Trout/Lamprey Spawning Stream*	Pit EDU	402	ha	387	ha	121	ha	320
Goose Lake Drainage Resident Redband Trout Stream Community	*Goose Lake Drainage Resident Redband Trout Stream*	Pit EDU	399	ha	224	ha	120	ha	187
Goose Lake Drainage Speckled Dace/Goose Lake Sucker Stream Community	*Goose Lake Drainage Speckled Dace/Goose Lake Sucker Stream*	Pit EDU	1	occ	1	occ			
Goose Lake Drainage Valley Tui Chub Stream Community	*Goose Lake Drainage Valley Tui Chub Stream*	Pit EDU	6	ha	6	ha	2	ha	300
North Pacific Bog and Fen Community	*North Pacific Bog and Fen*	Deschutes EDU	5	occ	5	occ	3	occ	167
North Pacific Bog and Fen Community	*North Pacific Bog and Fen*	Lower Columbia EDU	23	occ	16	occ	11	occ	145

East Cascades Targets and Goals Summary

Habitat Type / Level of Biological Organization / Taxon / Common Name	Scientific Name	Geographic Section	Amount Known		Captured in Porfolio		Conservation Goal		% of Goal Captured
North Pacific Bog and Fen Community	*North Pacific Bog and Fen*	Upper Klamath EDU	9	occ	9	occ	4	occ	225
North Pacific Fen Community	*Fen*	Pit EDU	1	occ	1	occ	1	occ	100
North Pacific Shrub Swamp Community	*North Pacific Shrub Swamp*	Deschutes EDU	2	occ	2	occ	2	occ	100
North Pacific Shrub Swamp Community	*North Pacific Shrub Swamp*	Lower Columbia EDU	9	occ	8	occ	4	occ	200
North Pacific Shrub Swamp Community	*North Pacific Shrub Swamp*	Upper Klamath EDU	4	occ	4	occ	3	occ	133
Northern Basalt Flow Vernal Pool Community	*Northern Basalt Flow Vernal Pool*	Pit EDU	5	occ	4	occ	3	occ	133
Northern Basalt Flow Vernal Pool Community	*Northern Basalt Flow Vernal Pool*	Upper Klamath EDU	12	occ	9	occ	6	occ	150
Northern Columbia Plateau Basalt Pothole Ponds Community	*Northern Columbia Plateau Basalt Pothole Ponds*	Lower Columbia EDU	3	occ	3	occ	3	occ	100
Pit R. Drainage Rough Sculpin/Shasta Crayfish Spring Stream Community	*Pit R. Drainage Rough Sculpin/Shasta Crayfish Spring Stream*	Pit EDU	1,329	ha	1,276	ha	399	ha	320
Pit River Drainage Modoc Sucker Stream Community	*Pit River Drainage Modoc Sucker Stream*	Pit EDU	571	ha	512	ha	171	ha	299
Pit River Drainage Speckled Dace/Pit Sculpin Stream Community	*Pit River Drainage Speckled Dace/Pit Sculpin Stream*	Pit EDU	287	ha	138	ha	86	ha	160
Pit River Drainage Squawfish/Sucker Valley Stream Community	*Pit River Drainage Squawfish/Sucker Valley Stream*	Pit EDU	331	ha	141	ha	99	ha	142
Temperate Pacific Freshwater Aquatic Bed Community	*Temperate Pacific Freshwater Aquatic Bed*	Lower Columbia EDU	2	occ	2	occ	2	occ	100
Temperate Pacific Freshwater Emergent Marsh Community	*Temperate Pacific Freshwater Emergent Marsh*	Deschutes EDU	4	occ	4	occ	3	occ	133
Temperate Pacific Freshwater Emergent Marsh Community	*Temperate Pacific Freshwater Emergent Marsh*	Lower Columbia EDU	6	occ	3	occ	3	occ	100
Temperate Pacific Freshwater Emergent Marsh Community	*Temperate Pacific Freshwater Emergent Marsh*	Upper Klamath EDU	9	occ	9	occ	4	occ	225
Temperate Pacific Montane Wet Meadow Community	*Temperate Pacific Montane Wet Meadow*	Deschutes EDU	5	occ	5	occ	3	occ	167
Temperate Pacific Montane Wet Meadow Community	*Temperate Pacific Montane Wet Meadow*	Lower Columbia EDU	9	occ	5	occ	4	occ	125
Temperate Pacific Montane Wet Meadow Community	*Temperate Pacific Montane Wet Meadow*	Upper Klamath EDU	9	occ	9	occ	4	occ	225

Appendix 10A – Draft Ecological Integrity Analysis for the East and West Cascades Ecoregions

Background

Successful conservation at the ecoregional scale requires an understanding of the current condition of the landscape relative to its natural condition. Only with this information can one judge the scale and scope of restoration activities needed to bring and maintain ecosystems within their normal range of variability. Management prescriptions can then be devised to adjust the structural and species composition of an ecosystem to a desired condition.

To assist land management entities with restoration activities, particularly the re-establishment of natural fire regimes, the Landfire partnership has mapped vegetation across the coterminous United States. This vegetation is mapped to the ecological systems classification developed by NatureServe, and contains information on the seral composition of each stand. By looking at aggregations of stands and the relative abundances of the different seral conditions they contain, metrics can be generated to describe the condition of a landscape relative to its historic range of variability.

The Cascades team used the rapid assessment (RA) products released by the Landfire partnership in May of 2005. Three datasets in particular were used for this work; the RA PNV vegetation map, the RA Succession Classes, and the reference condition descriptions.

A five box model is used by Landfire to describe the standard reference conditions for any ecological system. The five boxes correspond to the RA succession classes; early development, mid-development / open canopy, mid-development / closed canopy, late-development / open canopy, and late-development / closed canopy. Each stand of any given ecological system is assigned to one of these five categories.

As one looks at broader geographies beyond the stand level, the reference condition descriptions provide the relative percentages of each succession class for each ecological system in a naturally functioning ecosystem. Our geography, the identified suite of priority conservation areas, was tested against these RA products.

Methods

The RA PNV vegetation was clipped to the extent of our suite of priority conservation areas. Each PNV polygon within a portfolio site was assigned to that site and attributed with its RA Succession Class. An area weighted percentage was then calculated for each PNV vegetation type within each of the five succession classes. Using the "similarity and departure" formula developed by the FRCC, a value for departure from reference conditions was calculated for each Site/PNV combination. First, the values from the RA reference condition models for each PNV type are compared to the actual percentages present at the site. The 'similarity' (the lesser of the reference condition value, or the percentage of the PNV in a particular seral class) was recorded for each Site/PNV/Seral class combination. "Departure from reference conditions" was then calculated as (100 – (sum of similarities for each Site/PNV combination)) (Table 1). Once departure had been calculated for each Site/PNV combination, a weighted average was calculated for all PNV types across a site to derive a single "ecological integrity" value for each site (Table 2). These values were than normalized for all sites within each ecoregion on a 1 – 100 scale.

Discussion

Once the above analysis was complete, we reviewed the results for each portfolio site with experts. Although there was agreement that most of the sites were realistically portrayed by their measure of 'ecological integrity' there were some sites which did not appear to be correct.

These results pointed to the larger question of whether we had pushed the rapid assessment data beyond where it was supposed to go, or at a finer scale (the sub HUC6 level) than the rapid assessment was designed to be used at. Also, Landfire is due to come out with a newer FRCC analysis and data in 2007, which may be more applicable for an ecoregional assessment. For these reasons, we did not continue to fine tune the ecological integrity or fire risk analysis, but chose to present the methods we used in this appendix.

Table 1. Example Calculation for a PNV type at the Cascade Lakes Site

Cascade Lakes Site			
PNV = Mixed Conifer - Eastside Dry			
RA Succession Class	**Reference Percentage**	**Actual Percentage**	**Similarity**
Early	15	10	10
Mid-development / open canopy	1	5.2	1
Mid-development / closed canopy	30	14.8	14.8
Late-development / open canopy	40	8.8	8.8
Late-development / closed canopy	14	4.2	4.2
Uncharacteristic		33	
Departure = (100 - Similarity) = 61.2			**Similarity = 38.8**

Table 2. Example Calculation of the 'Ecological Integrity' of the Cascade Lakes Site

All PNV types at the Cascade Lakes Site	**Similarity**	**Departure**	**Percent of Site**	**Area weighted Departure**
Pacific Silver Fir--High Elevation	9.039	90.961	0.069	0.063
Western Juniper Pumice	19.835	80.165	0.142	0.113
Mixed Conifer - Eastside Dry	38.813	61.187	30.701	18.785
Mixed Conifer - Eastside Mesic	38.248	61.752	41.913	25.882
Mixed Conifer - Southwest Oregon	28.714	71.286	0.322	0.229
California Mixed Evergreen North	31.173	68.827	0.239	0.165
Mountain Hemlock	19.740	80.260	17.202	13.807
Lodgepole Pine - Pumice Soils	45.235	54.765	3.433	1.880
Dry Ponderosa Pine - Mesic	41.264	58.736	0.654	0.384
Ponderosa Pine - Xeric	33.935	66.065	2.468	1.631
Subalpine Woodland	23.398	76.602	0.034	0.026
Low Sagebrush	0.000	100.000	0.011	0.011
Mountain Big Sagebrush (Cool Sagebrush)	0.000	100.000	0.011	0.011
Spruce - Fir	55.337	44.663	1.236	0.552
Juniper and Pinyon Juniper Steppe Woodland	52.233	47.767	1.518	0.725
Wyoming Big Sagebrush Semi-Desert	0.000	100.000	0.001	0.001
Wyoming Sagebrush Steppe	0.000	100.000	0.043	0.043
Salt Desert Shrub	0.000	100.000	0.002	0.002
				pre-normalized ecological integrity value = 64.310