

**Fish and Wildlife Service - Oregon Restoration Programs:
Coastal, Greenspaces, Jobs in the Woods,
Partners for Fish and Wildlife, and
Private Stewardship Grants Programs**

Final Amended Programmatic Biological Assessment

List of Preparers: Dan Perritt, Timmie Mandish, and Jarvis Gust

List of Reviewers: Stephan Zylstra, Amy Horstman, Jennifer Thompson, Rich Szlemp, Fred Seavey, and David Leal

Fish and Wildlife Service
Oregon Fish and Wildlife Office
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266

May 5, 2003 (Final - Amended January 16, 2004)

Table of Contents

Chapter 1 - Introduction	8
Coastal Program	8
Greenspaces Program	8
Jobs in the Woods Program	9
Partners for Fish and Wildlife Program	9
Private Stewardship Grants Program	9
Rational for a Programmatic Biological Assessment	10
Chapter 2 - Affected Habitats	13
Coastal Program	13
Greenspaces Program	13
Jobs in the Woods Program	13
Partners for Fish and Wildlife Program	13
Private Stewardship Grants Program	14
Extent of Restoration Efforts	14
Chapter 3 - Description of Proposed Actions	17
Project Category I - Riparian Habitat Restoration	17
Installation of livestock fencing	17
Installation of livestock watering facilities	18
Installation of livestock crossings	18
Breaching, removing, and constructing berms and dikes	18
Installation of bio-engineered stream bank stabilization structures	19
Installation of wildlife habitat structures	19
Planting native riparian plant species	19
Silvicultural treatments	19
Control and removal of invasive/non native plant species	20
Project Category II - Wetland Habitat Restoration	21
Installation of livestock fencing	21
Installation of livestock watering facilities	21
Installation of livestock crossings	21
Breaching, removing, and constructing berms and dikes	21
Converting former wetlands and restoring current wetlands	21
Installation of wildlife habitat structures	22
Planting native wetland plant species	22
Control and removal of invasive/non native plant species	22
Project Category III - Instream Habitat Restoration	22
Installation of wood and boulder instream structures	22
Hydrologic modifications of natural alcoves and side channels	22
Re-channeling of streams into their historic locations	23

Salmon carcass placements	23
Project Category IV - Fish Passage Improvements	23
Installation and modification of artificial fishways	23
Re-engineering of existing irrigation diversions	24
External and internal modifications to roadway culverts	24
Realignment of roadway culverts to stream flows	24
Replacement of undersized roadway culverts with appropriately sized culverts	24
Replacement of roadway culverts with bridges	25
Permanent removal of roadway culverts, tide gates, and other artificial fish passage barriers	25
Project Category V - Upland Habitat Restoration	25
Installation of livestock fencing	25
Installation of livestock watering facilities	25
Installation of bio-engineered stabilization structures	26
Installation of wildlife habitat structures	26
Planting native upland plant species	26
Conversion of altered habitats to historic oak savannahs, short and tall grass prairies, or conifer/hardwood forests	26
Silvicultural treatments	26
Control and removal of invasive/non native plant species	27
Project Category VI - Coastal and Estuarine Habitat Restoration	27
Installation of wood and boulder structures	27
Reestablishment of natural coastal dune processes	27
Planting native coastal/estuarine plant species	28
Installation of wildlife habitat structures	28
Control and removal of invasive/non native plant species	28
Project Category VII - Road and Trail Improvements	28
Closure of roads and trails	28
Abandonment of roads and trails	28
Decommissioning of roads and trails	28
Improvements on roads and trails	28
Project Category VIII - Surveys, Assessments, and Monitoring Activities	29
Physical data collection	29
Biological data collection	29
Acquisition of Restoration Materials	29
Large Wood	29
Boulders	30
Native Plant Materials	30
Pressured Treated Wood Products	30
Other Actions Not Covered Under The Biological Assessment	31
Chapter 4 - Environmental Baseline	32

Mammals	32
Canada lynx	32
Columbian white-tailed deer	32
Birds	33
Marbled murrelet	33
Western snowy plover	34
Bald eagle	34
Brown pelican	35
Northern spotted owl	36
Inland Fish	37
Warner sucker	37
Oregon chub	38
Bull trout	38
Invertebrates	39
Vernal pool fairy shrimp	39
Fender's blue butterfly	40
Oregon silverspot butterfly	41
Plants	42
Willamette daisy	42
Gentner's fritillary	43
Water howellia	43
Western lily	44
Large-flowered meadowfoam	44
Bradshaw's lomatium	45
Cook's lomatium	45
Kincaid's lupine	46
MacFarlane's four o'clock	46
Rough popcornflower	47
Nelson's checkermallow	48
Spalding's catchfly	48
Howell's spectacular thelypody	49
Anadromous Fish	49
Snake River Chinook salmon	49
Lower Columbia River Chinook salmon	50
Upper Willamette River Chinook salmon	50
Southern Oregon coho salmon	50
Oregon coast coho salmon	50
Columbia River chum salmon	51
Snake River sockeye salmon	51
Middle Columbia River steelhead	51
Snake River Basin steelhead	51
Lower Columbia River steelhead	51

Upper Willamette River steelhead	51
Chapter 5 - Project Design Criteria for Listed Species	52
Mammals	52
Canada lynx	52
Columbian white-tailed deer	52
Birds	53
Marbled murrelet	53
Western snowy plover	53
Bald eagle	54
Brown pelican	54
Northern spotted owl	54
Inland Fish	55
Warner Sucker, Oregon Chub, and Bull Trout	55
Invertebrates	55
Vernal pool fairy shrimp	55
Fenders blue butterfly	55
Oregon silverspot butterfly	56
Plants	57
Anadromous Fish	58
Chapter 6 - Effect Determinations	59
Disturbance and Displacement	60
Physical Habitat Disturbance	62
Terrestrial Habitats	63
Aquatic Habitats	63
Water Quality	64
Conclusion	65
Essential Fish Habitat	66
Annual Reporting	67
Chapter 7 - Literature Cited	68
Appendix A. Project design standards.	70
Appendix A1. Project design standards for all restoration activities.	71
General Requirements	71
Equipment Operation	71
Pollution and Erosion Controls	72
Construction Techniques	74
Restoration Materials	75
Pressure Treated Wood Products	76

Fish and Wildlife Requirements	77
Appendix A2. Project design standards for riparian, wetland, upland, coastal, and estuarine habitat restoration.	79
General Requirements	79
Livestock Fencing	79
Livestock Stream Crossings	80
Hardened Livestock Fords	81
Livestock Watering Facilities	81
Prescribed Burns	82
Soil Stabilization	83
Silvicultural Treatments	86
Revegetation Techniques	87
Appendix A3. Project design standards for instream habitat restoration.	89
General Requirements	89
Techniques and Materials	89
Appendix A4. Project design standards for fish passage improvements.	91
General Requirements	91
Artificial Fishways	91
Culverts and Bridges	92
Irrigation Diversions	93
Fish Screen Requirements	94
Appendix A5. Project design standards for road and trail improvements.	95
General Requirements	95
Techniques and Materials	95
Appendix A6. Project design standards for surveys, assessments, and monitoring activities.	96
General Requirements	96
Techniques and Materials	96
Appendix A7. Project design standards for wildlife habitat structures.	97
Appendix B. Locations of marbled murrelet zones 1 and 2 in Oregon (U.S. Department of Agriculture and U.S. Department of Interior 1994, page C-10).	98
Appendix C. Primary western snowy plover nesting areas along the Oregon coast.	99
Appendix D. Maps of evolutionarily significant units (ESU's) for Pacific salmon and steelhead. ...	100
Appendix F. General information to be included in the annual report for each Service program covered under the biological assessment.	107

List of Tables and Figures

Table 1. Federally listed species included in the biological assessment [10](#)

Table 2. Type and extent of restoration activities to be completed under the Jobs in the Woods
Program for fiscal years 1994 to 2002 [14](#)

Table 3. Number of projects funded through Fish and Wildlife Service programs in Oregon [15](#)

Table 4. Harassment distances from various activities for marbled murrelets [53](#)

Table 5. Harassment distances from various activities for northern spotted owls [54](#)

Table 6. The typical range of habitat disturbances at a project site [62](#)

Table 7. Effect determinations for federally listed species included in the biological assessment [65](#)

Figure 1. The locations of completed restoration projects under the Jobs in the Woods Program by
project categories for fiscal years 1994 to 2002 [16](#)

Figure 2. Decibel levels and ranges from various sound sources [61](#)

**Fish and Wildlife Service - Oregon Restoration Programs:
Coastal, Greenspaces, Jobs in the Woods,
Partners for Fish and Wildlife, and
Private Stewardship Grants Programs**

Programmatic Biological Assessment

Chapter 1 - Introduction

Land use and management practices have affected many watersheds in the Pacific Northwest making them less able to support diverse native fish, wildlife, and plant communities. Several species have declined to a level that they now require Federal protection under the Endangered Species Act. The Fish and Wildlife Service (Service) believes that developing cooperative partnerships through programs that support restoration activities¹ is an important tool to effectively address watershed health and the decline of these species and their habitats. Many other at risk species, such as species of concern and migratory birds, will likely benefit from improved habitat protection, management, and restoration.

Service programs included in the biological assessment (BA) are described below. Only the administering offices listed under each program are included within the assessment. The assessment addresses restoration activities for a five-year period beginning in fiscal year 2004 for each program.

Coastal Program

The Service established a Coastal Program along the Oregon Coast in 2002. It is a non-regulatory program that relies on voluntary partnerships. The program objectives include promoting coastal ecosystem conservation and restoration, developing assessment and planning tools, conserving coastal habitats through conservation easements and locally-initiated land acquisition, and restoring degraded coastal habitats through site specific projects. In Oregon, the program is administered through the Coastal Oregon Field Office, 2127 SE OSU Drive, Newport, Oregon, 97365-5258 (Telephone: 541-867-4558).

Greenspaces Program

In the late 1980's, a group of representatives from Metro, nonprofit organizations, local governments, and citizens collaborated on greenspace protection in Portland, Oregon and Vancouver, Washington. Due to their efforts, Congress allocated Federal funding that is administered through a partnership between Metro and the Service called the Greenspaces Program. The program focuses on environmental education, habitat restoration, natural resource conservation, public outreach, and

¹ "Restoration" is defined in a broad context to include improving or restoring natural ecosystem functions; affecting a positive change in land use practices for fish, wildlife, and plant species and their habitats; and providing public outreach and environmental education.

regional planning. Activities funded through the program go beyond traditional restoration to include field-based environmental education, urban ecological studies, creation of backyard and schoolyard nature habitats, and projects designed to reduce the effects of urbanization (*e.g.*, innovative stormwater management improvements). In Oregon, the program is administered through the Oregon Fish and Wildlife Office, 2600 SE 98th Avenue, Suite 100, Portland, Oregon, 97266 (Telephone: 503-231-6179).

Jobs in the Woods Program

The Jobs in the Woods Program was established under the Northwest Economic Adjustment Initiative in 1994. It is part of the Service's contribution to the Northwest Forest Plan. The program supports community-based restoration efforts through a non-regulatory approach and provides social and economic assistance to timber-dependent communities in western Oregon. In Oregon, the program is administered through the Oregon Fish and Wildlife Office, 2600 SE 98th Avenue, Suite 100, Portland, Oregon, 97266 (Telephone: 503-231-6179).

Partners for Fish and Wildlife Program

In 1987, the Service established the Partners for Fish and Wildlife Program. The program provides technical and financial assistance to private landowners interested in restoring or otherwise improving native habitats for fish and wildlife. The program's philosophy is to work proactively with private landowners for the mutual benefit of declining Federal trust species and participating landowner interests. In Oregon, the program is administered through the Oregon Fish and Wildlife Office, 2600 SE 98th Avenue, Suite 100, Portland, Oregon, 97266 (Telephone: 503-231-6179) and Willamette Valley National Wildlife Refuge (NWR) Complex, 26208 Finley Refuge Road, Corvallis, Oregon, 97333-9533 (Telephone: 541-757-7236).

Private Stewardship Grants Program

The Private Stewardship Grants Program was congressionally established in fiscal year 2002 with funding appropriated from the Land and Water Conservation Fund. The program provides grants and other assistance on a competitive basis to individuals and groups engaged in local, private, and voluntary conservation efforts that benefit federally listed, proposed, or candidate species, or other at-risk species. The program also supports on-the-ground conservation actions, but does not fund planning, research activities, or land acquisition. Examples of the types of projects that may be funded include managing non-native competitors, reintroducing imperiled species, implementing measures to minimize risk from disease, restoring streams that support imperiled species, erecting fencing to exclude animals from sensitive habitats, or planting native vegetation to restore a rare plant community. This is not an exhaustive list. Any other approach that can demonstrate tangible on-the-ground benefits to the imperiled species in question can be considered for funding. In Oregon, excluding the Klamath Basin, the Private Stewardship Grants Program is administered through the Oregon Fish and Wildlife Office, 2600 SE 98th Ave., Suite 100, Portland, Oregon, 97266 (Telephone 503- 231-6179). Projects in

Washington, along the shoreline of the Columbia River from the mouth upstream to McNary Dam, are also administered by this office.

Rational for a Programmatic Biological Assessment

The similarity of restoration activities under these programs allowed for the categorization of these activities under the following eight project categories: (I) riparian habitat restoration, (II) wetland habitat restoration, (III) instream habitat restoration, (IV) fish passage improvements, (V) upland habitat restoration, (VI) coastal and estuarine habitat restoration, (VII) road and trail improvements, and (VIII) surveys, assessments, and monitoring activities. The rationale for this approach was that similar environmental affects could occur from a given project within a project category independent of its location. For example, a proposed fish passage improvement project to replace a culvert on a stream in Tillamook County, Oregon would likely have the same potential environmental affects as a similar sized culvert replacement project in Jackson County, Oregon. Additional factors supporting a categorical approach are:

- All program funded restoration projects are required to be in compliance with the National Environmental Policy Act, National Historic Preservation Act, Endangered Species Act (ESA), and Department of Interior policy for Level I Contaminant Surveys before project implementation.
- Local or regional watershed analyses or other similar planning efforts have been completed in watersheds where restoration activities will occur.
- A Federal or State biologist or other qualified professional, with local experience in completing restoration activities, is required to be involved in the planning, design, and implementation of each project.
- Local project cooperators must obtain required regulatory permits and comply with Federal, State, and local laws and regulations regarding all aspects of a restoration project.

Therefore, a programmatic BA was prepared for these project categories independent of the specific Service program, project location, and the fiscal year funding period. The Service is requesting formal consultation for federally listed species shown in Table 1.

Table 1. Federally listed species included in the biological assessment

Common Name	Scientific Name	Federal Status
U.S. Fish and Wildlife Service Trust Species		
Canada lynx	<i>Felis lynx canadensis</i>	T
Columbian white-tailed deer	<i>Odocoileus virginianus leucurus</i>	E
Marbled murrelet	<i>Brachyramphus marmoratus</i>	CH/T
Western snowy plover (coastal)	<i>Charadrius alexandrinus nivosus</i>	CH/T

Common Name	Scientific Name	Federal Status
Bald eagle	<i>Haliaeetus leucocephalus</i>	T
Brown pelican	<i>Pelecanus occidentalis</i>	E
Northern spotted owl	<i>Strix occidentalis caurina</i>	CH/T
Warner sucker	<i>Catostomus warnerensis</i>	CH/T
Oregon chub	<i>Oregonichthys crameri</i>	E
Bull trout	<i>Salvelinus confluentus</i>	PH/T
Vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	T
Fender's blue butterfly	<i>Icaricia icarioides fenderi</i>	E
Oregon silverspot butterfly	<i>Speyeria zerene hippolyta</i>	CH/T
Willamette daisy	<i>Erigeron decumbens</i> var. <i>decumbens</i>	E
Gentner's fritillary	<i>Fritillaria gentneri</i>	E
Water howellia	<i>Howellia aquatilis</i>	T
Western lily	<i>Lilium occidentale</i>	E
Large-flowered meadowfoam	<i>Limnanthes floccosa</i> ssp. <i>grandiflora</i>	E
Bradshaw's lomatium	<i>Lomatium bradshawii</i>	E
Cook's lomatium	<i>Lomatium cookii</i>	E
Kincaid's lupine	<i>Lupinus sulphureus</i> var. <i>kincaidii</i>	T
MacFarlane's four o'clock	<i>Mirabilis macfarlanei</i>	T
Rough popcornflower	<i>Plagiobothrys hirtus</i>	E
Nelson's checker-mallow	<i>Sidalcea nelsoniana</i>	T
Spalding's catchfly	<i>Silene spaldingii</i>	T
Howell's spectacular thelypody	<i>Thelypodium howellii</i> var. <i>spectabilis</i>	T
NOAA Fisheries Trust Species		
Chinook salmon (Snake River) (Spring/Summer/Fall Runs)	<i>Oncorhynchus tshawytscha</i>	CH/T
Chinook salmon (Lower Columbia River)	<i>Oncorhynchus tshawytscha</i>	T
Chinook salmon (Upper Willamette River)	<i>Oncorhynchus tshawytscha</i>	T
Coho salmon (Southern Oregon)	<i>Oncorhynchus kisutch</i> ssp.	CH/T
Coho salmon (Oregon Coast)	<i>Oncorhynchus kisutch</i> ssp.	T

Common Name	Scientific Name	Federal Status
Chum salmon (Columbia River)	<i>Oncorhynchus keta</i>	T
Sockeye salmon (Snake River)	<i>Oncorhynchus nerka</i>	CH/E
Steelhead (Middle Columbia River)	<i>Oncorhynchus mykiss</i> ssp.	T
Steelhead (Snake River Basin)	<i>Oncorhynchus mykiss</i> ssp.	T
Steelhead (Lower Columbia River)	<i>Oncorhynchus mykiss</i> ssp.	T
Steelhead (Upper Willamette River)	<i>Oncorhynchus mykiss</i> ssp.	T

CH - Critical Habitat has been designated for this species E - Endangered PH - Proposed Habitat has been designated for this species T - Threatened

Chapter 2 - Affected Habitats

Restoration projects funded through Service programs will occur in various regions and habitats within Oregon. Restoration activities for all programs will be limited to habitats inland from mainland coastal/estuarine areas. The specific regions and habitats associated with each program are as follows:

Coastal Program

The Coastal Program focuses exclusively on coastal and estuarine watersheds. Restoration activities will occur in various habitat types from coastal dunes and salt marshes to riparian areas higher in a watershed. Projects funded through the program will occur on private and public lands, including NWR lands in Clatsop, Tillamook, Lincoln, Lane, Douglas, Coos, and Curry counties.

Greenspaces Program

Restoration activities under the Greenspaces Program will occur in riparian, wetland, stream, and upland habitats. Projects funded through the program will occur on private and public lands in portions of Multnomah, Clackamas, and Washington counties in the Portland metropolitan region (*i.e.*, 24 cities, including Portland) and Clark County in Vancouver, Washington.

Jobs in the Woods Program

Restoration activities under the Jobs in the Woods Program will occur in riparian, wetland, stream, upland, coastal dune, and estuarine habitats. Projects funded through the program will occur on non-Federal lands (*e.g.*, private, city, county, State, and Tribal lands) in Benton, Clackamas, Clatsop, Columbia, Coos, Crook, Curry, Deschutes, Douglas, Hood River, Jackson, Jefferson, Josephine, Lane, Lincoln, Linn, Marion, Polk, Tillamook, Wasco, and Yamhill counties.

Partners for Fish and Wildlife Program

Restoration activities under the Partners for Fish and Wildlife Program will occur in riparian, wetland, stream, upland, coastal dune, and estuarine habitats. Projects funded through the program at the Oregon Fish and Wildlife Office will occur on private and Tribal lands in all Oregon counties, except Klamath County.

Projects funded through the program at the Willamette Valley NWR Complex will occur on private lands near or adjacent to the refuge complex. The refuge complex consists of three national wildlife refuges (Ankeny, Baskett Slough, and William L. Finley) and the Oak Creek fee title property located in the Willamette Valley, approximately 70 miles south of Portland, Oregon.

Private Stewardship Grants Program

Restoration activities under the Private Stewardship Grants Program will occur in riparian, wetland, stream, upland, coastal dune, and estuarine habitats. Projects funded through the program will only occur on non-government owned land throughout Oregon except for the southern portions of Lake and Klamath counties within the Klamath River Basin. Projects may also occur in Washington in areas immediately bordering the Columbia River in Pacific, Wahkiakum, Cowlitz, Clark, Cascade, Klickitat, and Benton counties.

Extent of Restoration Efforts

Service restoration programs have and will continue to accomplish local and regional goals and objectives in Oregon. These programs cannot completely restore all watersheds, but the completion of restoration projects under Service programs will contribute to the increase in the overall health of many watersheds and engage and educate the public. As an example, restoration activities to be completed in Oregon under the Jobs in the Woods Program are summarized in Table 2. The locations of completed restoration projects (approximately 135 of 182 projects) for this program are shown in Figure 1. These projects will help restore the biological, chemical, and physical features necessary for watershed health resulting in long-term benefits to a variety of fish, wildlife, and plant species. The number of past and current restoration projects funded through Service programs are presented in Table 3.

Table 2. Type and extent of restoration activities to be completed under the Jobs in the Woods Program for fiscal years 1994 to 2002

Restoration Activity	Extent of Activity
Acres of riparian habitat restored	1478
Acres of wetland habitat restored	359
Acres of coastal habitat restored	26
Acres of upland habitat restored	1569
Miles of instream habitats restored	119
Number of fish passage improvements	175
Miles of habitat accessible to fish from fish passage improvements	262
Miles of roads and trails improved, closed, abandoned, and decommissioned	62

Table 3. Number of projects funded through Fish and Wildlife Service programs in Oregon

Program Name	No. of Projects	Fiscal Year Period
Coastal Program - Coastal Oregon Field Office (includes both education and restoration projects)	15	2002-2003
Greenspaces Program - Oregon Fish and Wildlife Office (includes education, conservation, and restoration projects)	301	1991-2003
Jobs in the Woods Program - Oregon Fish and Wildlife Office	183	1994-2003
Partners for Fish and Wildlife Program - Oregon Fish and Wildlife Office and Willamette Valley National Wildlife Refuge Complex	130	1995-2003
Private Stewardship Grants Program	2	2003

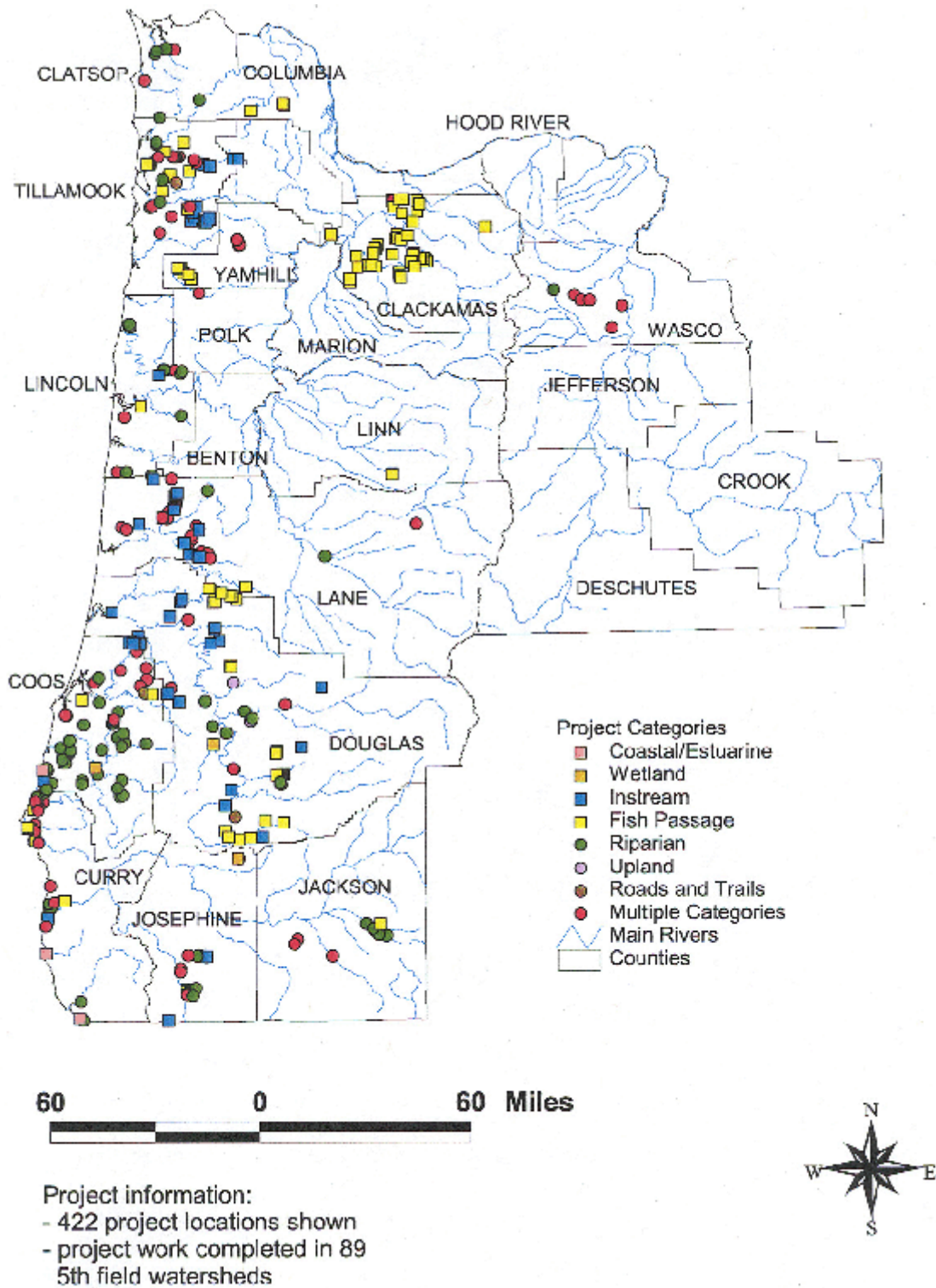


Figure 1. Locations of completed restoration projects under the Jobs in the Woods Program by project categories for fiscal years 1994 to 2002. A project location shown as multiple categories indicates that more than one project category occurred at the location.

Chapter 3 - Description of Proposed Actions

As mentioned previously, the similarity of activities under Service programs allow for the categorization of these activities under the following eight project categories: (I) riparian habitat restoration, (II) wetland habitat restoration, (III) instream habitat restoration, (IV) fish passage improvements, (V) upland habitat restoration, (VI) coastal and estuarine habitat restoration, (VII) road and trail improvements, and (VIII) surveys, assessments, and monitoring activities. Actions under each of the project categories are described below. Appendix A provides detailed information on project design standards that will be implemented during the completion of the various restoration activities. The acquisition and use of restoration materials is addressed at the end of the chapter.

The work area for an activity under any project category that may directly or indirectly affect surfaces water may require the temporary isolation of the area by one or more of the following techniques. These techniques will minimize or eliminate a potential increase in the turbidity of the water source adjacent to the work area. Sediments trapped behind the structure(s) will be removed and the work area will be stabilized before the water source is allowed to re-enter the area.

- Installation of sandbags, straw bales, water bladder, temporary coffer dams or other similar structure.
- Construction of a plastic lined channel adjacent to the work area to by-pass water flows.
- Installation of a metal or plastic culvert to by-pass water flows.
- Pumping the water source around the work area through an appropriately screened intake and discharging it through low velocity output diffuser.

Project Category I - Riparian Habitat Restoration

Activities in this project category will primarily focus on restoring the composition and structural diversity of native riparian plant communities, natural floodplain hydrology, and water quality. Specific restoration activities will consist of the following:

Installation of livestock fencing - Installation of livestock fencing will minimize or eliminate livestock degradation of stream banks and riparian areas. Woody and herbaceous vegetation greater than six inches in height will be manually or mechanically removed along a new fence line. The habitat affected will be limited to the area along a fence line for a width of 25 feet or less. Wooden support poles (four to six inches in diameter) will be either pounded into the ground with heavy equipment² or placed in holes dug by hand or with mechanical augers. Metal “T” support posts will be pounded into the ground by hand. Fences will be strung with New Zealand style smooth wire, barbed wire, or a combination of the two wire types. Electric fencing will consist of smooth wire, polytape, or polywire. Perimeter and

² “Heavy equipment” refers to farm tractors, excavators, backhoes, bulldozers, front-end loaders, scrapers, graders, compactors, cranes, trenchers, dump trucks, log trucks, and other similar types of construction equipment. Equipment will be supported on metal tracks or rubber tires.

cross-pasture fencing may be installed to promote rotational grazing. Existing livestock fences may be repaired and/or extended using the same techniques and materials indicated above. An old fence line will be removed if a new fence is installed with a greater buffer width than the old fence.

Installation of livestock watering facilities - Installation of livestock watering facilities will minimize or eliminate the need for direct livestock access to stream channels. Watering facilities may consist of nose pumps, gravity-fed or electric pumping systems, off-channel ponds, and controlled access areas (*e.g.*, hardened ford crossings and water gaps). A water line (PVC or other plastic tubing) will be installed from each watering facility to the water source. This line will often be buried 12 to 24 inches below the ground. Heavy equipment will be used to excavate and backfill the trench. A screened foot valve (*i.e.*, water intake) may be installed at the end of a water line and placed in a stream channel, wetland, or off-channel pond, depending on available water sources and type of watering facility.

Installation of livestock crossings - Installation of livestock stream crossings (*e.g.*, culverts, bridges, and hardened ford crossings) will minimize or eliminate livestock degradation of stream banks and riparian areas. Livestock crossings (*e.g.*, culverts, bridges, and hardened ford crossings) will be constructed using culverts, flatbed railroad cars or semi-trailers, or other materials (*e.g.*, wood, steel and/or concrete for bridge construction). A crossing structure will be placed on earthen, rock, or concrete abutments and supported above the bankfull³ elevation of a stream. A hardened ford crossing will consist of a rock armored area of the stream bank and channel. The stream bank may be graded and shaped to accommodate livestock and minimize erosion. The maximum width of a livestock crossing will be limited to eight feet for a hardened ford and ten feet for other crossing types. Fencing will be installed at crossings to limit livestock access to stream channels. Heavy equipment will be used to complete these activities.

Breaching, removing, and constructing berms and dikes - This restoration activity will allow more natural hydrologic flows to occur in riparian areas and may increase the width of channel migration zones. Existing berms and dikes will be breached or completely removed at specific locations. These activities will be designed not to cause the artificial entrapment⁴ of fish and other aquatic species in adjacent areas. Constructed berms and dikes will be used to protect existing infrastructure from restoration activities that will be completed in the immediate project area. The height and width of constructed berms and dikes will depend on site specific conditions and the intent of the project. Heavy equipment will be used to complete these activities. Site preparations may involve the removal of vegetation on and around berms and dikes. Soil disturbances will be primarily limited to the areas where these structures will be altered or constructed. (*Note: Berms and dikes will not be*

³ "Bankfull elevation" means the bank height inundated by a 1.5 to 2 year average recurrence interval and may be estimated by morphological features such average bank height, scour lines and vegetation limits.

⁴ "Artificial entrapment" refers to man-made habitat changes or structures (*e.g.*, isolated ditches, depressions, or other topographical changes) that would not allow the passive surface flow of water to return to a stream channel as water levels recede.

constructed in riparian areas adjacent to fish bearing streams⁵ that contain federally listed anadromous fish species without a site specific consultation from NOAA Fisheries. This also includes stream reaches that are one-half stream miles above anadromy.)

Installation of bio-engineered stream bank stabilization structures - Installation of stream bank stabilization structures will minimize or eliminate sedimentation and erosion and improve water quality in adjacent streams. Natural materials (*e.g.*, native vegetation, boulders, and woody debris) will be used to redirect flows in stream channels to minimize stream bank erosion. Structures (*e.g.*, rock barbs, tree revetments, and fascines) will be placed and anchored within the toe and bank areas of stream channels. Similar materials and/or structures may be placed in adjacent floodplains to redirect flows across these areas. Stream banks may also be reshaped or graded and planted with native vegetation to stabilize them. Heavy equipment will be used to complete these activities.

Installation of wildlife habitat structures - Installation of wildlife habitat structures will increase cover, shelter, and nesting habitats for a variety of wildlife species in riparian areas. Various structures will be installed or constructed to enhance habitats for wildlife. These structures may include bat roosting/breeding structures, avian nest boxes and platforms, turtle basking logs, conifer/hardwood snags, and brush piles.

Planting native riparian plant species - Native vegetation will be planted to increase the composition and abundance of riparian plant communities. Native vegetation to be planted will include conifers and hardwood trees, forbs, shrubs, and grasses, and any other vegetation that would have naturally occurred at a project site. Vegetation will be planted by hand, mechanical planters, or broadcasted with hand or mechanical spreaders (*e.g.*, no till seed drill and hydro-seeding with vehicle mounted pressurized equipment). Cottonwood (*Populus spp.*), willows (*Salix spp.*) and other tree species able to propagate readily from cuttings may be bundled and buried into shallow, narrow trenches along stream banks to promote a greater abundance of seedling sprouts. Heavy equipment may be used to excavate and backfill the trenches.

Silvicultural treatments - Silvicultural treatments in riparian areas will be limited to juniper tree removal to improve native vegetative diversity and minimize fuel loading for wildfire control. Selected juniper trees will be removed by pulling smaller trees (*i.e.*, eight inches in diameter or less) from the ground, pushing over larger trees with heavy equipment, and cutting trees with chainsaws. Trees that are removed may be used in soil bio-engineered stabilization and fish habitat structures, remain on-site for nutrient recycling, piled and burned on-site, or transported to appropriate upland disposal sites. Burn

⁵ “Fish bearing streams” refer to perennial and ephemeral streams that are known to contain one or more native fish species. A stream is assumed “fish bearing” unless a presence/absence or other appropriate survey has been completed to prove otherwise.

sites will not be located in riparian areas⁶ and must be at least 100 feet away from perennial and ephemeral stream channels. ***(Note: Other types of silvicultural treatments in riparian areas will not be completed without a site specific consultation from NOAA Fisheries, if project sites are adjacent to fish bearing streams that contain federally listed anadromous fish species, and/or the Service, if project sites are adjacent to fish bearing streams that contain non anadromous listed aquatic species. This also includes stream reaches that are one-half stream miles above areas that contain a listed species.)***

Control and removal of invasive/non native plant species - Control and removal of invasive and non native vegetation (*i.e.*, woody and herbaceous species) will improve the composition and abundance of native riparian plant communities. Invasive and non native plant species, including aquatic and terrestrial species, will be controlled or removed by manual, mechanical, and biological methods:

- Manual - hand pulling and grubbing with hand tools or cutting and bagging seed heads. Hand-operated power tools, such as chain saws, may also be used.
- Mechanical - excavating, mowing, tilling, discing, plowing, stump grinding, or competitive seedbed preparation.
- Biological - grazing by cattle, sheep and/or goats. The purpose of this method is not complete removal, but to minimize target plant species to a negligible status.

Heavy equipment may be used to gather and pile plant materials. These materials may be chipped or burned on-site, or transported to appropriate upland disposal sites. Determining which method(s) to use for controlling or removing unwanted plant materials (including timing and frequency of use) will be based on, but not limited to, the following factors:

- Physical growth characteristics of target plant species (*i.e.*, rhizomatous vs. tap-rooted, etc.)
- Seed longevity and germination
- Infestation size
- Relationship of the project site to other infestations
- Relationship of the project site to listed and/or proposed species
- Distances to surface waters
- Accessibility for equipment and project personnel
- Use of the area by people (*e.g.*, for recreation, farming, or ranching)
- Effectiveness of treatment on the target plant species
- Overall cost

⁶ “Riparian areas” are defined as two site potential tree heights (of native, site potential vegetation) located from the channel migration zone (defined as the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years, *e.g.*, alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams).

Due to these various factors, one or more treatment methods may be required in a given area for several years after an initial treatment. Prescribed burns will not be conducted in riparian areas and must be at least 100 feet away from the edge of perennial and ephemeral stream channels.

Stormwater management - Stormwater management activities will help to improve water quality and closely mimic natural hydrology and runoff patterns. Activities will include creating or improving bioswales, removing impervious surfaces and replacing them with pervious surfaces, installing rooftop gardens on built structures, installing street tree wells, naturesscaping, removing curbs, disconnecting downspouts, and regrading sites to de-channelize/spread flows and dissipate hydrologic energy. These activities will typically occur in urbanized areas and will be designed not to cause the artificial entrapment of fish and other aquatic species in adjacent areas. Heavy equipment may be used to complete these activities.

Project Category II - Wetland Habitat Restoration

Activities in this project category will primarily focus on restoring the composition and structural diversity of native wetland plant communities, natural wetland hydrology, and wetland functions. Marine, estuarine, riverine, lacustrine, and palustrine wetlands are included in this category. Specific restoration activities will consist of the following:

Installation of livestock fencing - Installation of livestock fencing will minimize or eliminate livestock degradation of wetland areas. Same as described in Project Category I - Riparian Habitat Restoration.

Installation of livestock watering facilities - Installation of livestock watering facilities will minimize or eliminate the need for direct livestock access to wetland areas. Same as described in Project Category I - Riparian Habitat Restoration, except for the following action. A natural spring (wetland) used as water source will be protected from livestock degradation by fencing off the perimeter of the spring and developing a low impact water withdraw system.

Installation of livestock crossings - Installation of livestock stream crossings will minimize or eliminate livestock degradation of wetland areas. Same as described in Project Category I - Riparian Habitat Restoration. Substitute wetland for stream in the description.

Breaching, removing, and constructing berms and dikes - The restoration activity will allow more natural hydrologic flows to occur in wetland habitats. Same as described in Project Category I - Riparian Habitat Restoration. *(Note: Berms and dikes will not be constructed along wetland areas adjacent to fish bearing streams that contain federally listed anadromous fish species without a site specific consultation from NOAA Fisheries. This also includes wetland areas that are one-half stream miles above anadromy.)*

Converting former wetlands and restoring current wetlands - Wetland restoration activities will offset wetland losses and improve their functions for fish, wildlife, and plants. Wetlands activities may

involve the excavation and removal of fill materials, installation of water control structures, backfilling or plugging drainage ditches and tiles, and grading the land to restore former shallow and deep water wetland habitats. These activities will be designed to not cause the artificial entrapment of fish and other aquatic species in adjacent areas. Heavy equipment will be used to complete these activities.

Installation of wildlife habitat structures - Installation of wildlife habitat structures will increase the cover, shelter, and nesting habitat availability for a variety of wildlife species in wetland areas. Same as described in Project Category I - Riparian Habitat Restoration.

Planting native wetland plant species - Native wetland vegetation will be planted to increase the diversity and abundance of existing wetland plant communities. Vegetation to be planted will include conifers and hardwood trees, shrubs, and grasses, sedges, rushes, and any other vegetation that would have naturally occurred at the project site. Planting will be done by manual labor, seed drilling, tilling, installation of vegetated mats, or other appropriate planting techniques.

Control and removal of invasive/non native plant species - Control and removal of invasive and non native vegetation will promote the composition and abundance of native wetland plant communities. Same as described in Project Category I - Riparian Habitat Restoration, except for the following action. Prescribed burn areas will not be located in wetland areas and must be at least 100 feet away from the edge of perennial and ephemeral stream channels.

Project Category III - Instream Habitat Restoration

Activities in this project category will primarily focus on improving instream diversity and complexity and natural stream hydrology for fish and other aquatic species. Specific restoration activities will consist of the following:

Installation of wood and boulder instream structures - Installation of structures will improve spawning and rearing habitats for fish and other aquatic species. Installations will consist of weirs, revetments, log jams, and other cover structures designed with large woody debris and/or boulders. Large woody debris includes whole conifer and hardwood trees, logs, and rootwads. Structures will be either non-affixed or affixed⁷ depending on the site location and project objectives. Structures may partially or completely span stream channels or be positioned along the stream banks. Sizing requirements for wood and boulder materials will depend on bankfull widths and stream discharge rates, and the local availability of these materials. Heavy equipment and helicopters will be used to complete these activities.

Hydrologic modifications of natural alcoves and side channels - Improvements to natural alcoves and side channels will promote off-channel habitats and refuge areas for fish and other aquatic species. Natural alcoves and side channels will be modified by improving stream flows through these areas.

⁷ Instream structures that are firmly buried or cabled in a stream channel or bank.

Instream structures will be installed, as necessary, to redirect stream flows and provide habitats for aquatic species. These activities will be designed not to cause the artificial entrapment of fish and other aquatic species. Heavy equipment will be used to complete these activities. (*Note: Alcoves and side channels adjacent to fish bearing streams that contain federally listed anadromous fish species will not be enhanced without a site specific consultation from NOAA Fisheries. This also includes stream reaches that are one-half stream miles above anadromy.*)

Re-channeling of streams into their historic locations - The re-channelization of streams will restore or enhance their historic form and function that were lost as a result of past artificial channel modifications. Re-channelization activities will include grading and shaping of new channels to obtain natural meander patterns, depth/width ratios, pool/riffle ratios, and substrate composition. Existing stream channels may be backfilled to disconnect them from the new channel. Existing stream flows may also be directed into old channels if they are discernable instead of creating new historic channels. Heavy equipment will be used to complete these activities. (*Note: Re-channelization projects adjacent to fish bearing streams that contain federally listed anadromous fish species will not be completed without a site specific consultation from NOAA Fisheries. This also includes stream reaches that are one-half stream miles above anadromy.*)

Salmon carcass placements - Salmon carcass placements will help to mimic stream enrichment and nutrient recycling. Carcasses will be obtained from State fish hatcheries. They will be placed along and in streams by hand. This activity will be directly or indirectly supervised by a fisheries biologist from the Oregon Department of Fish and Wildlife.

Project Category IV - Fish Passage Improvements

Activities in this project category will primarily focus on improving and restoring fish passage through artificial stream structures to allow fish and other aquatic species access to former spawning and rearing habitats. Specific restoration activities will consist of the following:

Installation and modification of artificial fishways⁸ - Installations or modifications of fishways will provide fish passage to habitats beyond man-made barriers (*e.g.*, dams and spillways). Artificial fishways will generally consist of a flume with baffles or a series of stepped pools that slow water velocities and provide adequate water depths to allow fish passage. Examples of fishways include vertical slot fishways, Denil ladders, and Alaskan steep passes. Modifications to fishways may include

⁸ “Artificial fishway” is defined as any non-culvert related fish passage structure constructed within a stream channel to aid in the passage of juvenile and/or adult fish or other aquatic species. This includes stand alone fishways and those incorporated into approved irrigation diversions. The structure must also be a semipermanent or permanent installation and constructed of wood, rock, concrete, and/or metal. Simple boulder-step pool weirs are not defined as an artificial fishway if they are designed and constructed to meet NOAA Fisheries’ fish passage criteria and Oregon Road/Stream Crossing Restoration Guide (Robison *et al.* 1999). A closed or open by-pass fish conveyance (*e.g.*, piped or ditched system) installed within an irrigation diversion is not defined as an artificial fishway if fish are returned to the original stream a short distance downstream of the diversion.

deepening plunge pools, redirecting water flows to provide proper water levels and flow velocities, installing debris deflectors, providing adequate resting areas inside fishways, maintaining appropriate entrance flows to attract fish, and installing finger traps at the crest of weirs to restrict fish access. Heavy equipment will be used to complete these activities. ***(Note: Artificial fishway projects adjacent to fish bearing streams that contain federally listed anadromous fish species will not be completed without a site specific consultation from NOAA Fisheries. This also includes stream reaches that are one-half stream miles above anadromy.)***

Re-engineering of existing irrigation diversions - The re-engineering of irrigation diversions will result in more efficient irrigation systems that will conserve water and improve fish passage and water quality. Designs for irrigation diversions described below will be reviewed and approved by NOAA Fisheries' Engineering staff and the Service before initiating project activities. This includes designs for headgates, headgate/sluice gate combinations, screening, fish passage, diversion dams/structures, and water delivery systems (*i.e.*, open ditch or closed pipe systems). Irrigation diversions may include infiltration galleries, cross vanes, "W" weirs, "A" frame weirs, central pumping stations, and individual pump intakes. Multiple diversions may be consolidated into one permanent diversion or pumping station. Abandoned open ditches and other similar structures will be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them. Heavy equipment will be used to complete these activities. ***(Note: Infiltration galleries and lay-flat stanchions will not be constructed in streams that contain federally listed anadromous fish species without a site specific consultation from NOAA Fisheries. This also includes stream reaches that are one-half stream miles above anadromy.)***

External and internal modifications to roadway culverts - The modification of roadway culverts will improve fish passage at road-stream crossings. Culvert modifications may include the installation of internal baffles to redirect or reduce flow velocities and the construction of boulder-step pool weirs to backwater a culvert outlet. Heavy equipment will be used to complete these activities.

Realignment of roadway culverts to stream flows - Realigning culverts to current stream flows will improve fish passage at road-stream crossings and increase protection to streambanks and roadway fills. Misaligned culverts will be excavated and repositioned at the existing road-stream crossing. The existing culvert must be adequately sized for the stream and in good condition to be reinstalled. All culvert installations will be in compliance with NOAA Fisheries' fish passage criteria and Oregon Road/Stream Crossing Restoration Guide. Heavy equipment will be used to complete these activities.

Replacement of undersized roadway culverts with appropriately sized culverts - Replacement of undersized culverts will improve fish passage at road-stream crossings. Culverts determined to be undersized, with respect to current stream conditions, will be replaced with appropriately sized culverts. The existing culvert will be excavated and the stream channel prepared for the installation of the new culvert. All culvert installations will be in compliance with NOAA Fisheries' fish passage criteria and Oregon Road/Stream Crossing Restoration Guide. Grade control structures (*e.g.*, log or boulder weirs) may be constructed upstream and downstream of a culvert within the stream channel to control

potential stream channel incision (Castro 2003). The stream channel, up to linear distance of 50 feet upstream or downstream of a culvert, may be altered (*e.g.*, graded, armored, or realigned parallel to the culvert) to allow for improved stream flow into and out of the culvert. This action will provide increased erosion protection to the road-stream crossing and reduce turbulent flows inside the culvert for improved fish passage. Heavy equipment will be used to complete these activities. (*Note: A culvert installation requiring the alteration of a stream channel at a linear distance greater than 50 feet upstream or downstream of a culvert on a fish bearing stream that contain federally listed anadromous fish species will not be completed without a site specific consultation from NOAA Fisheries. This also includes stream reaches that are one-half stream miles above anadromy.*)

Replacement of roadway culverts with bridges - Replacement of culverts with bridges will allow unobstructed fish passage at road-stream crossings. A road-stream crossing determined to be inappropriate for a culvert installation, based on current stream conditions, will be redesigned for a full spanning bridge. Bridges will be constructed from wood, steel, and/or reinforced concrete or flatbed railroad cars. Concrete abutments will be constructed above the bankfull elevation of the stream to support and anchor bridge structures. Grade control structures (*e.g.*, log or boulder weirs) may be constructed upstream and downstream of a bridge within the stream channel to control potential stream channel incision (Castro 2003). Bridge designs will incorporate necessary elements to allow for wildlife movement over or under bridges whenever possible.

Permanent removal of roadway culverts, tide gates, and other artificial fish passage barriers -

Permanent removal of culverts, tide gates, and other fish passage barriers will allow unobstructed fish passage at the stream crossing. Culverts, tide gates, and other fish passage barriers (*e.g.*, irrigation dams, water control structures, and old bridge abutments) will be excavated and removed from stream locations. Stream banks will be graded and shaped, as necessary, to minimize or eliminate erosion. Stream channels may also be graded or streambed deposition partially removed to control potential stream channel incision. Permanent culvert removals will primarily be associated with road and trail abandonment and decommissioning projects.

Project Category V - Upland Habitat Restoration

Activities in this project category will primarily focus on restoring the composition and structural diversity of native upland plant communities. Specific restoration activities will consist of the following:

Installation of livestock fencing - Installation of livestock fencing will minimize or eliminate livestock degradation of upland habitats. Same as described in Project Category I - Riparian Habitat Restoration.

Installation of livestock watering facilities - Installation of livestock watering facilities will minimize or eliminate the need for direct livestock access to aquatic habitats. Same as described in Project Category I - Riparian Habitat Restoration.

Installation of bio-engineered stabilization structures - Installation of stabilization structures will minimize or eliminate erosion at site specific locations. These installations will improve the water quality in downslope aquatic habitats. Natural materials (*e.g.*, vegetation, boulders, and woody debris) will be installed to control erosion on unstable slopes and areas developing rills and gullies. Heavy equipment will be used to complete these activities.

Installation of wildlife habitat structures - Installation of wildlife habitat structures will increase the cover, shelter, and nesting habitat availability for a variety of wildlife species in upland areas. Same as described in Project Category I - Riparian Habitat Restoration.

Planting native upland plant species - Native upland vegetation will be planted to increase the diversity and abundance of existing upland plant communities. Native vegetation to be planted will include conifers and hardwood trees, shrubs, and grasses, and any other vegetation that would have naturally occurred at a project site. Vegetation will be planted by hand, mechanical planters, or broadcasted with hand or mechanical spreaders (*e.g.*, no till seed drill and hydro-seeding with vehicle mounted pressurized equipment). Heavy equipment may be used to complete these activities.

Conversion of altered habitats to historic oak savannahs, short and tall grass prairies, or conifer/hardwood forests - Habitat conversions will restore or enhance human-altered habitats to more closely mimic historic habitats. Many of these habitats have been converted in the past for timber, ranching, farming, and industrial/commercial purposes. Non historic vegetation will be removed and replaced in these habitats with historic vegetative species. Planting will be done by manual labor, seed drilling, tilling, or other appropriate planting techniques. Invasive and non native vegetation will be controlled or removed by manual, mechanical, biological methods and prescribed burns.

Silvicultural treatments - Silvicultural treatments in upland areas will improve forest health and reduce fuel loading for wildfire control. Silvicultural treatments will include:

- removing or girdling dominate hardwood or conifer trees.
- removing understory vegetation to release existing hardwood or conifers trees.
- pre-commercial thinning timber stands to reduce hardwood or conifer stocking rates.
- replanting hardwood or conifer seedlings to establish or reestablish timber stands.
- removing ground fuels to reduce fuel loading.

Silvicultural treatments will occur in upland areas based on the following criteria.

- Treatments will occur in occupied and suitable unsurveyed habitats for federally listed terrestrial species if they do not remove or degrade these habitats.
- Treatments will occur in areas that are at least 500 feet (*i.e.*, measured as a straight line distance from the nearest edge of the timber stand to the stream channel) from a fish bearing stream that contains federally listed aquatic species. The stand must also be on a slope of less than twenty percent to the stream channel.
- Treatments may occur in areas that are at least 250 feet or two site potential tree heights

away (*i.e.*, whichever is greater) away from a fish bearing stream that does not contain federally listed fish species. The stand must also be on a slope of less than twenty percent to the stream channel.

- Treatments may occur in areas that are at least 125 feet or two site potential tree heights (*i.e.*, whichever is greater) away from a non-fish bearing stream. The stand must also be on a slope of less than twenty percent to the stream channel.
- If the status of a stream (*i.e.*, whether it contains federally listed species) is unknown, then silvicultural treatments in upland areas must adhere to requirements for a fish bearing stream that contains federally listed aquatic species.

Conifer and hardwood trees felled in forest stands may be removed from the stand, remain on-site for nutrient recycling, or used for other habitat restoration activities (*e.g.*, materials for instream structures). Heavy equipment may be used to complete these activities. (***Note: Silvicultural treatments in upland areas that do not meet the criteria above will not be completed without a site specific consultation from NOAA Fisheries and/or the Service.***)

Control and removal of invasive/non native plant species - Control and removal of invasive and non native vegetation will promote the composition and abundance of native upland plant communities. Same as described in Project Category I - Riparian Habitat Restoration, except for the following action. Prescribed burns will occur in upland areas for control and removal of invasive and non native vegetation. These burns will be used as a site-preparation tool rather than for strict control purposes. Burns will not occur in riparian and wetland areas and will be at least 100 feet away from the edge of perennial and ephemeral stream channels.

Stormwater management - Same as described in Project Category I - Riparian Habitat Restoration.

Project Category VI - Coastal and Estuarine Habitat Restoration

Activities in this project category will primarily focus on restoring the natural diversity and complexity of coastal dune and estuarine habitats. Activities under Wetland Habitat Restoration will also apply in these habitats. Specific restoration activities will consist of the following:

Installation of wood and boulder structures - Installation of structures will increase the complexity and diversity of estuarine habitats and provide spawning and rearing habitats for fish and other aquatic species. Same as described in Project Category III - Instream Habitat Restoration, except for the following action. Structures will be placed in estuaries and streams that drain into them.

Reestablishment of natural coastal dune processes - The reestablishment of coastal dune processes will restore nesting habitat for the western snowy plover. Sand dunes being stabilized by European beach grass (*Ammophila arenaria*) will be bulldozed to remove the grass biomass and lower the elevation of the dunes. Existing drift wood in the project areas will be piled at the high tide mark (*i.e.*, to be removed from the areas under tidal action). Dunes will be lowed to an elevation where ocean

tides can complete a wash over of the area to maintain an open beach habitat. Followup activities may need to continue for one to two years after the initial treatment to get the area to be self-maintaining.

Planting native coastal/estuarine plant species - Native coastal and estuarine vegetation will be planted to increase the diversity and abundance of existing plant communities. Same as described in Project Categories I and II - Riparian and Wetland Habitat Restoration.

Installation of wildlife habitat structures - Installation of wildlife habitat structures will increase the cover, shelter, and nesting habitat availability for a variety of wildlife species in coastal and estuarine areas. Same as described in Project Category I - Riparian Habitat Restoration.

Control and removal of invasive/non native plant species - Control and removal of invasive/non native vegetation will promote the composition and abundance of native coastal and estuarine plant communities. Same as described in Project Category I - Riparian Habitat Restoration, except for the following action. Prescribed burns will not occur in riparian and wetland areas and will be at least 100 feet away from the edge of perennial and ephemeral stream channels.

Project Category VII - Road and Trail Improvements

Activities in this project category will primarily focus on sedimentation reduction and erosion control from roads and trails in riparian, wetland, and upland areas. Specific restoration activities will consist of the following:

Closure of roads and trails - This activity will restrict motorized vehicle access on a road or trail by installing a temporary or permanent gate or other type of barrier. Barriers may include large wood, boulders, or ditches dug perpendicular to the road.

Abandonment of roads and trails - This activity will eliminate pedestrian, bike, or motorized vehicle access on a road or trail. Activities will include installing a temporary or permanent gate or other type of barrier, drainage improvements, revegetation, and soil stabilization to prevent sedimentation and erosion.

Decommissioning of roads and trails - This activity will return a road or trail to natural conditions before its construction. Activities will include installing a permanent gate or other type of barrier, removing cross-drainage and stream culverts, contour shaping of the road or trail base, soil stabilization, and tilling compacted surfaces to reestablish native vegetation.

Improvements on roads and trails - This activity will include installing or upgrading road and trail structures (*e.g.*, cross-drainage culverts, water bars, and water dips), road prism shaping, revegetation of fill and cut slopes, removal and stabilization of sidecast materials, and grading or resurfacing roads and trails with gravel, bark chips, or other appropriate materials.

Project Category VIII - Surveys, Assessments, and Monitoring Activities

Activities in this project category will primarily focus on the collection of physical, chemical, and biological information. For activities related to specific restoration projects, the information will be used to develop an adaptive management approach for future restoration activities under Project Categories I-VII. Other field work will be conducted to gather data for habitat conservation efforts and to increase public outreach and education through field studies and observations. Specific activities will consist of the following:

Physical data collection -

- Stream channel morphology.
- Road inventories addressing road conditions and sedimentation concerns.
- Fish passage assessments on road-stream crossings.
- Monitoring the retention of instream structures.
- Water quality monitoring.
- General visual observations and site assessments.

Biological data collection -

- Macroinvertebrate surveys.
- Aquatic surveys, including spawning and juvenile fish surveys.
- Surveys for the presence, abundance, distribution, and composition of flora and fauna.
- Monitoring plant survival and growth.
- General visual observations and site assessments.

Acquisition of Restoration Materials

Although the Service does not have complete control over restoration material acquisition, appropriate steps will be taken to ensure that acquired materials will not affect federally listed species. Steps to be taken include the implementation of project design standards (Appendix A), written terms and conditions on official project authorizations issued to project cooperators, and follow-up monitoring by the Service personnel during and after construction activities.

Large Wood - Large wood⁹ used in restoration activities will be either donated, purchased, or salvaged. Whole trees, logs, and rootwads will be obtained from, but not limited to, local lumber mills, approved silvicultural operations on Federal, State, Tribal, and private lands, roadway projects, and urban development sites. Riparian timber stands will not be harvested to supply large wood to

⁹ "Large wood" means a tree, log, or rootwad big enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull channel width of the stream in which the wood occurs. See Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (<http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/lrgwood.pdf>).

complete a restoration activity. A limited number of appropriately sized (*i.e.*, length and diameter) conifer trees in upland habitats (*e.g.*, ten conifer trees/stream or road mile) may be harvested and incorporated as key structural components in restoration activities. Harvesting of upland conifer trees may occur in habitats where federally listed species may be present; however, these trees will not be harvested if they will remove or degrade occupied or suitable habitats. Down coarse woody debris¹⁰ in riparian and upland habitats may also be incorporated into a restoration activity. However, this material will remain at or near its original location to maintain the natural (or current) characteristics of the local area. Large wood will be obtained during appropriate seasonal periods to minimize or eliminate soil disturbance and compaction.

Boulders - Boulder and other rock materials will be obtained outside of aquatic habitats. Boulders used in restoration activities will be donated, purchased, or salvaged from non-streambed sources (*i.e.*, primarily from established upland quarries on Federal, State, and private lands). Boulders used in aquatic restoration activities will be appropriately sized (*i.e.*, diameter and weight) and of durable composition to meet the intent of an activity and habitat needs for aquatic species. To meet this intent, boulder composition may be different from the native composition at a project site. Boulder composition refers to the formation, mineral makeup, and hardness on the rock material. Boulders will be obtained during appropriate seasonal periods to minimize or eliminate soil disturbance and compaction.

Native Plant Materials - Native vegetation to be planted or seeded will be primarily obtained from Federal, State, local (*e.g.*, City of Portland), and private suppliers and nurseries. However, local native plant species may be collected and transplanted at project sites, depending on their availability from established suppliers and nurseries. Plants purchased from suppliers and nurseries will be selected, as appropriate, for the environmental conditions (*e.g.*, light, hydrology, elevation, and range) present at a project site. Plants may also be salvaged from areas where soil disturbance will be occurring and replanted on the same project site following the completion of construction activities. Tree and shrub species that can be propagated from cuttings (*e.g.*, willows and cottonwoods) may be obtained from local natural stands. The number and type of cuttings collected from a stand will not affect the stand from continuing to provide benefits to the local watershed.

Pressured Treated Wood Products - Pressured treated wood products¹¹ containing water or oil-borne preservatives may be incorporated into restoration activities under appropriate project categories. However, these wood products will not be placed in areas where they will be in constant contact with standing or moving water or placed over water where they will be exposed to mechanical abrasion or leachate may enter aquatic habitats. These products will typically be used for livestock fence

¹⁰ "Coarse woody debris" consists of snags, fallen logs, wind blown trees, and large branches.

¹¹ "Treated wood" means lumber, pilings, and other wood products preserved with alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), ammoniacal copper zinc arsenate (ACZA), copper naphthenate, chromated copper arsenate (CCA), pentachlorophenol, or creosote.

installations (e.g., fence support poles). Treated wood products will be required to have been manufactured using American Wood-Preservers Association best management practices to ensure proper preservative application and drying of the wood product before use. Wood products of unknown origin or method of treatment will not be used in a restoration activity under any project category. Subject to the above conditions, natural decay resistant wood (e.g., cedar products), metal, concrete, rock, or plastic materials will be used in place of treated materials. ***(Note: Use of pressure treated wood products that do not meet the criteria above will not be incorporated into any restoration activity without a site specific consultation from NOAA Fisheries and/or the Service, as appropriate.)***

Other Actions Not Covered Under The Biological Assessment

The following actions will not be covered under the programmatic BA. Site specific consultations will need to be completed with NOAA Fisheries and/ or the Service, as appropriate, for any of these actions.

- Installing or upgrading tide gates.
- Use of pesticides to control or remove vertebrate and invertebrate species and microorganisms (e.g., viruses, bacteria, and fungi).
- Use of herbicides to control or remove vegetation.
- Operation and maintenance of irrigation facilities beyond the first year of operation.
- Maintenance of culverts and bridges after the completion of construction activities.
- Use of explosives (i.e., dynamite and gun powder).

Chapter 4 - Environmental Baseline

The environmental baseline for federally listed species included in the BA will be the current status of these species in Oregon. Current history and population status of listed species are described below.

Mammals¹²

Canada lynx - listed as a threatened species in 2000 (65 FR 16051). Due to a lack of data, the historic and current status of resident lynx populations in Oregon is uncertain. Museum specimens exist from seven counties in Oregon. There are also at least 247 bounty records known for lynx from twelve counties in the state. There are 72 recently (post-1985) reported lynx sightings in Oregon, including one specimen shot in 1993. Recent observations of lynx are primarily from the Cascade and from the Blue Mountains.

Canada lynx inhabit montane coniferous forests. They are specialized predators that are highly dependent on the snowshoe hare (*Lepus americanus*) for food, but also eat alternate prey such as squirrels and grouse. Snowshoe hare prefer diverse, early successional forests with dense stands of conifers and shrubby understories that provide food, cover to escape from predators, and protection during extreme weather. Lynx usually concentrate their winter foraging activities in areas where hare activity is high.

Canada lynx den in forests with large woody debris, such as downed logs and windfalls, to provide denning sites with security and thermal cover for kittens. In Washington, lynx used lodgepole pine (*Pinus contorta*), spruce (*Picea spp.*), and subalpine fir (*Abies lasiocarpa*) forests older than 200 years for denning. Based on information from the western United States, sites selected for denning also must provide for minimal disturbance by humans and proximity to foraging habitat (early successional forests), with denning stands at least one hectare (2.5 acres) in size. Intermediate-age forests allow for lynx access between den sites and foraging areas, movement within home ranges, and random foraging opportunities.

Lynx habitat includes the footprint of the Malheur, Umatilla, Wallowa-Whitman, and Deschutes National Forests within Baker, Deschutes, Grant, Jefferson, Umatilla, Union, and Wallowa counties. Lynx habitat generally occurs around 4000 feet in elevation and above (Ruediger *et al.* 2000).

Columbian white-tailed deer - listed as an endangered species in 1967. At this time, only a small population was known to survive on islands and a small mainland area in Washington along the lower Columbia River. In 1978, a small population of deer was identified in Douglas County, Oregon. On

¹² Reference source - <http://oregonfwo.fws.gov/EndSpp/FactSheets/MammalSpecies.dwt>

July 24, 2003, the Columbian white-tailed deer was delisted in Douglas County, Oregon. A recovery plan was published in 1983 for the Columbia River deer population.

Early records indicate that Columbian white-tailed deer were once quite numerous over its historic range. The deer once ranged from the western slopes of the Cascade Mountains to the ocean and from Puget Sound in Washington southward to the Umpqua River Basin in southern Oregon. This sub-species of white-tailed deer became endangered throughout its range due to habitat modification by human activities, such as farming and logging, as well as commercial and residential development. Over hunting and poaching also contributed to the decline. Columbian white-tailed deer occur in two separate populations. The Lower Columbia River population is found in Wahkiakum and Cowlitz Counties, Washington, and Clatsop and Columbia counties, Oregon. The Douglas County population is found in the Umpqua River Basin, Douglas County, Oregon. When the Columbian white-tailed deer was listed, the number of deer remaining was estimated to be less than 1000 individuals. Under the protection afforded by the Endangered Species Act, the Douglas County population has increased to over 5000 animals. The Lower Columbia River population suffered heavy losses due to extensive flooding of its habitat in 1996, however it is expected to recover to pre-flood numbers within a few years.

Columbian white-tailed deer are closely associated with riparian (riverside) habitats in both the Lower Columbia River and Douglas County populations. The deer found on islands in the Columbia River use "tidal spruce" habitats characterized by dense forested swamps covered with tall shrubs and scattered spruce, alder (*Alnus spp.*), cottonwood and willows. In Douglas County, the deer use willow and cottonwood habitats along rivers and streams, and are also found in oak-savannah habitats in the upland areas.

Birds¹³

Marbled murrelet - Washington, Oregon, and California populations were listed as a threatened species in 1992 (57 FR 45328). Critical habitat was designated for the species in 1996 (61 FR 26255). A recovery plan was published in 1997.

The North American subspecies of marbled murrelet ranges from the Aleutian Islands and southern Alaska south to central California, the largest portion of the population occurs in Alaska and British Columbia. Due to loss of older forests used for nesting sites, the California, Oregon, and Washington population of the marbled murrelet is declining. For example, current estimates indicate that only approximately 6,500 individual murrelets inhabit the area along the coast of California. Using known population numbers relative to remaining suitable nesting habitat, it has been estimated that historically, 60,000 marbled murrelet pairs may have been found in this same area. Along the Oregon coast, recent surveys have shown a decline in murrelet numbers during the 1990's. Loss and fragmentation of nesting

¹³ Reference source - <http://oregonfwo.fws.gov/EndSpp/FactSheets/BirdSpecies.dwt>

habitat leading to nesting failure is thought to be a primary factor responsible for an estimated annual four to seven percent decline in marbled murrelet populations. It is unlikely that population numbers will increase rapidly due to the naturally low reproductive rate and the continued loss of nesting habitat indicates that the recovery of the species is likely to take decades.

The marbled murrelet is a small robin-sized diving seabird that feeds primarily on fish and invertebrates in near-shore marine waters. It spends the majority of its time on the ocean, roosting and feeding, but comes inland up to 80 kilometers (50 miles) to nest in forest stands with old growth forest characteristics. These dense shady forests are generally characterized by large trees with large branches or deformities for use as nest platforms. The listed population nests in stands varying in size from several acres to thousands of acres. However, larger, unfragmented stands of old growth appear to be the highest quality habitat for marbled murrelet nesting. Nesting stands are dominated by Douglas fir in Oregon and Washington and by old growth redwoods in California. Marbled murrelets nest from mid-April to late September.

Western snowy plover - listed as a threatened species in 1993 (58 FR 12864). Critical habitat was designated in 1999 (64 FR 68507) at 28 areas along the coasts of California, Oregon and Washington.

The Pacific coast population of the western snowy plover is defined as those individuals that nest beside or near tidal waters, and includes all nesting colonies on the mainland coast, peninsulas, offshore islands, adjacent bays and estuaries from southern Washington to southern Baja California, Mexico. Historic records indicate that western snowy plovers nested at 29 locations on the Oregon coast. Currently, only nine locations in Oregon support nesting western snowy plovers, a 69 percent reduction in active breeding locations. Primary nesting areas along the Oregon coast are shown in Appendix C.

As early as the 1970's, observers suspected a decline in plover numbers. The primary cause of decline is loss and degradation of habitat. The introduced European beach grass contributes to habitat loss by reducing the amount of open, sandy habitat and contributing to steepened beaches and increased habitat for predators. Urban development has reduced the available habitat for western snowy plovers while increasing the intensity of human use, resulting in increased disturbance to nesting plovers.

The Pacific coast population of western snowy plovers breeds on coastal beaches. They nest in open, flat, sparsely vegetated beaches and sand spits above the high tide. Because the sites they choose are in loose sand or soil, nesting habitat is constantly changing under the influence of wind, waves, storms, and encroaching plants. The nesting season extends from early March through late September.

Bald eagle - Bald eagles in the lower 48 states were first protected in 1940 by the Bald Eagle Protection Act and then were listed as an endangered species in 1967. In 1995, the bald eagle was reclassified as threatened in all of the lower 48 States. The species was proposed for delisting on July 6, 1999. A decision on whether to delist the bald eagle is pending (64 FR 36453).

The bald eagle is the only eagle unique to North America. It ranges from central Alaska and Canada down to northern Mexico. The majority of nesting bald eagles in Oregon occur in the following areas: Columbia River below Portland, the Oregon coast and Coast Range, the High Cascades, Klamath Basin, and the upper Willamette River Basin. A nesting survey found 371 breeding pairs in Oregon and 36 on the Washington side of the Columbia River in 2000. Population goals in eight of ten recovery zones in Oregon have been met or exceeded. Wintering bald eagles are found throughout Oregon, but concentrations occur in areas with dependable food supplies such as Klamath and Harney Basins and along the Snake and Columbia Rivers.

Bald eagle nest site selection varies widely from deciduous, coniferous, and mixed forest stands. Nest trees are usually large diameter trees characterized by open branching and stout limbs. Nests are in dominant or codominant trees often located near a break in the forest such as a burn, clear-cut, field edge (including agricultural fields), or water. The majority of nest sites are within 0.5 miles of a body of water such as coastal shorelines, bays, rivers, lakes, farm ponds, dammed up rivers (*i.e.*, beaver dams, log jams, etc.) and have an unobstructed view of the water. Bald eagles nest from January to September. Bald eagle habitat occurs primarily in undeveloped areas with little human activity.

Winter foraging areas are usually located near open water on rivers, lakes, reservoirs, and bays where fish and waterfowl are abundant, or in areas with little or no water (*i.e.*, rangelands, barren land, tundra, suburban areas, etc.) where other prey species (*e.g.*, rabbit, rodents, deer, and carrion) are abundant. Communal roost sites contain large trees (standing snags and utility poles have also been used) with stout lower horizontal branches for perching and may be used at night by three to greater than one hundred bald eagles, as well as during the day, especially during inclement weather. Perch trees used during the day possess the same characteristics as roost trees but are located closer to foraging areas.

Brown pelican - listed as an endangered species in 1970. A recovery plan was published in 1983.

There are two geographically and genetically distinct regional populations or subspecies of brown pelican that occur in North America. They are the California brown pelican (*P. o. californicus*), ranging from California to Chile, and the eastern brown pelican (*P. o. carolinensis*), which occurs along the Atlantic and Gulf coasts, the Caribbean, and the Central and South American coasts. Current information indicates that the California brown pelican has sufficiently recovered as a result of restrictions on the use of certain types of pesticides (organochlorines), and this news has prompted a proposal to delist this subspecies. A final ruling on this action is pending.

Brown pelicans received severe exposure to DDT and other contaminants through consumption of contaminated fish. As was the case with many birds, this exposure resulted in the production of eggs with thin eggshells that were unable to withstand the weight of the parent during incubation, resulting in crushed eggs instead of healthy chicks. As a consequence, the number of chicks produced each year declined dramatically, and the population was severely reduced.

Other factors, including local food shortages and human disturbance, also contributed to the decline of the species. Pelicans require undisturbed habitat and abundant supplies of fish, particularly during the breeding season. If nesting pelicans are startled while on the nest, their abrupt departure often crushes their eggs. If sufficient food supplies are not readily available, pelicans will abandon breeding colonies. Factors contributing to decreased food availability include commercial fishing and naturally occurring increases in ocean water temperature.

The brown pelican is a warm weather species that thrives near coasts and on islands. The California brown pelican generally uses the rocky islands along the California coast for their group or "colonial" nest sites. These islands typically feature steep, rocky slopes and little vegetation, and they must be without terrestrial predators or human disturbances. Nearby high quality marine habitat is also essential. Pelicans will only breed in areas and at times with enough food to support the breeding colony. Roosting and resting or "loafing" sites where brown pelicans can dry their feathers and rest without disturbance are also important. Pelicans have been recently seen roosting along the Oregon coast on spits and jetties (*e.g.*, in Coos County).

Northern spotted owl - listed as a threatened species in 1990 (55 FR 26114). In 1992, areas of critical habitat were designated to further protect this subspecies on Federal lands (57 FR 1796).

The northern spotted owl is believed to have historically inhabited most forests throughout southwestern British Columbia, western Washington and Oregon, and northwestern California as far south as the San Francisco Bay. Loss and adverse modification of nesting, roosting and foraging habitat due to timber harvesting, land conversions, natural disturbances such as fire and windstorms, and increased competition with barred owls, however, have led to a decline of northern spotted owls throughout much of their historic range. Today spotted owls are particularly rare in British Columbia, the Cascade mountains of northern Washington, the Coast ranges of southwest Washington and northwest Oregon. A large and virtually isolated population persists on the Olympic peninsula. Estimates suggest that the amount of suitable habitat available to spotted owls has been reduced by over sixty percent in the last 190 years. Owl numbers appear to have declined annually since 1985 when many studies began. Although the listing of the spotted owl as threatened and the designation of critical habitat offer some protection for the spotted owl on federal lands, past trends suggest that much of the remaining unprotected habitat could disappear in ten to thirty years.

Northern spotted owls live in forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops. Although they are known to nest, roost, and feed in a wide variety of habitat types, these owls prefer older forest stands with variety: multi-layered canopies of several tree species of varying size and age, both standing and fallen dead trees, and open space among the lower branches to allow flight under the canopy. Typically, forests do not attain these characteristics until they are at least 150 to 200 years old. Although the breeding season varies with geographic location and elevation, spotted owls generally nest from February to June. One to four (usually two) pure white eggs are laid in the early spring and hatch about a month later. During incubation, the male typically does most of the foraging and brings food to the female and

the young owlets. At three to four weeks, the owlets are able to perch away from the nest, but still depend on their parents for food. Parental care of the juveniles generally lasts into September when the young owls finally take off on their own.

Inland Fish¹⁴

Warner sucker - listed as a threatened species in 1985 (50 FR 39117). Critical habitat has been designated for the species. A recovery plan was published in 1998.

The probable historic range of the Warner sucker includes the main Warner lakes (Hart, Crump and Pelican), ephemeral lakes, sloughs, and lower-gradient streams in Lake County, Oregon. Historically abundant and widely-distributed in the basin, the Warner sucker still maintains sizable numbers in a few habitats. It is still known to occur in most lakes, sloughs, and potholes, except during drought years. Stream resident populations are found in Honey and Twentymile creeks, and in Deep Creek below Deep Creek falls. In most habitats the Warner sucker is rare, although aggregations of spawning adults or young-of-the-year may be encountered.

Drought in the late 1980's and early 1990's dried most lake and slough habitats and basin-wide surveys conducted from 1993 to 1997, after the lakes had refilled, documented the recolonization of these habitats by native and non-native fish. Prior to the drought, the lake population of suckers was comprised of only large older individuals indicating a lack of successful reproduction or recruitment to lake habitats. During the same time, non-native piscivorous fishes (crappie [*Pomoxis spp.*] and brown bullhead [*Ictalurus nebulosus*]), comprised approximately 87 percent of the fish fauna in the Warner lakes. Following the drought, recolonization by native fishes, including the Warner sucker, was found to occur at a much faster rate than for non native fishes. Surveys in 1997 indicated that native fish (Warner suckers, tui chubs [*Gila bicolor ssp.*] and redband trout [*Oncorhynchus mykiss ssp.*]) comprised approximately eighty percent of the total catch. Information collected from 1993 to 1997 suggests that the drought may have had a significantly greater impact on non native fishes as compared to the native species that evolved under fluctuating environmental conditions. However, over time it is anticipated that the number of crappie and brown bullhead will increase significantly to levels observed prior to the drying of lake habitat in 1992.

Larvae are found in shallow backwater pools or on stream margins where there is no current, often among or near macrophytes (aquatic plants). Young of the year use deep still pools, but also move into faster flowing areas near the heads of pools. Adults use stretches of stream where the gradient is low enough to allow the formation of long (greater than 50 meters) pools. These pools tend to have undercut banks, large beds of aquatic macrophytes, root wads or boulders, a vertical temperature differential of at least 2° C, a maximum depth greater than 1.5 meters, and over-hanging vegetation.

¹⁴ Reference source - <http://oregonfwo.fws.gov/EndSpp/FactSheets/FishSpecies.dwt>

Oregon chub - listed as an endangered species in 1993 (58 FR 53800). A recovery plan was published in 1998.

Oregon chub are endemic to the Willamette River Valley of western Oregon. Although information is scarce, the Oregon chub probably occurred throughout the lower elevations of the Willamette River valley. Historical records indicate that Oregon chub were found as far downstream as Oregon City and as far upstream as Oakridge. Historical records also report Oregon chub were collected from the Clackamas River, Molalla River, South Santiam river, North Santiam River, Luckiamute River, Long Tom River, McKenzie River, Mary's River, Coast Fork Willamette River, Middle Fork Willamette River, and the Mainstem Willamette River from Oregon City to Eugene.

The current distribution of Oregon chub is limited to about twenty known naturally occurring populations and four recently reintroduced populations. The populations are found in the Santiam River, Middle Fork Willamette River, Coast Fork Willamette River, McKenzie River, and several tributaries to the Mainstem Willamette River downstream of the Coast Fork/Middle Fork confluence. Almost all of the populations are small and isolated. Without management, the Oregon chub could potentially disappear completely.

Oregon chub are found in slack water off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes. These habitats usually have little or no water flow, silty and organic substrate, and aquatic vegetation as cover for hiding and spawning. The average depth of Oregon chub habitats is typically less than two meters (six feet) and the summer water temperature typically exceeds 16° C (61° F). Spawning occurs from the end of April through early August when water temperatures are between 16° and 28° C (60° and 82° F). Adult Oregon chub seek dense vegetation for cover and frequently travel in the mid-water column in beaver channels or along the margins of aquatic plant beds. Larval chub congregate in near shore areas in the upper layers of the water column in shallow areas. Juvenile Oregon chub venture farther from shore into deeper areas of the water column. In the winter months, Oregon chub can be found buried in the detritus or concealed in aquatic vegetation. Fish of similar size classes school and feed together. In the early spring, Oregon chub are most active in the warmer, shallow areas of ponds.

Bull trout - populations listed as a threatened species in 1998 (63 FR 31647).

Bull trout are native throughout the Pacific Northwest. In Oregon, bull trout were historically found in the Willamette River and major tributaries on the west side of the Oregon Cascades, the Columbia and Snake Rivers and major tributaries east of the Cascades, and in streams of the Klamath basin. Currently, most bull trout populations are confined to headwater areas of tributaries to the Columbia, Snake, and Klamath rivers.

Bull trout are vulnerable to many of the same threats that have reduced salmon populations. Due to their need for very cold waters and long incubation time, bull trout are more sensitive to increased water temperatures, poor water quality and degraded stream habitat than many other salmonids. Further

threats to bull trout include hybridization and competition with non-native brook trout, brown trout and lake trout, over fishing, poaching, and man-made structures that block migration.

In many areas, continued survival of the species is threatened by a combination of factors rather than one major problem. For example, past and continuing land management activities have degraded stream habitat, especially along larger river systems and streams located in valley bottoms. Degraded conditions have severely reduced or eliminated migratory bull trout as water temperature, stream flow and other water quality parameters fall below the range of conditions which these fish can tolerate. In many watersheds, remaining bull trout are smaller, resident fish isolated in headwater streams. Brook trout, introduced throughout much of the range of bull trout, easily hybridize with them, producing sterile offspring. Brook trout also reproduce earlier and at a higher rate than bull trout so bull trout populations are often supplanted by these non-natives. Dams and other in-stream structures also affect bull trout by blocking migration routes, altering water temperatures and killing fish as they pass through and over dams or are trapped in irrigation and other diversion structures.

Bull trout are seldom found in waters where temperatures are warmer than 59 to 64° F. Besides very cold water, bull trout require stable stream channels, clean spawning gravel, complex and diverse cover, and unblocked migration routes. They spawn in the fall after temperatures drop below 48° F, in streams with abundant cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes. Many spawning areas are associated with cold water springs or areas where stream flow is influenced by groundwater. Bull trout eggs require a long incubation period compared to other salmon and trout, hatching in late winter or early spring. Fry may remain in the stream gravels for up to three weeks before emerging.

Bull trout may be either resident or migratory. Resident fish live their whole life near areas where they were spawned. Migratory fish are usually spawned in small headwater streams, and then migrate to larger streams, rivers, lakes, reservoirs or salt water where they grow to maturity. Smaller resident fish remain near the areas where they were spawned while larger, migratory, fish will move considerable distances to spawn when habitat conditions allow. For instance, bull trout in Montana's Flathead Lake have been known to migrate up to 250 kilometers to spawn.

Invertebrates¹⁵

Vernal pool fairy shrimp - listed as a threatened species in 1994 (59 FR 48136).

Vernal pool fairy shrimp occur primarily in vernal pools, seasonal wetlands that fill with water during fall and winter rains and dry up in spring and summer. Typically the majority of pools in any vernal pool complex are not inhabited by the species at any one time. Different pools within or between complexes may provide habitat for the fairy shrimp in alternative years, as climatic conditions vary.

¹⁵ Reference source - <http://oregonfwo.fws.gov/EndSpp/FactSheets/InvertSpecies.dwt>

Vernal pool fairy shrimp typically hatch when the first rains of the year fill vernal pools. They mature in about 41 days under typical winter conditions. Adult fairy shrimp live only for a single season, while there is water in the pools. Towards the end of their brief lifetime, females produce thick-shelled "resting eggs" also known as cysts. During the summer, these cysts become embedded in the dried bottom mud, and during the winter, they are frozen for varying periods. These cysts hatch when the rains come again. In fact, it appears that prior freezing and/or drying seems to be necessary for the eggs to hatch.

At the time of its listing, the vernal pool fairy shrimp was known to occur only in California, extending from Tulare County in the south to Shasta County in the north. In 1998, these fairy shrimp were discovered in vernal pools in Jackson County, Oregon, in an area north of Medford known as the Agate Desert. Prior to this discovery, the most northerly known location for the species was south of Mount Shasta, California, some eighty miles south of the Agate Desert.

Vernal pool fairy shrimp have declined primarily because of destruction or degradation of vernal pools through development of urban, suburban, and agricultural projects. In addition to direct habitat loss, vernal pool fairy shrimp populations have declined from a variety of activities that degrade existing vernal pools by altering pool hydrology (water regime). Vernal pool hydrology can be altered by a variety of activities, including the construction of roads, trails, ditches, or canals that can block the flow of water into or drain water away from the vernal pool complex.

Fender's blue butterfly - listed as an endangered species in 2000 (65 FR 3875).

This subspecies of the Boisduval's blue butterfly (*Icaricia icarioides*) was believed to be extinct from 1937 until it was rediscovered in 1989. The distribution of this butterfly is restricted to the Willamette Valley, Oregon, where it currently occupies 32 sites in Yamhill, Polk, Benton, and Lane counties. One population is found in wet, Deschampsia-type prairie, while all other remaining populations are found on drier, upland prairies characterized by *Festuca* species. Sites occupied by Fender's blue butterfly are located almost exclusively on the western side of the valley, within 33 kilometers (21 miles) of the Willamette River. The largest populations occur at the Willow Creek Main Preserve managed by The Nature Conservancy and Baskett Slough NWR.

Fender's blue butterfly occurs in native prairie habitats. Most Willamette Valley prairies are seral (one stage in a sequential progression), requiring natural or human-induced disturbance for their maintenance. The vast majority of these prairies would eventually be forested if left undisturbed. Fender's blue butterfly is typically found in native upland prairies, dominated by red fescue (*Festuca rubra*) and/or Idaho fescue (*F. idahoensis*), where its primary larval food plant, Kincaid's lupine or its secondary larval food plants sickle-keeled lupine (*L. albicaulis*) and spur lupine (*L. arbustus*) also occur. Its primary larval food plant, Kincaid's lupine (listed as a threatened species), occurs on a few, small prairie remnants in the Willamette Valley. Native plants, including Tolmie's mariposa (*Calochortus tolmiei*), Hooker's catchfly (*Silene hookeri*), broadpetal strawberry (*Fragaria virginiana*), rose checker-mallow (*Sidalcea virgata*), and common lomatium (*Lomatium spp.*) also occur on native

upland prairies and serve as herbaceous indicators of prairie condition. These dry, fescue prairies make up the majority of habitat for Fender's blue butterfly. Although Fender's blue butterfly is occasionally found on steep, south facing slopes and barren rocky cliffs, it does not appear to thrive in the xeric oatgrass communities often found there.

The life cycle of a Fender's blue butterfly begins in late spring or early summer when an adult female deposits an egg on the underside of a Kincaid's lupine leaflet. The egg soon hatches and the larva feeds on lupine leaflets. The larva may pass through one molt before dropping to the ground in mid-June or July where it goes into hibernation for the fall and winter. In the following March or April, the larva begins to feed on fresh lupine leaflets again. After three to four additional molts, it ecloses into a butterfly in May and begins the cycle again.

Oregon silverspot butterfly - listed as a threatened species in 1980 (45 FR 44935). Critical habitat has been designated for the species. A revised recovery plan was published in 2001.

The historical range of this subspecies extends from the Long Beach Peninsula, Pacific County, Washington, south to Del Norte County, California. All of these populations were restricted to the immediate coast, centered around salt-spray meadows, or within a few miles of the coastline in similar meadow-type habitat. At the time of listing, the only viable population known was on the Siuslaw National Forest in Tillamook County, Oregon. Additional populations have since been discovered at Cascade Head, Bray Point, and Clatsop Plains in Oregon, on the Long Beach Peninsula in Washington, and in Del Norte County in California.

The life history of the Oregon silverspot revolves around its obligatory host plant, the early blue violet (*Viola adunca*). Females oviposit up to 200+ eggs singly amongst the salt-spray meadow vegetation near the violet host plant, usually in late August and early September. Sites with good sun exposure are favored. The eggs hatch in approximately sixteen days and the newly hatched larvae wander short distances to find a suitable site for diapause (suspended growth for overwintering). The larvae end diapause sometime in early spring and begin to feed on the violet leaves. As the larvae grow, they pass through five molts (shed outer covering) before they enter the intermediate stage between larval and adult forms (pupate). Approximately two or more weeks later, the butterflies emerge from their pupal case (eclose). Adult emergence starts in July and extends into September. Shortly thereafter, their wings and other body parts harden and they escape the windy, cool meadows for nearby forests or brush lands.

The Oregon silverspot occupies three types of grassland habitat. One type consists of marine terrace and coastal headland salt-spray meadows (*e.g.*, Cascade Head, Bray Point Rock Creek-Big Creek and portions of Del Norte sites). The second consists of stabilized dunes as found at the Long Beach Peninsula, Clatsop Plains, and the remainder of Del Norte. Both of these habitats are strongly influenced by proximity to the ocean, mild temperatures, high rainfall, and persistent fog. The third habitat type consists of montane grasslands found on Mount Hebo and Fairview Mountains.

Conditions at these sites include colder temperatures, significant snow accumulations, less coastal fog, and no salt spray.

The most important feature of the habitat of the Oregon silverspot is the presence of the early blue violet. This plant is normally the only species on which the Oregon silverspot can successfully feed and develop as larva. However, in the laboratory the butterflies will accept other species of violets, and there is evidence that some individuals on Mount Hebo are using another species of violet. This plant is part of the salt-spray meadow vegetation and is an obligatory component of the butterfly's habitat. Other features of optimum habitat include moderate grass cover, including red fescue used as a shelter for larvae, and a mixture of herbaceous plants such as California aster (*Aster chilensis*) used for nectaring by adults. Apparently the more inland meadow sites occupied by related subspecies of silverspots are not accessible to Oregon silverspots. The habitat is similar on Mount Hebo with blue violet as the key component. The distribution and composition of the flora may differ slightly, but the habitat functions similarly to the salt-spray meadow. The shallow soil apparently helps to keep this area in the meadow stage.

Although the salt-spray meadow is the nursery area for the butterfly and a key element of this species' habitat, it is a rather harsh environment for the adults. Upon eclosion (metamorphosis of the pupa into the adult butterfly), the adults generally move out of the meadows into the fringe of conifers or brush where there is shelter for more efficient heat conservation and nectaring flights. The forest shelter may also be used for courtship and mating. Where such sheltered conditions exist, the adults will use various nectar sources, including native and exotic plants, particularly composites such as the native California aster, yarrow (*Achillea millefolium*), and Indian thistle (*Cirsium edule*) and some exotics such as false dandelion (*Hypochaeris radicata*) and tansy ragwort (*Senecio jacobaea*).

Plants¹⁶

Willamette daisy - listed as an endangered species in 2000 (65 FR 3875).

The Willamette Daisy is endemic to Oregon's Willamette Valley. Historically, this plant was likely widespread throughout the Valley. Currently, eighteen sites are known, distributed over an area of 700,000 hectares (1.7 million acres), between Grand Ronde and Goshen, Oregon.

Prior to European settlement, prairie habitat was maintained by fire, which prevented the establishment of woody species. Willamette Valley prairie is considered to be among the rarest habitats in western Oregon and is threatened by fragmentation, agriculture and urban growth. Most sites are small and privately owned and few sites are in protective ownership.

¹⁶ Reference source - <http://oregonfwo.fws.gov/EndSpp/FactSheets/PlantSpecies.dwt>

This species occurs on alluvial soils (deposited by flowing waters). The Willamette daisy occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81). The species is known to have been extirpated (destroyed or no longer surviving) from an additional nineteen historic locations. Willamette daisy populations are known mainly from bottomland but one population is found in an upland prairie remnant. Flowering typically occurs from June to early July.

Gentner's fritillary - listed as an endangered species in 1999 (64 FR 69195). A recovery plan was published in 2003.

Gentner's fritillary is known only from scattered localities in southwest Oregon, along the Rogue and Illinois River drainages in Josephine and Jackson counties. It is highly localized in a 48 kilometer (30 mile) radius around Jacksonville, Oregon, on land managed by the Bureau of Land Management, U.S. Forest Service, Department of Transportation, Southern Oregon University, City of Jacksonville, and private landowners. Residential development, agricultural activities, logging, fire suppression, road and trail maintenance, off-road vehicle use, and collecting for gardens all contribute to the rarity of this species.

Gentner's fritillary typically grows in or on the edge of open woodlands at elevations from 60 to 450 meters (180 to 1,360 feet) with Oregon white oak (*Quercus garryana*) and Pacific madrone (*Arbutus menziesii*) as the most common overstory plants. Western yellow pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) are also frequently present. Associated understory species include white-leaved manzanita (*Arctostaphylos viscida*), poison oak (*Rhus diversiloba*), ashy rock cress (*Arabis subpinnatifida*), Rogue River milkvetch (*Astragalus accidens* var. *hendersoni*), fringed brome (*Bromus ciliatus*), Henderson's shootingstar (*Dodecatheon hendersoni*), California fescue (*Festuca californica*), mission bells (*Fritillaria affinis*), scarlet fritillary (*Fritillaria recurva*), fineleaf biscuit-root (*Lomatium utriculatum*), Sandberg's bluegrass (*Poa sandbergii*), and American vetch (*Vicia americana*).

Gentner's fritillary can also grow in open chaparral/grassland habitat, which is often found within or adjacent to the mixed hardwood forest type, but always where some wind or sun protection is provided by other shrubs. It does not grow on very dry sites. Flowering typically occurs from April to June.

Water howellia - listed as a threatened species in 1994 (59 FR 35860).

Water howellia is known to occur sporadically in Washington, Idaho, Montana, and California. There are no known extant occurrences in Oregon. However, the species has historically been collected (voucher specimens in herbariums) from at least four different places in the state. It was first collected in 1879 from Sauvie Island, Multnomah County. It was collected from Sauvie Island again in 1886, but not since then. It was also collected from Lake Oswego in Clackamas County in 1892. It was collected from two places in the Salem area, most recently in 1977. Numerous attempts to relocate these sites have been unsuccessful. The historic Oregon sites were all located within the Columbia River floodplain or the broad valley of the Willamette River.

In Oregon, sites where water howellia were historically found are now within developed urban areas. Channelization and construction of dams along the Columbia, Willamette, and other rivers has led to loss of suitable wetland habitats. The historical California population may have been eliminated by cattle grazing and trampling. Idaho bottomland habitats have been altered by roads, development, and conversion to agriculture and pasture lands. Timber harvest, wetland succession, and encroachment by non-native plants such as reed canarygrass (*Phalaris arundinaceae*) have also contributed to the decline of this species.

Information on herbarium labels or Oregon collections describe the habitat of water howellia as "ponds in woods", "pond in shaded woods", and "stagnant ponds in the timber". Information from other locales indicate that this species is restricted to small, vernal, freshwater wetlands, glacial pothole ponds, or former river oxbows that have an annual cycle of filling with water over the fall, winter and early spring, followed by drying during the summer months. These habitats are generally small (less than one hectare [2.5 acres]) and shallow (less than one meter [three feet] deep). Bottom surfaces are reported as firm, consolidated clay, and organic sediments. Most locations were surrounded by deciduous trees and howellia was found in shallow water or around the edges of deep ponds. Associated species include duckweed (*Lemna spp.*), water starwort (*Callitriche spp.*), water buttercup (*Ranunculus aquatilis*), yellow water-lily (*Nuphar polysepalum*), bladderwort (*Utricularia vulgaris*), and pondweeds (*Potamogeton spp.*). Flowering typically occurs from May to August.

Western lily - listed as an endangered species in 1994 (59 FR 42171). A recovery plan was published in 1998.

Western lily has been reported from sites in a narrow band along the Pacific Coast no more than four miles inland from Coos County, Oregon, south to Humboldt County, California. In Oregon, the plant occurs on State of Oregon, Bureau of Land Management, and private lands. Agriculture (pasture and cranberry bogs) and infrastructure projects (roads, campgrounds, and utilities), and succession have contributed to the decline of this species.

Western lily typically occurs on the edges of bogs near the ocean. These bogs are composed of poorly drained, highly organic soils (Blacklock) of Sphagnum origin. Associated plant species include sundews (*Drosera spp.*), Pacific rhododendron (*Rhododendron macrophyllum*), evergreen huckleberry (*Vaccinium ovatum*), Labrador tea (*Ledum groenlandicum*), and red alder (*Alnus rubra*). Flowering typically occurs from mid-June to early August.

Large-flowered meadowfoam - listed as an endangered species in 2002 (67 FR 68004).

The large-flowered meadowfoam is known to occur in the Agate Desert region of Jackson County, Oregon on land owned by Jackson County, Oregon Department of Fish and Wildlife, the City of Medford, and private individuals. Industrial, commercial, and residential development, road and power-line construction and maintenance, livestock grazing, agricultural conversion, weed competition, mowing, and roadside spraying have all contributed to the decline of this species.

Large-flowered meadowfoam occurs at the edge of vernal pools at elevations of 375 to 400 meters (1,230 to 1,310 feet), generally near the wetter, inner edges as opposed to the drier outer fringes which harbor the sympatric *ssp. floccosa*. Associated species include small-flowered lupine (*Lupinus micranthus*), poverty clover (*Trifolium depauperatum*), and least mouse-tail (*Myosurus minimum*). Flowering typically occurs from April to May.

Bradshaw's lomatium - listed as an endangered species in 1988 (53 FR 38448). A recovery plan was published in 1993.

Bradshaw's lomatium currently extends from Clark County, Washington, to the southern end of the Willamette Valley, Oregon. The greatest concentrations of remaining sites where plants occur is in and adjacent to the Eugene, Oregon metropolitan area. Endemic to and once widespread in the wet, open areas of the Willamette Valley of western Oregon, Bradshaw's lomatium is limited now to a few sites in Lane, Marion, and Benton counties. Most of its habitat has been destroyed by land development for agriculture, industry, and housing. In addition, water diversions and flood control structures have changed historic flooding patterns, which may be critical to seedling establishment. Reductions in natural flooding and fire cycles also permit invasion of trees and shrubs, and eventual conversion of wet prairies to woodlands.

The majority of Bradshaw's lomatium populations occur on seasonally saturated or flooded prairies, adjacent to creeks and small rivers in the southern Willamette Valley. Soils at these sites are dense, heavy clays, with a slowly permeable clay layer located fifteen to thirty centimeters (six to twelve inches) below the surface. This clay layer results in a perched water table during winter and spring, and is critical to the wetland character of these grasslands, known as tufted hair-grass (*Deschampsia cespitosa*) prairies. Bradshaw's lomatium occurs on alluvial (deposited by flowing water) soils. The species occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81). Flowering typically occurs from April to early May.

Cook's lomatium - listed as an endangered species in 2002 (65 FR 30941).

Cook's lomatium is known from the Agate Desert near Medford, Jackson County, Oregon and French Flat in the Illinois Valley in Josephine County, Oregon on land owned by The Nature Conservancy (Agate Desert Preserve), Jackson County, Oregon Department of Fish and Wildlife, City of Medford, Oregon Department of Transportation, Bureau of Land Management (French Flat), and private landowners. Industrial, commercial, and residential development, road and power-line construction and maintenance, livestock grazing, agricultural conversion, weed competition, mowing, and roadside spraying have all contributed to the decline of this species. In Josephine County, Cook's lomatium is also threatened by gold mining, logging, fire suppression, and uncontrolled off-road-vehicle use.

Cook's lomatium occurs only where soil types have a hard pan or clay pan layer close to the soil surface, creating seasonally wet soils and vernal pools. The Agate Desert is characterized by shallow, Agate-Winlow soils, a relative lack of trees, sparse prairie vegetation, and agate on the soil surface.

Associated species in the Agate Desert include meadowfoams (*Limnanthes floccosa* ssp. *grandiflora* - also proposed for listing- and *L. f. ssp. floccosa*), *Plagiobothrys bracteatus* (no common name), and *Navarretia* spp. Associated species at French Flat include California oatgrass (*Danthonia californica*), *Plagiobothrys bracteatus*, shaggy horkelia (*Horkelia congesta*), short-stemmed star tulip (*Calochortus uniflorus*), and sedge-leaf buckbrush (*Ceanothus cueatus*). Flowering typically occurs from mid-March to mid-May.

Kincaid's lupine - listed as a threatened species in 2000 (65 FR 3875).

Kincaid's lupine occupies sites throughout the Willamette Valley, a few sites in the Umpqua River Basin, and one site in southern Washington. The northern limit of Kincaid's lupine is Lewis County, Washington, and it ranges south to Douglas County, Oregon.

Native prairie has been virtually eliminated from the Willamette Valley as a result of conversion to agriculture, urbanization, and other development. Most Willamette Valley grasslands are seral (one stage in a sequential progression), requiring natural or human-induced disturbance for their maintenance. Grasslands by nature are a transient community which require disturbance to prevent transition to forest. The vast majority of Willamette Valley grasslands would be forested if left undisturbed. Native Americans probably maintained Willamette Valley prairies by manipulating fire regimes prior to European settlement. With extensive changes in the fire regime, disturbance forces that maintained native prairies were substantially altered allowing tree and shrub species to invade and shade out the low-growing Kincaid's lupine. In addition, non native species such as Himalayan blackberry (*Rubus discolor*) aggressively overtake open spaces and crowd out native species.

Kincaid's lupine is found mainly in the Willamette Valley, Oregon where it occupies native grassland habitats. Kincaid's lupine is typically found in native upland prairie with the dominant species being red fescue and/or Idaho fescue. Tolmie's mariposa, Hooker's catchfly, broadpetal strawberry, rose checker-mallow, and common lomatium serve as herbaceous indicator species. These dry, fescue prairies make up the majority of habitat for Kincaid's lupine. Although Kincaid's lupine is occasionally found on steep, south facing slopes and barren rocky cliffs, it does not appear capable of occupying the most xeric oatgrass communities on these south facing slopes. The plant's distribution implies a close association with native upland prairie sites that are characterized by heavier soils and mesic to slightly xeric soil moisture levels. At the southern limit of its range, this species occurs on well developed soils adjacent to serpentine outcrops (high in magnesium, iron and certain toxic metals) where the it is often found under scattered oaks. Flowering typically occurs from May to June.

MacFarlane's four o'clock¹⁷ - listed as an endangered threatened species in 1979 (44 FR 61912). The species was later down listed to a threatened status in 1996 (61 FR 10693). A revised recovery plan was published in 2000.

¹⁷ Reference source - <http://ecos.fws.gov/servlet/SpeciesProfile?spcode=OIZF>

MacFarlane's four o'clock is endemic to portions of the Snake, Salmon, and Innaha River canyons in Wallowa County in northeast Oregon, and adjacent Idaho County in Idaho. It is currently found in eleven populations in Idaho and Oregon. It is endemic to low to mid-elevation canyon grassland habitats in west-central Idaho and northeastern Oregon. Plants are found on gravelly to loamy and sandy soils between approximately 300 and 900 meters (1,000 to 3,000 feet) elevation. Grazing by domestic livestock and the invasion of exotic (non-native) plants are the greatest threats to this species. Other threats include human trampling, off-road vehicle use, construction and maintenance of roads and trails, and herbicide spraying.

The amount of occupied habitat located in Idaho and Oregon since the species' listing represents a three-fold increase due to new discoveries. Currently, almost 1,000 plants are known on about 66 hectare (163 acres) in eighteen locations. The species occurs along 9.6 kilometers (six miles) of Hells Canyon of the Snake River in Idaho County, Idaho, and Wallowa County, Oregon; along 29 kilometers (eighteen miles) of the Salmon River in Idaho County, Idaho; and along 4.8 kilometers (three miles) of the Innaha River in Wallowa County, Oregon.

MacFarlane's four o'clock is found on talus slopes in canyon land corridors where the climate is regionally warm and dry with precipitation occurring mostly in a winter-to-spring period. The species generally occurs as scattered plants on open, steep (fifty percent) slopes of sandy soils, generally having west to southeast aspects. Flowering typically occurs from early May to early June.

Rough popcornflower - listed as an endangered species in January 2000 (65 FR 3866). A recovery plan was published in 2003.

Rough popcornflower is endemic to seasonal wetlands in the interior valley of the Umpqua River in southwestern Oregon. The rough popcornflower has a narrow range historically, and currently occurs on only seventeen habitat patches in Oregon's Umpqua Valley in Douglas County. The sites are all located within eight kilometers (five miles) of one another and total under eighteen hectares (45 acres) in area. Fewer than 7,000 plants are known to exist.

The rough popcornflower is highly threatened by direct loss of habitat from conversion to urban and agricultural uses, hydrological alterations, and fire suppression. Other threats to the species include spring and summer livestock grazing, roadside mowing, spraying, competition with non native vegetation, and landscaping.

Rough popcornflower was probably widespread historically on the floodplains of the interior valleys of the Umpqua River. Because it occurs in low-lying areas, seeds were likely dispersed by flood waters, resulting in a patchy, clumped distribution on the floodplains. Natural processes such as flooding and fire maintained open, wetland habitat. Draining of wetlands for urban and agricultural uses and road and reservoir construction, however, has altered the original hydrology of the valley to such an extent that the total area of suitable habitat for this species has been significantly reduced.

Rough popcornflower grows in open, seasonal wetlands in poorly- drained clay or silty clay loam soils at elevations ranging from 30 to 270 meters (100 to 900 feet). The taxon depends on seasonal flooding and/or fire to maintain open habitat and to limit competition with invasive native and non native plant species. This plant occurs in open micro sites within the one-sided sedge (*Carex unilateralis*)-meadow barley (*Hordeum brachyantherum*) community type within interior valley grasslands. The plant occurs on soils in the Conser Silty Clay Loam Series (NRCS mapped soil unit SSURGO 44A). Flowering typically occurs from June to July.

Nelson's checkermallow - listed as a threatened species in 1993 (58 FR 8235). A recovery plan was published in 1998.

The majority of sites where Nelson's checkermallow occurs is in the Willamette Valley of Oregon. The plant is also found at several sites in the Coast Range of Oregon and at two sites in the Puget Trough of southwestern Washington. Thus, the range of the plant extends from southern Benton County, Oregon, north to Cowlitz County, Washington, and from central Linn County, Oregon, west to the crest of the Coast Range. The species is known to occur in 62 patches within five relict population centers in Oregon, and at two sites in Washington.

Prior to European colonization of the Willamette Valley, naturally occurring fires and fires set by Native Americans maintained suitable Nelson's checkermallow habitat. Current fire suppression practices allow succession by introduced and native trees and shrubs; the trees may gradually invade habitat for Nelson's checkermallow. Remnant prairie patches in the Willamette Valley have been modified by livestock grazing, fire suppression, or agricultural land conversion. Stream channel alterations, such as straightening, splash dam installation, and rip-rapping cause accelerated drainage and reduce the amount of water that is diverted naturally into adjacent meadow areas. As a result, areas that would support Nelson's checkermallow are lost.

Within the Willamette Valley, Nelson's checkermallow most frequently occurs in Oregon ash (*Fraxinus latifolia*) swales and meadows with wet depressions, or along streams. The species also grows in wetlands within remnant prairie grasslands. Some populations occur along roadsides at stream crossings where non-native plants, such as reed canarygrass, blackberry (*Rubus spp.*), and Queen Anne's lace (*Daucus carota*), are also present. Nelson's checkermallow primarily occurs in open areas with little or no shade and will not tolerate encroachment of woody species.

In the Willamette Valley, Nelson's checkermallow occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81) and Malabon, Coburg and Salem Series (NRCS mapped soil unit STATSGO 91). Flowering typically occurs from late May to mid-July.

Spalding's catchfly - listed as a threatened species in 2001 (66 FR 51598).

Spalding's catchfly is mainly a species of the Palouse Prairie and adjacent areas in Washington, Oregon, Idaho, and Montana. It is known in Oregon from private land in Wallowa County and on land owned

by The Nature Conservancy, Forest Service, Bureau of Land Management, and U.S. Air Force in Idaho, Washington and Montana. Agricultural and urban development, livestock and native ungulate grazing and trampling, herbicide treatment, and competition from non native plants have all contributed to the decline of this species.

This species grows on mesic grassland prairies at low- to mid-elevations. Associated species include Idaho fescue, blue bunch wheatgrass (*Agropyron spicatum*), Nutka rose (*Rosa nutkana*), purple avens (*Geum triflorum*), sticky geranium (*Geranium viscosissum*), balsamroot (*Balsamorhiza sagittata*), and scattered Ponderosa pine. Flowering typically occurs from June to September.

Howell's spectacular thelypody - listed as a threatened species in 1999 (64 FR 28393). A recovery plan was published in 2002.

Howell's spectacular thelypody occurs at eighteen sites in the Baker-Powder River Valley located in Union and Baker counties, Oregon. The plant has been extirpated from about one-third of known historic sites, including the type locality in Malheur county. Threats to the taxon include habitat loss due to urban and agricultural development; habitat degradation due to livestock grazing and hydrological modification; consumption by livestock; use of herbicides or mowing during the growing season; and competition with exotic species such as teasel (*Dipsacus sylvestris*), bull thistle (*Cirsium vulgare*), Canada thistle (*C. canadensis*), and yellow sweet clover (*Melilotus officinalis*).

Howell's spectacular thelypody occurs in moist, moderately well-drained, somewhat alkaline meadow habitats, typically growing with salt tolerant species such as greasewood (*Sarcobatus vermiculatus*), giant wild rye (*Elymus cinereus*), and goosefoot (*Chenopodium spp.*). Howell's spectacular thelypody appears to be dependent on periodic flooding because it rapidly colonizes areas adjacent to streams that have flooded. The species occurs on soils in the Wingville, Baldock and Haines Series (NRCS mapped soil unit STATSGO 179). Flowering typically occurs from June to July.

Anadromous Fish¹⁸

Snake River Chinook salmon - listed as a threatened species in 1992 (57 FR 14653). The ESU¹⁹ includes all natural populations of fall-run Chinook salmon in the mainstem Snake River and any of the following subbasins: Tucannon River, Grande Ronde River, Innaha River, Salmon River, and Clearwater River.

Critical habitat for the species was designated in 1993 (58 FR 68543). The habitat for the listed ESU is designated to include river reaches presently or historically accessible (except reaches above

¹⁸ Reference source - <http://www.nwr.noaa.gov/1salmon/salmesa/index.htm>

¹⁹ An "ESU" or evolutionarily significant unit is a distinctive group of Pacific salmon or steelhead. Maps of ESU's for Pacific salmon and steelhead are shown in Appendix D.

impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River fall chinook salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers; the Snake River, all river reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: Idaho - Adams, Clearwater, Idaho, Latah, Lemhi, Lewis, and Nez Perce; Oregon - Baker, Union, and Wallowa; Washington - Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman.

Lower Columbia River Chinook salmon - listed as a threatened species in 1999 (64 FR 14308). The ESU includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River.

Upper Willamette River Chinook salmon - listed as a threatened species in 1999 (64 FR 14308). The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon.

Southern Oregon coho salmon - listed as a threatened species in 1997 (62 FR 24588). The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California.

Critical habitat for the species was designated in 1999 (64 FR 24049). The habitat for the ESU is designated to include all river reaches accessible to listed coho salmon between Cape Blanco and Punta Gorda. Excluded are areas above specific dams or above longstanding, naturally impassable barriers (*i.e.*, natural waterfalls in existence for at least several hundred years). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 18,090 square miles in California and Oregon. The following counties lie partially or wholly within watersheds inhabited by this ESU: California - Del Norte, Glenn, Humboldt, Lake, Mendocino, Siskiyou, and Trinity; Oregon - Coos, Curry, Douglas, Jackson, Josephine, and Klamath.

Oregon coast coho salmon - listed as a threatened species in 1998 (63 FR 42587). The ESU includes all naturally spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco.

Columbia River chum salmon - listed as a threatened species in 1999 (64 FR 14508). The ESU includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon.

Snake River sockeye salmon - listed as an endangered species in 1991 (56 FR 58619). The ESU includes populations of sockeye salmon from the Snake River Basin, Idaho (extant populations occur in the Stanley River subbasin).

Critical habitat for the species was designated in 1993 (58 FR 68543). The habitat for the ESU is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River sockeye salmon in the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) and including all Columbia River estuarine areas and river reaches upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River upstream to the confluence of the Salmon River; all Salmon River reaches from the confluence of the Snake River upstream to Alturas Lake Creek; Stanley, Redfish, Yellow Belly, Pettit, and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek, and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Watersheds containing spawning and rearing habitat for this ESU comprise approximately 510 square miles in Idaho. The watersheds lie partially or wholly within the following counties: Blaine and Custer.

Middle Columbia River steelhead - listed as a threatened species in 1999 (64 FR 14517). The ESU includes all naturally spawned populations of steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington. Excluded are steelhead from the Snake River Basin.

Snake River Basin steelhead - listed as a threatened species in 1997 (62 FR 43937). The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho.

Lower Columbia River steelhead - listed as a threatened species in 1998 (63 FR 13347). The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive) and the Willamette and Hood Rivers, Oregon (inclusive). Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon Rivers in Washington

Upper Willamette River steelhead - listed as a threatened species in 1999 (64 FR 14517). The ESU includes all naturally spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River, inclusive.

Chapter 5 - Project Design Criteria for Listed Species

Project design criteria (PDC) are specific conservation measures designed to minimize or eliminate the likelihood of adverse affects to federally listed species based on an individual species' life history. These PDC are separated by habitat and disturbance.

Habitat PDC are designed to avoid or minimize adverse affects which may result in harm to a listed species. "Harm" is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavior patterns such as breeding, feeding, or sheltering. These criteria are also designed not to have an adverse affect on designated critical habitat and should provide beneficial effects to the constituent elements supporting critical habitat.

Disturbance PDC are designed to avoid or minimize disturbance of a listed species which may rise to the level of harassment. "Harassment" is defined by the Service as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Mammals

Canada lynx

Habitat - Restoration activities²⁰ that reduce vegetative habitat and cover will not occur in snowshoe hare habitat. Snowshoe hare habitat is considered areas where live limb (*e.g.*, trees and shrubs) can be reached by hares at snow depth.

Disturbance - Restoration activities (*i.e.*, above local ambient noise and visual activity levels) will not occur within 0.25 miles of lynx denning habitat from May 1 to August 31.

Columbian white-tailed deer

Habitat - "Wildlife friendly" livestock fencing (BLM 1989) will be constructed in areas where Columbia white-tailed deer occur.

Disturbance - Project personnel will be instructed to reduce vehicle speeds around project sites where Columbia white-tailed deer occur to avoid vehicle-deer collisions. Project personnel will also be instructed not to approach adults or fawns at any time. Restoration activities (*i.e.*, above local ambient noise and visual activity levels) will not occur in fawning areas from June 1 to July 15.

²⁰ "Restoration activities" includes all actions under Project Categories I-VIII, unless otherwise specified.

Birds

Marbled murrelet

Habitat - Restoration activities that remove or degrade suitable marbled murrelet habitat will not occur within murrelet zones 1 and 2 (Appendix B) or zones A and B on the Siskiyou National Forest.

Disturbance - For project sites located within 500 feet of occupied or unsurveyed suitable habitat, restoration activities (*i.e.*, above local ambient noise and visual activity levels) will not occur during the critical nesting period from April 1 to August 5, and will only occur during daylight hours between two hours after sunrise to two hours before sunset from August 6 to September 15. Service standards being developed for disturbances to murrelets are shown in Table 4. A greater avoidance distance will be required on Service funded projects in order to be more conservative in potential murrelet disturbances.

Table 4. Harassment distances from various activities for marbled murrelets

Type of Activity	Distance at which murrelets may flush or abort a feeding attempt
Use of an impact pile driver, jackhammer, or rock drill	300 feet
Use of a helicopter or single engine airplane	360 feet
Use of heavy equipment	300 feet
Use of chainsaws	300 feet

Western snowy plover

Habitat - Restoration activities that remove or degrade suitable western snowy plover habitat will not occur. Ground disturbing activities on coastal dunes will occur during the fall and winter months before the critical nesting period (*i.e.*, March 15 to September 15).

Disturbance - Restoration activities under Project Categories I-VII will not occur within 0.25 miles of a known occupied beach during the critical nesting period. Project cooperators will coordinate with local plover monitoring biologists to identify occupied beaches. Project personnel must take appropriate measures not to attract potential avian or mammalian predators to project sites. These include eliminating human-introduced food sources, properly disposing of organic waste, and not planting vegetation that could be potential cover or perches for predators near suitable habitat. Survey, assessment, and monitoring activities (Project Category VIII) during the critical nesting period will only be conducted by qualified biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage (*e.g.*, working as an agent of the state under Oregon Department of Fish and Wildlife's Cooperative Agreement).

Bald eagle

Habitat - Restoration activities that remove or degrade suitable bald eagle habitat will not occur.

Disturbance - The most recent bald eagle survey data from the Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, will be consulted to determine project proximity to known bald eagle nests. Restoration activities (*i.e.*, above local ambient noise and visual activity levels) will not occur within 0.25 miles (or 0.5 miles line-of-site) from an occupied nest during the critical nesting period from January 1 to September 1 or known winter roost areas from October 31 to April 30.

Brown pelican

Disturbance - Restoration activities (*i.e.*, above local ambient noise and visual activity levels) will not occur within 0.25 miles from an known pelican roost site.

Northern spotted owl

Habitat - Restoration activities that remove or degrade suitable northern spotted owl habitat will not occur.

Disturbance - For project sites located within 400 feet of occupied or unsurveyed suitable habitat, restoration activities (*i.e.*, above local ambient noise and visual activity levels) will not occur during the critical nesting period from March 1 to July 15, (or specific provincial critical nesting period), unless a qualified biologist confirms known owls are not nesting. Service standards being developed for disturbances to owls are shown in Table 5. A greater avoidance distance will be required on Service funded projects in order to be more conservative in potential owl disturbances.

Table 5. Harassment distances from various activities for northern spotted owls

Type of Activity	Distance at which owls may flush or abort a feeding attempt
Use of an impact pile driver, jackhammer, or rock drill	180 feet
Use of a helicopter or single engine airplane	360 feet
Use of heavy equipment	105 feet
Use of chainsaws	195 feet

Inland Fish

Warner Sucker, Oregon Chub, and Bull Trout

Habitat - Aquatic restoration activities will follow the Oregon guidelines for the timing of in-water work for each affected stream reach, unless the Oregon Department of Fish and Wildlife approves an extension based on current year site specific conditions.

Disturbance - Survey, assessment, and monitoring activities (Project Category VIII) requiring the physical capture and handling of these species will only be conducted by qualified biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage.

Invertebrates

Vernal pool fairy shrimp

Habitat - For project sites located in or adjacent to a vernal pool, restoration activities will not disrupt the impermeable, sub-surface soil layer or cause the movement of soils that could be deposited into the vernal pool. Project personnel will avoid traveling through the wetted portions of a vernal pool.

Fenders blue butterfly

Habitat - Surveys will be conducted for Fender's blue butterfly during the mid-May to early July flight period on any project sites that support or may support Kincaid's, spur, or sickle-keeled lupine within the Willamette Valley.

Mechanical - Mechanical activities, occurring in occupied habitat, will be conducted when lupine and nectar plants have completed seed production and the butterflies are in diapause (*i.e.*, August 15 to February 28). Maintenance activities include: mowing, line trimming, grubbing, girdling trees, and chain saw removal of woody species. No more than 75 percent of the occupied habitat at any given site will be mowed. Untreated strips of occupied habitat, approximately twelve meters wide, will be evenly distributed throughout the mowed portions of a site. The center of a mowed area will be within 100 meters of untreated occupied habitat, which can serve as a recolonization source. Mowers will be set at a height so that the blades gouge no more than five percent of the ground.

Early spring mowing (*i.e.*, March 1 to May 15) may be used for management purposes in unoccupied habitat. Mowers will be set at a height to avoid harming low-stature native plants and gouging the ground. Mowing will not occur during this time if Kincaid's lupine is present in the unoccupied habitat.

Prescribed burns - In the fall (*i.e.*, September 1 to November 30), prescribed burns may be performed to discourage woody plant growth, remove accumulated leaf litter and duff, and encourage the spread of native prairie grasses and forbs. The annual burn unit (ABU) will be determined based on the individual site conditions and population sizes.

The ABU for sites supporting 100 or more adult Fender's may be a maximum of one-third of the occupied habitat. The ABU for sites with less than 100 adult Fender's may be a maximum of one-quarter of the occupied habitat. The center of the ABU will be within 100 meters of unburned occupied habitat, which can serve as a recolonization source. Once burned, a unit will not be re-burned for at least three years, to allow butterfly populations to rebuild. The use of fire for habitat maintenance inherently increases the risk of accidentally impacting more habitat than originally intended. In order to ensure the maximum allowable ABU will not be exceeded, project cooperators will plan to burn approximately five percent less than the annual maximum.

In order to reduce the potential fuel load, the removal of large woody plants will occur prior to burning, when feasible. Ignition of burn areas will be by hand, using propane, fusees, or drip torches. Fire control/suppression will be accomplished with the use of pre-burn hose lays, wet-lining, or fire retardant foam. Vehicles would not be operated in the areas of listed species. Additionally, where patch size allows, butterfly refugia within burn units will be protected with a fire break and/or watering down prior to a burn.

When using controlled fire as a management technique, additional consideration of subsequent annual treatments for the ABU will be necessary. That is, the year following a burn, management of that unit will be limited to manual techniques and herbicide applications. Additionally, during a burn year, management activities will also be limited for adjacent units of the site. That is, mowing will not occur on a site that is scheduled to be burned, in order to limit the maximum affected area to approximately one-third of the site.

Disturbance - Survey, assessment, and monitoring activities (Project Category VIII) requiring the physical capture and handling of this species will only be conducted by qualified biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage.

Oregon silverspot butterfly

Habitat - Surveys will be conducted for Oregon silverspot butterfly within its range during the late July to early September flight period on any project sites that support or may support the western blue violet. Manual, mechanical, and biological activities (see descriptions under control and removal of invasive/non native plant species: Project Category I - Riparian Habitat Restoration [Chapter 3]) will not occur in habitats that are occupied by the butterfly or contain the violet. These activities will only occur in areas outside of these identified habitats.

Disturbance - Survey, assessment, and monitoring activities (Project Category VIII) requiring the physical capture and handling of this species will only be conducted by qualified biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage.

Plants

Habitat - Surveys will be conducted during the appropriate flowering period if a project site is known to be in a suitable habitat or soil type. Surveys will be conducted by a botanist or qualified biologist (*i.e.*, recognized by the Service with appropriate botanical expertise) following standardized protocol for the specific plant. Project cooperators will coordinate with a Service botanist or qualified biologist for all proposed project sites containing listed plant species. They will decide whether to proceed with a project or develop alternatives to the project to minimize or eliminate affects to the plants.

Mechanical - Project sites occupied by listed plants species may be mowed to control or removal woody vegetation or invasive or non native vegetation when listed plants are dormant and seeds have been dispersed. Mowing activities will require the use of low ground impact equipment. Mowers will be set at a height so that blades gouge no more than five percent of the ground. All equipment will be cleaned of invasive and non native plant materials before entering an occupied site to prevent the dispersal of seeds or other reproductive plant parts.

Prescribed burns - Prescribed burns will not be conducted on project sites occupied by Willamette daisy, Gentner's fritillary, Water howellia, Western lily, Large-flowered meadowfoam, Cook's lomatium, Macfarlane's four o'clock, Rough popcornflower, Spalding's catchfly, and Howell's spectacular thelypody because relatively little is known about the effects of fire on them. If adequate information is gathered to support the use of prescribed burns to benefit these plant species, the Service consultation may be amended to include prescribed burns as a conservation and recovery technique.

Prescribed burns may be conducted on project sites occupied by Bradshaw's lomatium, Kincaid's lupine, and Nelson's checkermallow when these plants are dormant and seeds have been dispersed. Burns will be conducted to control and removal invasive and non native plant species and mimic natural fire regimes. Individual sites will not be burned more than once every two years.

Disturbance - A site specific consultation with the Service will be required for all activities involving the relocation or destruction of listed plant species. Survey, assessment, and monitoring activities (Project Category VIII) requiring the physical collection and handling of listed plant species will only be conducted by qualified botanist(s) or biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage.

Anadromous Fish

Snake River Chinook salmon, Lower Columbia River Chinook salmon, Upper Willamette River Chinook salmon, Southern Oregon coho salmon, Oregon coast coho salmon, Columbia River chum salmon, Snake River sockeye salmon, Middle Columbia River steelhead, Snake River Basin steelhead, Lower Columbia River steelhead, and Upper Willamette River steelhead

Habitat - Aquatic restoration activities will follow the Oregon guidelines for the timing of in-water work for each affected stream reach, unless the Oregon Department of Fish and Wildlife approves an extension based on current year site specific conditions.

Disturbance - Survey, assessment, and monitoring activities (Project Category VIII) requiring the physical capture and handling of these species will only be conducted by qualified biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage.

Chapter 6 - Effect Determinations

The Service will review projects funded through the included programs on an annual basis. A species list will be obtained from the Oregon Natural Heritage Program (ONHP) or in consultation with ONHP for each project location²¹. Project activities and locations will be correlated with the best available information on federally listed species that may be affected by a project. Service staff will verify potential affects and document the methodologies used in the project file at the Service office responsible for the project. Projects that cannot meet the requirements or effect determinations addressed in the BA will result in the reinitiation of formal consultation on a site specific project basis. This will allow for a more in-depth analysis of a specific restoration project under a separate BA. In addition, formal consultation will be reinitiated with NOAA Fisheries and/or Service if:

- An activity is modified in a way that causes an affect to a listed species that was not previously considered in the BA.
- New information or project monitoring reveals that an activity may affect a listed species in a way not previously considered in the BA.
- A new species is listed or critical habitat is designated that may be affected by project activities.
- A new restoration activity or program change occurs outside the scope of the BA.

Listed species may be affected in the following ways: disturbance (*i.e.*, stresses from increased ambient noise, visual stimuli, and ground vibrations), displacement to another area, and physical habitat disturbance (including air and water pollution). Attempts will be made to limit the duration and intensity of these potential effects through the following actions:

- Project designs will be reviewed and approved by the Service, NOAA Fisheries, and/or other qualified professionals, as appropriate, before project implementation.
- Project cooperators will be required to adhere to appropriate PDC (Chapter 5), project design standards (PDS) (Appendix A), and Federal, State, and local laws and regulations (*e.g.*, regulatory permits) during project implementation.
- Project cooperators will be experienced in the specific restoration activity to be completed and in the habitat(s) where it will occur.
- Service personnel and/or project cooperators will complete inspections of work during and after project completion.

The Service will require project monitoring, as necessary, for each completed restoration project for at least one year. Monitoring will ensure that restoration activities completed at project sites are functioning as intended and are not causing unforeseen adverse effects to human health and safety; fish,

²¹ “Project location” is defined as the area where impacts may occur during the completion of a restoration activity. This area may be beyond the actual footprint of a completed activity (*e.g.*, fence line, culvert, and irrigation diversion) and will include equipment staging areas, material storage sites, and other impacted locations associated with the project.

wildlife, and plant species and their habitats; or private and public properties and facilities. The Service and project cooperators will take corrective actions, as appropriate, to correct any problems. The type of documentation (*e.g.*, photographic or written) needed for an individual project monitoring effort will depend on the activities completed under a project.

Since many projects funded under Service programs are on private lands, it will be dependent on landowners and project cooperators to be diligent in seeing that restoration activities achieve their intended purpose(s). This may require the Service to provide additional technical assistance and program funding or landowners and project cooperators to secure other cost-shares (*e.g.*, monetary or in-kind contributions) to adaptively manage these projects into the future.

Disturbance and Displacement

Animal responses to noise and visual disturbances and resulting displacements are documented; however, their effects are not consistent or well understood (EPA 1971, Fletcher and Busnel 1978). Animal flight and avoidance responses vary widely and depend on many factors, including local habitat conditions; the timing, duration, level, and type of noise and visual exposures; behavior of individuals within a local population; and the degree of habituation to a disturbance (Burger 1981, Conomy *et al.* 1998, Delaney *et al.* 1999, Grubb *et al.* 1998, Knudsen *et al.* 1997, Rodgers and Schwikert 2002, Stalmaster and Newman 1978, Weisenberger *et al.* 1996).

Noise and visual stimuli resulting from the implementation of restoration activities at many project sites should not increase significantly above the ambient levels that would normally occur from logging, ranching, and farming practices; human recreational activities; passenger and commercial vehicles traveling on nearby roadways; and low flying aircraft²². Noise level ranges for equipment powered by internal combustion engines, pneumatics, and electricity are shown in Figure 2. Potential noise disturbances associated with specific restoration activities are shown in Appendix E.

Noise generated at a project site will generally be lessened as the distance increases from the site. The level of noise attenuation will depend on the sound frequency, atmospheric conditions, terrain, ground impedance, foliage, and vegetation in the local area (Aylor 1971, Embleton 1963, Fletcher and Busnel 1978, Ingard 1953, Ingard and Maling 1963). Visual disturbance will depend on the local topography and vegetative cover type in and around a project site. Minimal direct line of sight distances have been proposed for listed mammalian and avian species to minimize or eliminate noise and visual disturbances (Chapter 5). Noise and visual disturbances will be limited to daylight hours for all restoration activities, except biological fish surveys (*e.g.*, snorkel surveys) that may be conducted on a limited basis at night.

²² Many of the project sites will be in areas (*e.g.*, semi-urban to rural) associated with ongoing urban development, logging, ranching, and farming activities, and often adjacent to existing roads (*e.g.*, primary and secondary highways, light duty and unimproved forest roads), railroad lines, and electrical transmission lines.

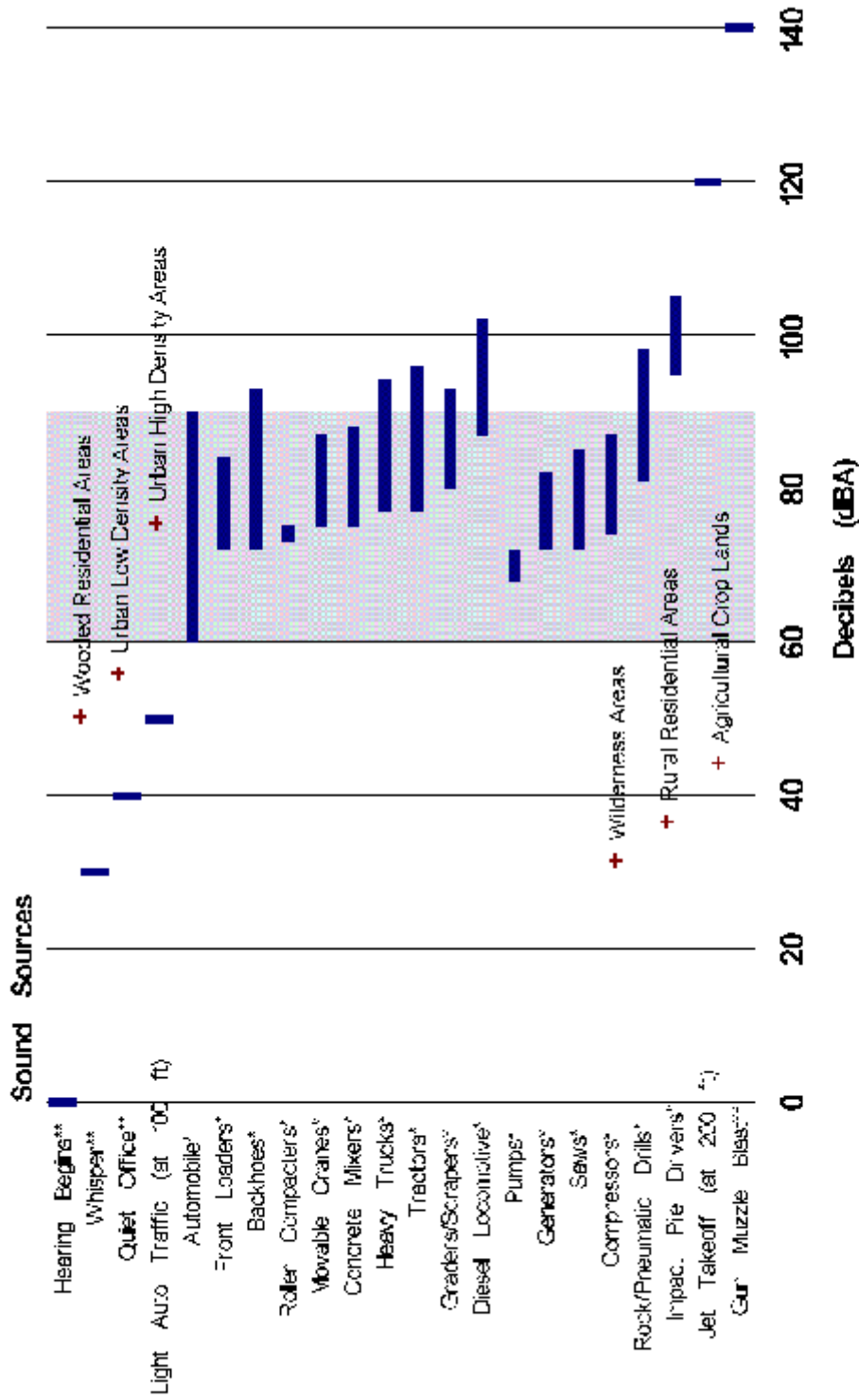


Figure 2. Decibel levels and ranges from various sound sources (American Academy of Otolaryngology 1991, DEQ 1991, EPA 1977, EPA 1978, Holmgren et al. 1971). Shaded area represents the moderate noise level disturbance range from Appendix D.

* - dBA ranges measured at 50 ft

** - dBA levels measured at the ear

+ average outdoor day night dBA levels at various locations (EPA 1978)

The timing of construction and non-construction activities will also minimize or eliminate adverse effects to listed species during critical activity periods, such as migration, breeding, and nesting. For listed fish species, the Oregon guidelines for the timing of in-water work will be followed for each affected stream reach, unless the Oregon Department of Fish and Wildlife approves an extension based on current year site specific conditions. Timing restrictions (*e.g.*, daily and calendar periods) have also been proposed for other listed animal and plant species (Chapter 5). These timing constraints will be followed at project sites with documented use or where nearby occupied or unsurveyed suitable habitats exist, depending on the PDC for the specific species.

Physical Habitat Disturbance

The Service is not able to precisely document where project sites will be located over the next five years or describe specific site conditions that may affect a listed species, whether adversely or beneficially. However, all of the covered restoration activities should provide long-term habitat benefits by improving their existing conditions for many of these species. The duration of these benefits will depend on the specific activity and any other actions that may occur in the future to extend the current benefits at a project site.

The Service will normally fund 40 to 50 projects through the five programs during a fiscal year. The actual number will depend on annual program budgets and the costs of projects selected for funding. The estimated amount of habitat that may be affected from the completion of restoration activities at a project site is shown in Table 6. An individual project will typically affect one to two habitat types. A project may contain one to multiple sites. Activities will normally occur on a single site until the work is completed, unless similar actions will be completed on adjacent sites. The duration of a restoration activity at a site may last for less than one day to several weeks. However, this will depend on the extent and complexity of the activity. The overriding assumption regarding activity duration is that there will be more potential habitat disturbances for activities requiring a longer duration to complete. These longer activities will usually require a greater length of time to restore a habitat back to a stable condition (Appendix E).

Table 6. The typical range of habitat disturbances at a project site

Habitat Type	Potential Habitat Affected/Site ^(a)
Riparian	0.5 - 40 acres
Wetland and estuarine	0.5 - 20 acres for each habitat type
Instream (non-fish passage)	.25 - 3 miles
Instream (fish passage)	1 - 3 barrier removals/stream mile
Coastal	10 - 40 acres
Upland	30 - 400 acres - juniper removal 10 - 170 acres - other activities

Habitat Type	Potential Habitat Affected/Site ^(a)
Riparian and upland (road and trail decommissioning or abandonment)	0.5 - 3 miles for each habitat type
Riparian and upland (road and trail improvements)	1 - 10 miles for each habitat type

^(a) - Refers to non-contiguous project sites separated by a minimal distance of 0.5 miles.

Terrestrial Habitats

Most of the terrestrial project sites will be in areas that have been degraded due to past and present urban development, timber, agricultural, and/or ranching activities. These practices have reduced or eliminated the habitat suitability for many species that depend on them. Activities occurring in these areas are generally associated with road and trail activities, removal of invasive and non native vegetation, planting of native plant species, installation of livestock facilities, and silvicultural related activities.

Terrestrial habitats will be directly affected by any of the restoration activities proposing to restore or enhance riparian, upland, and coastal areas. These activities will help to restore the composition and structural diversity of native plant communities and hydrologic functions in riparian and coastal areas.

Habitat modifications will be restricted to the immediate project vicinities. Soil disturbance and compaction or removal of existing woody and herbaceous vegetation may occur on project sites requiring the use of heavy equipment and during silvicultural treatments. Important habitat features (*e.g.*, downed logs, snags, and native vegetation) will be maintained, to the extent possible, during construction activities. Affected areas will be restricted and the effects are expected to be short-term because the implementation of appropriate PDC and PDS listed in the BA. Dispersal and travel areas for wildlife species will be improved as project sites are stabilized and native vegetation recovers over time.

Aquatic Habitats

Aquatic habitats may be directly or indirectly affected by any of the activities under Project Categories I-VIII. Activities involving the installation of instream structures will increase habitat diversity, cover, pool depths, turbulence, and stream edge complexity. Fish passage activities will improve the reconnection of stream reaches that were partially or completely inaccessible to native anadromous and resident fish and other aquatic species. Realignment or replacement of culverts will help reduce potential sedimentation and increase stream bank stability at those locations. Together these activities will help to improve the hydrologic conditions within a watershed to provide greater habitat suitability, improved spawning and rearing areas, and improved stream conditions and functions.

Riparian and upland restoration activities will contribute to improved aquatic habitat conditions by stabilizing stream banks, increasing shade thus reducing water temperatures, providing increased amounts of organic material into the systems, and reducing nutrient and sediment loads. Riparian and wetland livestock activities (*e.g.*, fencing and off-channel watering) will have positive effects at the project site and in downslope areas. Road and trail work will help to decrease the impacts of sediment loading and control runoff that may be magnified during heavy rains. Riparian, wetland, and estuarine habitats are expected to show signs of recovery very quickly in most areas.

Adverse impacts to riparian, wetland, instream, and estuarine habitats due to construction activities will be localized and limited in duration (Appendix E). Activities requiring the use of heavy equipment will likely impact small portions of existing vegetation. The loss of vegetation should not adversely affect the overall function of these habitats, since these areas will be revegetated with native vegetation before the completion of a project.

Water Quality

Many restoration activities under Project Categories I-VII will have short-term negative water quality impacts (Appendix E) that will be addressed through the implementation of appropriate PDS during all construction phases. These water quality effects are unlikely to be prolonged, result in substantial changes in substrate composition, or decrease growth or survival of freshwater life stages of listed fish species. The quality of water sources should improve over time because of the reduction or elimination of chronic sediment sources, control of point and non point source pollutants, increased dissolved oxygen, and temperature abatement.

Construction related sediments may enter a water source through soil disturbances and use of heavy equipment, particularly during in-water work activities. These sediments may appear as localized increases in turbidity due to fine sediments. Sediment increases may occur during the implementation of an activity or when a water source reenters the project site after the removal of work area isolation structures. The time duration for the turbidity increase is dependent on several factors that includes:

- Type of erosion control structures installed at the project site.
- Ability to remove sediments from behind work isolation structures before removal.
- Amount of area that was originally disturbed and the local topography of the area.
- Distance between the structure or activity and the water source, including the amount and type of filter materials (*e.g.*, vegetation) in the buffer area.
- Time duration between the completion of the activity and onset of high flows or heavy rains.

Chemical contamination of the water sources could also occur from equipment leaks (*e.g.*, diesel fuel, oil, hydraulic fluids, and antifreezes) or refueling spills during project implementation. The implementation of PDS under Equipment Operation and Pollution and Erosion Controls (Appendix A) should significantly reduce these hazards.

Conclusion

Based on the above information, the Service believes that the implementation of activities covered in the BA will not rise to the level of harm or harassment to listed species, except Fender’s blue butterfly, Warner sucker, Oregon chub, bull trout, and anadromous fish (Table 7). A “likely to adversely affect” determination was made for Fender’s blue butterfly due the potential for harm or harassment during mechanical and prescribe burning activities in occupied habitats. The same determination was made for listed fish, since there is a greater potential to cause injury or mortality to these species when completing any in-water activity. This potential is independent of whether the work area is isolated or not.

Table 7. Effect determinations for federally listed species included in the biological assessment

Common Name	Federal Status	Determination
U.S. Fish and Wildlife Service Trust Species		
Canada lynx	T	NLAA
Columbian white-tailed deer	E	NLAA
Marbled murrelet	CH/T	NLAA/NLAA
Western snowy plover (coastal)	CH/T	NLAA/NLAA
Bald eagle	T	NLAA
Brown pelican	E	NLAA
Northern spotted owl	CH/T	NLAA/NLAA
Warner sucker	CH/T	NLAA/LAA
Oregon chub	E	LAA
Bull trout	PH/T	NLAA/LAA
Vernal pool fairy shrimp	T	NLAA
Fender's blue butterfly	E	LAA
Oregon silverspot butterfly	CH/T	NLAA/NLAA
Willamette daisy	E	NLAA
Gentner's fritillary	E	NLAA
Water howellia	T	NLAA
Western lily	E	NLAA
Large-flowered meadowfoam	E	NLAA
Bradshaw's lomatium	E	NLAA
Cook's lomatium	E	NLAA

Common Name	Federal Status	Determination
Kincaid's lupine	T	NLAA
MacFarlane's four o'clock	T	NLAA
Rough popcornflower	E	NLAA
Nelson's checker-mallow	T	NLAA
Spalding's catchfly	T	NLAA
Howell's spectacular thelypody	T	NLAA
NOAA Fisheries Trust Species		
Chinook salmon (Snake River) (Spring/Summer/Fall Runs)	CH/T	NLAA/LAA
Chinook salmon (Lower Columbia River)	T	LAA
Chinook salmon (Upper Willamette River)	T	LAA
Coho salmon (Southern Oregon)	CH/T	NLAA/LAA
Coho salmon (Oregon Coast)	T	LAA
Chum salmon (Columbia River)	T	LAA
Sockeye salmon (Snake River)	CH/E	NLAA/LAA
Steelhead (Middle Columbia River)	T	LAA
Steelhead (Snake River Basin)	T	LAA
Steelhead (Lower Columbia River)	T	LAA
Steelhead (Upper Willamette River)	T	LAA

CH - Critical Habitat has been designated for this species E - Endangered LAA - Likely to adversely affect NLAA - Not likely to adversely affect PH - Proposed Habitat has been designated for this species T - Threatened

Essential Fish Habitat

The Service believes that the implementation of activities covered in the BA would “not adversely affect” essential fish habitat²³ (EFH) for listed anadromous species. This conclusion is based on the implementation of PDC and PDS listed in the BA. These conservation measures will minimize or eliminate direct impacts to EFH. Completed projects under any of the Service programs should provide long-term benefits to anadromous fish species and their habitat.

²³ “Essential fish habitat” means those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.

Annual Reporting

The Service will complete an annual report for completed projects funded through programs covered under the BA. The report will cover a fiscal year period (*i.e.*, October 1 to September 30) starting in 2004 and continue until all projects funded under the BA have been completed. Projects funded through the covered programs that do not affect a listed or proposed species will not be included in the report. The Service will document all projects in a report within one year of completion. The purpose of the reporting is to:

- Help estimate the extent and amount of take that may have occurred.
- Determine compliance with PDC and PDS in the BA, and terms and conditions addressed in NOAA Fisheries and Service BO's.
- Describe the locations and accomplishments of completed projects under each program.

A program summary page will be completed (*e.g.*, similar to the page in Appendix F) for each program to provide an overview of accomplishments and a list of species affected during the implementation of projects. The Service will attach individual project summaries to the program summary pages. Project summaries will contain, but are not limited to, the following information:

- Project identification:
 - Project name.
 - Type and extent of completed activities.
 - Type and amount of materials used.
 - Project location(s) by fifth field hydrologic unit code and latitude/longitude or UTM coordinates.
 - Starting and ending dates for work completed.
 - Service contact person.
- Photo documentation of site conditions before, during, and after completion of a restoration project. Each photograph will be labeled with the date it was taken, project name, photographer's name, and a comment about the subject matter.
- Documentation (*i.e.*, photographic and/or written) showing compliance with NOAA Fisheries guidelines and criteria or other appropriate guidelines and criteria listed in the PDS.
- Documentation addressing the capture and release of listed fish species during the isolation of an in-water work area.
- A summary of pollution and erosion control inspections, including any control failures, contaminant releases, and correction efforts.
- Results of project monitoring activities.

Each program coordinator at the respective Service office will complete their section of an annual report. The individually submitted program sections will be compiled by the Oregon Fish and Wildlife Office before being sent to NOAA Fisheries and Service. Reports will be sent to these agencies in January of each year.

Chapter 7 - Literature Cited

- American Academy of Otolaryngology. 1991. Noise, ears and hearing protection (pamphlet). Head and Neck Surgery, Inc.
- Aylor, D. 1971. Noise reduction by vegetation and ground. *Journal of the Acoustical Society of America* 51(1): 197-205.
- BLM. 1989. Fencing - Bureau of Land Management manual handbook H-1741-1.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation* 21: 231-241.
- Castro, J. 2003. Geomorphologic Impacts of Culvert Replacement and Removal: Avoiding Channel Incision. (<http://pacific.fws.gov/jobs/orojitw/standard/proj-std.htm>).
- Conomy, J.T., J.A. Dubovsky, J.A. Collazo, and W.J. Fleming. 1998. Do black ducks and wood ducks habituate to aircraft disturbances?. *Journal of Wildlife management* 62(3): 1135-1142.
- Delany, D.K., T.G. Grubb, P. Beier, L.L. Pater, and M.H. Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. *Journal of Wildlife Management* 63(1): 60-76.
- DEQ. 1991. Finding solutions to noise problems (public information packet). Department of Environmental Quality. Portland, OR.
- Embleton, T.F.W. 1963. Sound propagation in homogenous deciduous and evergreen woods. *Journal of the Acoustical Society of America* 35(8): 1119-1125.
- EPA. 1971. Effects of noise on wildlife and other animals. U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C. (Report No. NTID300.5)
- EPA. 1977. Noise and its measurement. U.S. Environmental Protection Agency.
- EPA. 1978. Protective noise levels: condensed version of EPA levels document. U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C. (EPA 550/9-79-100).
- Fletcher J.L. and R.G. Busnel (ed.). 1978. Effects of noise on wildlife. Academic Press, New York, NY. 305 pp.
- Grubb, T.G., L.L. Pater, and D.K. Delaney. 1998. Logging truck noise near nesting northern goshawks, U.S. Forest Service Rocky mountain Research Station: Research Note RMRS-RN-3.

- Holmgren, G, L. Johnsson, B. Kylin, and O. Linde. 1971. Noise and hearing of a population of forest workers. *In Occupational Hearing Loss* (ed. D.W. Robinson), Academic Press, New York, NY. pp 35-42.
- Ingard, U, and G.C. Maling, Jr. 1963. On the effect of atmospheric turbulence on sound propagated over ground. *Journal of the Acoustical Society of America* 35: 1056-1058.
- Ingard, U. 1953. A review of the influence of meteorological conditions on sound propagation. *Journal of the Acoustical Society of America* 25(3): 405-411.
- Knudsen, F.R., C.B. Schreck, S.M. Knapp, P.S. Enger, and O. Sand. 1997. Infrasound produces flight and avoidance response in Pacific juvenile salmonids. *Journal of Fish Biology* 51(4): 824-829.
- Robison, G.E., A. Mirati, and M. Allen. 1999. Oregon Road/Stream Crossing Restoration Guide (Advanced Fish Passage Training Version - June 8, 1999). 80 pp. (Available at http://www.dfw.state.or.us/odfwhtml/infocntrfish/management/oregonrd_stream.pdf)
- Rodgers, J.A. and S.T. Schwikert. 2002. Buffer-zone distances to protect foraging and loafing waterbirds from disturbance by personal watercraft and outboard-powered boats. *Conservation Biology* 16(1): 216-224.
- Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy - 2nd Edition. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Missoula, MT., 142 pp. (United States Forest Service Publication Number R1 0053)
- Stalmaster, M.V. and J.R. Newman. 1978. Behavioral responses of wintering bald eagles to human activity. *Journal of Wildlife Management* 42(3): 506-513.
- U.S. Department of Agriculture and U.S. Department of Interior. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. Forest Service, Bureau of Land Management. Portland, Oregon.
- Weisenberger, M.E., P.R. Krausman, M.C. Wallace, D.W. De Young, and O.E. Maughan. 1996. Effects of simulated jet aircraft noise on heart rate and behavior of desert ungulates. *Journal of Wildlife Management* 60(1): 52-61.

Appendix A. Project design standards.

The following project design standards will be implemented, as appropriate, during the implementation of restoration activities for projects funded through programs addressed in the BA. Standards are written in a tense (*e.g.*, substituting “must” for “will”) so that the Service can include them in official project authorization to project cooperators. These standards are grouped under the following appendices:

- Appendix A1. Project design standards for all restoration activities
- Appendix A2. Project design standards for riparian, wetland, upland, coastal, and estuarine habitat restoration
- Appendix A3. Project design standards for instream habitat restoration
- Appendix A4. Project design standards for fish passage improvements
- Appendix A5. Project design standards for road and trail improvements
- Appendix A6. Project design standards for surveys, assessments, and monitoring activities
- Appendix A7. Project design standards for wildlife habitat structures

Plans and/or designs for restoration activities referenced under the project categories will usually be provided by project cooperators. The Service will review and approve these activities before their implementation. Technical publications and guidelines, other than those listed in the BA, will be used by the Service to evaluate restoration activities. Restoration activities or projects that do not meet individual program policies and guidelines or pass technical reviews will not be funded through Service programs.

Appendix A1. Project design standards for all restoration activities.

General Requirements

1. All regulatory permits and official project authorizations must be secured before project implementation. Follow all terms and conditions included in these documents.
2. The Oregon guidelines for the timing of in-water work must be followed for each affected stream reach when completing restoration activities requiring in-water work. The timing of in-water work may be extended if the Oregon Department of Fish and Wildlife approves an extension based on current year site specific conditions. In-water work should occur during the lowest water period within the timing guidelines for the affected stream reach.
3. Significant modifications to a project work plan must be reviewed and approved by appropriate agency personnel and the landowner(s) before completing the modifications.
4. Explosives (*i.e.*, dynamite and gun powder) must not be used on a project site.
5. Pesticides must not be used to control or remove invertebrate and vertebrate species and microorganisms (*e.g.*, viruses, bacteria, and fungi).
6. Herbicides must not be used to control or remove invasive and non native vegetation.
7. Monitoring, as necessary, is required for at least one year following completion of a project.

Equipment Operation

1. Use existing roads or travel paths to access project sites whenever possible.
2. All temporary access roads for equipment must be constructed as follows:
 - Use existing roads and travel paths whenever possible, unless construction of a new road or path would result in less habitat loss.
 - Temporary roads and paths must not be built mid-slope or on slopes steeper than thirty percent.
 - Minimize soil disturbance and compaction whenever a new temporary road or path is necessary within 150 feet²⁴ of a stream, water body, or wetland by clearing vegetation to ground level and placing clean gravel over geotextile fabric, unless otherwise approved by the Fish and Wildlife Service.
 - Minimize the number of temporary stream crossings.
 - Survey any potential spawning habitat within 300 feet downstream of a proposed stream crossing. Do not place a temporary stream crossing at known or suspected spawning areas, or within 300 feet upstream of such areas if spawning areas may be affected.
 - Design a temporary stream crossing to provide for foreseeable risks (*e.g.*, flooding and associated bedload and debris, to prevent the diversion of stream flow out of the channel and

²⁴ Distances from a stream or water body are measured horizontally from, and perpendicular to, the bankfull elevation, the edge of the channel migration zone, or the edge of any associated wetland, whichever is greater. "Channel migration zone" means the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years (*e.g.*, alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams).

- down the road if the crossing fails).
- Vehicles and machinery must cross riparian areas and streams at right angles to the main channel whenever possible.
 - When a project is complete, obliterate all temporary access roads that will not be in footprint of a new bridge or other permanent structure, stabilize the soil, and revegetate the site. Abandon and restore temporary roads in wet or flooded areas by the end of the local in-water work period.
3. Equipment must be limited in capacity, but sufficiently sized to complete required restoration activities. When heavy equipment will be used, the equipment selected must have the least adverse effects on the environment (*e.g.*, minimally sized, low ground pressure equipment).
 4. Minimize the use of equipment in or adjacent to a stream channel to reduce sedimentation rates and channel instability.
 5. Aquatic and riparian habitats must not be used as equipment staging or refueling areas. Locate these areas 150 feet or more from any stream, water body, or wetland. (Note: This distance must be greater if a staging or refueling area is up slope from an aquatic or riparian habitat). These areas should be used to store equipment, supplies, materials, and fuels, and for the cleaning, maintenance, and refueling of equipment.
 6. To reduce potential contamination, limit the size of staging and refueling areas and only store enough supplies, materials, and equipment on-site to complete the project.
 7. All equipment operated within 150 feet of an aquatic habitat, must be inspected daily for fluid leaks before leaving the equipment staging area. All detected leaks must be repaired in the staging area before the equipment resumes operation.
 8. All equipment must be cleaned to remove external oil, grease, dirt, and mud before beginning operations below the bankfull elevation of a stream.
 9. All stationary power equipment (*e.g.*, generators) operated within 150 feet of any aquatic habitat must be diapered to prevent leaks and/or enclosed in a containment device (*e.g.*, non permeable drip pan) of adequate capacity to retain equipment fluids (*e.g.*, gasoline, diesel fuel, and oil) if a leak occurs.

Pollution and Erosion Controls

1. A written hazardous spill contingency plan must be developed for all project sites where hazardous materials (*e.g.*, fuels, oils, and fertilizers) will be used or stored. For information on your role in a spill response, please review the Oregon Department of Environmental Quality (ODEQ) fact sheet at the following web site:
<http://www.deq.state.or.us/wmc/cleanup/factsheets/WhatToExpectWhenYouHaveSpilled.pdf>.
2. Appropriate materials and supplies (*e.g.*, shovels, disposal containers, absorbent materials, first aid supplies, and clean water) must be available on-site to cleanup any small accidental spill. Responding personnel must be trained in dealing with the spill.
3. Hazardous spills must be reported to the Oregon Emergency Response System at 1-800-452-0311 (system available 24 hours a day). Please review the ODEQ emergency response web site at <http://www.deq.state.or.us/wmc/cleanup/spl0.htm> for more information.

4. The removal, transport, and disposal of hazardous materials must be done according to U.S. Environmental Protection Agency and ODEQ regulations.
5. All hazardous materials must be handled in strict accordance to label specifications. Proper personal protection (*e.g.*, gloves, face masks, and clothing) must be worn by all personnel handling hazardous materials. Obtain a copy of the material safety data sheet from the manufacturer for detailed information on each hazardous material. Contact the Oregon Poison Control Center at 1-800-222-1222 (24 hours) for assistance in responding to emergency exposures.
6. Install hazardous material containment booms in situations where there is a potential for release of petroleum or other toxicants in aquatic habitats or construct containment berms in non aquatic habitats.
7. Contaminated or sediment laden water from a construction project (*e.g.*, concrete washout, pumping for work area isolation, and vehicle wash water) must not be discharged directly or indirectly into any aquatic habitat until it has been treated by a proper method (*e.g.*, bioswale, filter system, and settlement pond).
 - Design, build, and maintain facilities to collect and treat all construction discharge water using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.
 - If construction discharge water is released using an outfall or diffuser port, velocities must not exceed four feet per second, and the maximum size of any aperture must not exceed one inch.
 - Do not release construction discharge water within 300 feet upstream of active spawning areas or areas with submerged aquatic vegetation.
 - Do not allow pollutants including green concrete, contaminated water, silt, welding slag, sandblasting abrasive, or grout cured less than 24 hours to contact any wetland or the two year floodplain.
8. Store construction waste in leak-proof containers until they can be transported off-site for recycling, reuse, or disposal at an upland facility approved to accept the specific waste. Project personnel must remove all waste from the project site at the completion of the project.
9. Temporary erosion controls must be installed at all project sites where restoration activities will result in soil disturbance and the potential for sediment transport. Controls must remain in place and be maintained until vegetation is established at the sites or as needed to prevent erosion. Controls include, but are not limited to, silt fences, straw bales²⁵, sandbags, jutte mats, coffer dams, water bladders, and coconut logs.
10. During construction, all erosion controls must be inspected daily during the rainy season and weekly during the dry season to ensure they are working adequately²⁶.
 - If monitoring or inspection shows that the erosion controls are ineffective, mobilize work

²⁵ When available, certified weed-free straw or hay bales must be used to prevent introduction of invasive and non native weeds.

²⁶ "Working adequately" means that project activities do not increase ambient stream turbidity by more than ten percent when measured relative to a control point immediately upstream of the turbidity causing activity.

crews immediately to make repairs, install replacements, or install additional controls as necessary.

- Remove sediment from erosion controls once it has reached one-third of the exposed height of the control.
 - Sediments collected behind erosion control structures must be removed and stabilized at an appropriate upland disposal site immediately after the completion of a project.
11. Emergency erosion controls (*e.g.*, silt fences and straw bales) must always be available on-site whenever surface water is present at a project site.
 12. An oil-absorbing floating boom must be present on-site when operating heavy equipment within 50 feet of aquatic habitats.
 13. Locate stockpile areas on or immediately beside a project site whenever possible, but at least 150 feet from aquatic habitats. Erosion controls must be implemented around stockpiled materials, as needed, to prevent the introduction of pollutants into the surrounding areas.
 14. Excess excavated materials removed during the completion of a project must be disposed of properly and stabilized to eliminate future environmental problems. Disposal sites must not be located in aquatic or riparian habitats or floodplains.
 15. Concrete structures used in open-bottom culvert and bridge installations (*e.g.*, vault sections, footers, wing walls, and abutments) must be cured before they are placed in aquatic habitats.

Construction Techniques

1. The boundary of a project site must be flagged to prevent soil disturbance to areas outside the site. Confine construction impacts to the minimum area necessary to complete the project.
2. Limit the removal of any native vegetation to the amount that is absolutely necessary to complete a construction activity.
3. Conserve native materials for site restoration as follows:
 - Leave native materials where they are found, whenever possible.
 - Replace native materials that are damaged or destroyed with functional equivalents during site restoration.
 - Stockpile any large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction for use during site restoration.
4. Completely isolate an in-water work area from the active flowing stream using inflatable bladders, sandbags, sheet pilings, or similar materials if adult or juvenile fish are reasonably certain to be present, or if the work area is 300 feet upstream of spawning habitats. This does not apply to the placement of large woody debris and boulders to construct fish habitat structures.
5. Fish screens must be installed, operated, and maintained according to NOAA Fisheries' fish screen criteria²⁷ on each water intake used for project construction, including pumps used to

²⁷ National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (<http://www.nwr.noaa.gov/1hydroweb/ferc.htm>). Note: New criteria are currently being drafted by NOAA

isolate an in-water work area.

6. Institute practices that prevent construction materials and debris from dropping into aquatic habitats. Remove any materials that do drop in with a minimal amount of disturbance to these habitats.
7. Cease project operations under high stream flow conditions that may result in inundation of the project area, except for efforts to minimize or eliminate resource damage.
8. Temporary coffer dams built as a part of a project must use materials from non streambed sources that are free of fines. Upon project completion, coffer dams must be removed from the stream or feathered out in the stream channel.
9. Stream banks damaged from project activities must be restored to a natural slope, pattern, and profile that are suitable for the establishment of permanent herbaceous and/or woody vegetation as appropriate.
10. Stabilize all disturbed areas following any break in work unless construction will resume within seven days.

Restoration Materials

1. The use of non native vegetation will be limited to situations where appropriate native vegetation (*e.g.*, grasses) is not commercially available or would not meet immediate project goals (*e.g.*, temporary cover using sterile wheatgrass). Non native vegetation planted at a project site must be a close subspecies or variety to native species or reproductively altered (*i.e.*, sterilized) to avoid future ecological complications with native species. The Fish and Wildlife Service must review and approve the use of non native vegetation on project sites before project implementation.
2. Native vegetation must be planted on disturbed sites within thirty days of disturbance (including the project site, disposal and staging areas, and access roads) to reduce erosion, establish cover, provide shade, and prevent non native plant colonization. Non native vegetation may be planted (*see item 1 above*) if soil disturbances occur outside of the appropriate planting periods for native vegetation (*i.e.*, replanting of native vegetation must occur before the first April 15 following construction). Erosion controls must remain in place at disturbed sites until vegetation is well established.
3. Replant each area requiring revegetation using a diverse assemblage of species native to the project area or region, including grasses, forbs, shrubs and trees. Invasive and noxious species must not be used for revegetation.
4. Obtain project boulders, rock, and large wood²⁸ outside of aquatic habitats. These materials must also be obtained during appropriate seasonal periods to minimize or eliminate soil disturbance and

Fisheries.

²⁸ "Large wood" means a tree, log, or rootwad big enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull channel width of the stream in which the wood occurs. See Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (<http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/lrgwood.pdf>).

compaction.

5. Riparian timber stands must not be harvested to supply large wood to complete a restoration activity.
6. A limited number of trees in upland timber stands may be harvested for large wood to complete a restoration activity, but methods of selection and harvest must be reviewed and approved by the Fish and Wildlife Service before completing a timber harvest.
7. Down coarse woody debris²⁹ and boulders in riparian and upland habitats may be used to complete a restoration activity, but these materials must remain at or near their original locations to maintain the natural (or current) characteristics of the local area. Methods of selection, collection, and use must be reviewed and approved by the Fish and Wildlife Service before completing the activity.

Pressure Treated Wood Products

1. Pressured treated wood³⁰ containing water-borne or oil-borne preservatives must not be placed in areas where they will be in constant contact with standing or moving water or placed over water where they will be exposed to mechanical abrasion or leachate may enter aquatic habitats (*e.g.*, bridge construction or decking at a road-stream crossing).
2. Dispose of treated (preserved) wood debris removed during a project at an upland facility approved for hazardous materials of this classification. Do not allow any treated wood debris (*i.e.*, saw dust and scrape wood) to be stacked next to or enter any aquatic habitat (*e.g.*, stream, wetland, and pond).
3. Treated wood debris or products that fall into any aquatic habitat must be removed immediately.
4. Treated wood products used for authorized structures must be certified as to being produced using the most current version of the American Wood-Preservers Association best management practices.
5. Treated wood products of unknown origin or method of treatment must not be used for any restoration application.
6. A project specific biological assessment must be written if pressure treated wood products are not used according to the conditions stated above. This process may result in NOAA Fisheries and Fish and Wildlife Service issuing biological opinions under the Endangered Species Act for the project.

²⁹ "Coarse woody debris" consists of snags, fallen logs, wind blown trees, and large branches.

³⁰ "Treated wood" means lumber, pilings, and other wood products preserved with alkaline copper quaternary (ACQ), ammoniacal copper arsenate (ACA), ammoniacal copper zinc arsenate (ACZA), copper naphthenate, chromated copper arsenate (CCA), pentachlorophenol, or creosote.

Fish and Wildlife Requirements

1. Complete restoration activities at a project site in a timely manner. This will reduce disturbance and displacement of fish and wildlife in the project area.
2. Provide passage for any adult or juvenile salmonid species present in the project area during construction, unless otherwise approved in writing by the Fish and Wildlife Service. Upstream passage is not required during construction if it did not previously exist.
3. Before and intermittently during pumping to isolate an in-water work area, an attempt must be made to capture and release federally listed fish species from the isolated area using trapping, seining, electrofishing, or other methods as are prudent to minimize risk of injury to them.
 - The entire capture and release operation must be conducted or supervised by a fishery biologist experienced with work area isolation and competent to ensure the safe handling of all listed fish.
 - Do not use seining or electrofishing if water temperatures exceed 18° C.
 - If electrofishing equipment is used to capture fish, comply with NOAA Fisheries' electrofishing guidelines³¹.
 - Handle listed fish with extreme care, keeping fish in water to the maximum extent possible during seining and transfer procedures to prevent the added stress of out-of-water handling.
 - Transport fish in aerated buckets or tanks.
 - Release fish into a safe release site as quickly as possible and as near as possible to capture sites.
 - Do not transfer listed fish to anyone except NOAA Fisheries' or Fish and Wildlife Service' personnel as appropriate, unless otherwise approved in writing by the respective Federal agency.
 - Obtain all Federal, State, and local permits necessary to conduct the capture and release activity.
 - Fish and Wildlife Service and NOAA Fisheries' personnel or its designated representative must be allowed to accompany the capture team during capture and release activities.
 - A report must be prepared addressing the capture and release of listed fish species during the isolation of an in-water work area. The report must include the following:
 - ▶ Supervisory fish biologist's name and address.
 - ▶ Methods of work area isolation.
 - ▶ Stream conditions before, during, and after completion of work area isolation.
 - ▶ Methods and means of fish capture.
 - ▶ Number of fish captured by species.
 - ▶ Location and physical condition of all fish released.
 - ▶ Any incidence of observed injury or mortality to listed fish.

³¹ National Marine Fisheries Service, *Backpack Electrofishing Guidelines* (December 1998) (<http://www.nwr.noaa.gov/1salmon/salmesa/pubs/electrog.pdf>).

4. An attempt must also be made to capture and release non listed fish and wildlife (*e.g.*, amphibians and reptiles) from isolated work areas as addressed above. Consult with the Fish and Wildlife Service or Oregon Department of Fish and Wildlife for guidance on capture and release techniques for these species.

Appendix A2. Project design standards for riparian, wetland, upland, coastal, and estuarine habitat restoration.

General Requirements

1. Knowledgeable and trained personnel (*e.g.*, biologist, hydrologist, or engineer) must be involved in the design and implementation of habitat restoration projects.
2. Deposition of fill materials in any habitat must not violate Federal, State, county, or local regulations and guidelines as set forth by the Oregon Division of State Lands, U.S. Army Corps of Engineers, or other regulatory agencies.
3. Hydric soils from wetlands and topsoil from riparian and upland areas must be salvaged, stockpiled, and then replaced in appropriate project areas during construction activities. It may not be appropriate to reuse these soils if they are contaminated with toxic materials or contain reproductive parts (*e.g.*, seeds, bulbs, and rhizomes) of invasive, non native, or noxious vegetation.
4. Berms and dikes that are breached or constructed must meet appropriate Federal and State engineering and safety standards.
5. Berms and dikes that are breached, removed, or constructed must not cause the artificial entrapment of fish and other aquatic species in areas adjacent to them. Artificial entrapment refers to man-made habitat changes or structures (*e.g.*, isolated ditches, depressions, or other topographical changes) that would not allow the passive surface flow of water to return to a stream channel as water levels recede.
6. A project specific biological assessment must be written for constructed berms and dikes adjacent to a fish bearing stream³² containing federally listed anadromous fish species. This process may result in NOAA Fisheries issuing a biological opinion under the Endangered Species Act for the project. The Fish and Wildlife Service must review and approve the designs for these structures adjacent to non anadromous stream reaches.
7. Appropriate pollution and erosion controls must be implemented as they apply to specific restoration activities.

Livestock Fencing

1. Livestock fence installations must be reviewed and approved by the Fish and Wildlife Service before installation to ensure compliance with wildlife compatible fence designs.
2. Woven wire fence installations must be limited to areas around buildings and barns.
3. The durability of fencing materials must meet intended livestock management objectives.
4. An electric fence (hard-wired or solar powered) is a preferred alternative to a traditional wire fence.

³² “Fish bearing streams” refer to perennial and ephemeral streams that are known to contain one or more native fish species. A stream is assumed “fish bearing” unless a presence/absence or other appropriate survey has been completed to prove otherwise.

5. Cross-pasture fencing should be combined with perimeter pasture fences to promote better pasture management.
6. Fences must not be constructed in areas where natural barriers restrict livestock movements.
7. Fences must not be constructed on steep hillsides.
8. Fences must not restrict the natural movement of any wildlife species, especially deer, elk, and pronghorn.
9. Adjustable or lay-down fences/panels should be constructed in areas of high deer, elk, and pronghorn use and within traditional migration corridors for these species.
10. Pole-topped fences should be constructed in areas where elk frequently cross back and forth. This will help to reduce fence damage and repair costs.
11. Fences in or near areas where sage grouse are known or suspected to occur should be designed and constructed as follows:
 - Increase the visibility of fences occurring within 0.5 miles of seasonal sage grouse habitats to prevent injuries to flying grouse (*see item 14 below*).
 - Use smooth wire for the top and bottom wires, not barbed wire.
 - Avoid creating potential raptor perches within 1.5 miles of seasonal sage grouse habitats by reducing fence post height to four feet or less. Where fence posts must exceed this height, modify the top of the posts (*e.g.*, cut the top of wooden posts to a steep point).
 - Fences within 1.5 miles of seasonal sage grouse habitats should maximize the setback distance from streams, ponds, springs, seeps, and wet meadows to accommodate grouse flight lines. Avoid constructing fences across water sources.
12. Maintain a clear line of sight along a fence line for a distance of at least ten feet to make it more visible to wildlife.
13. Fences should be constructed at least 100 feet from the perimeter of a wetland to reduce potential collisions with flying waterfowl and large wading birds.
14. Tie colored flagging on the top wire of all new fences to make them more visible to wildlife. For a more permanent visible marker, slide PVC pipe (*i.e.*, one to two foot lengths) onto one of the upper fence wires during construction. Use white PVC pipe or paint the pipe with a bright color for more visibility.

Livestock Stream Crossings

1. Livestock crossings must not be located in areas where compaction or other damage may occur to sensitive soils and vegetation (*e.g.*, wetlands) due to congregating livestock.
2. Livestock must be encouraged to loaf away from crossing locations.
3. Livestock crossings must be designed and constructed to accommodate reasonably foreseeable flood risks, including associated bedload and debris, and prevent the diversion of stream flow out of the channel and down an adjacent road if there is a crossing failure.
4. Locate livestock crossings where native riparian vegetation will not have to be cleared to install the structure.
5. Suspended livestock crossings must be load rated for its intended use (*e.g.*, type of livestock, farm equipment, and vehicles to cross the structure).

6. Abutments for livestock bridge crossings (*e.g.*, railroad car and constructed bridges) must be armored and placed above the bankfull elevation³³ of the stream.
7. Culverts used for livestock stream crossings on fish bearing streams must follow project design standards for fish passage improvements (*see Appendix A4*).
8. Minimize the number of livestock crossings installed on a landowner's property. Locate the crossings where they will best meet livestock management objectives.
9. The maximum width of a non hardened ford livestock crossing must be not exceed ten feet.
10. Each livestock crossing must be fenced to restrict livestock access to the stream channel. Fencing can be installed as a temporary or permanent installation, depending on local stream conditions and grazing management requirements.

Hardened Livestock Fords

1. Construct a hardened livestock ford where stream banks are naturally low.
2. The stream bank, channel, and approach lanes in the pasture must be stabilized with native vegetation, geotextile fabric, and angular rock to reduce chronic sedimentation problems; however, these materials must not impede natural channel migration potential.
3. Livestock fords must not be constructed within known or suspected spawning areas, or within 300 feet upstream of such areas if they may adversely affect them.
4. Livestock fords must be designed to allow the passage of juvenile and adult fish at normal seasonal stream flows.
5. The maximum width of a hardened ford must be not exceed eight feet.
6. Follow other appropriate project design standards under Livestock Stream Crossings.

Livestock Watering Facilities

1. Livestock off-channel watering facilities must not be located in areas where compaction or other damage may occur to sensitive soils and vegetation (*e.g.*, wetlands) due to congregating livestock.
2. Livestock watering facilities should be constructed in a manner that meets its primary purpose while providing additional benefits to wildlife. Facilities must be designed to prevent the entrapment of wildlife if they are installed to provide multiple benefits.
3. A solid, dry surface is recommended around all watering facilities to prevent ground saturation, runoff, and erosion. A concrete pad or a plastic/geotextile/gravel grid must be constructed around a facility to minimize or eliminate these problems.
4. Float-controlled devices in all watering facilities must be inspected weekly to ensure that they are operating properly and not contributing to excess water overflow.
5. A natural spring used as water source must be protected from livestock degradation by fencing off the perimeter of the spring and developing a low impact water withdraw system.

³³ "Bankfull elevation" means the bank height inundated by a 1.5 to 2 year average recurrence interval and may be estimated by morphological features such average bank height, scour lines and vegetation limits.

6. Pump intakes for livestock watering facilities must to be screened according to NOAA Fisheries' fish screen criteria when they are placed in a stream channel.
7. Ponds used for livestock watering must be constructed according to all State and local requirements and the following criteria.
 - Ponds must not be constructed within the channel (*i.e.*, water course) of a perennial, intermittent, or ephemeral stream.
 - Ponds must not be directly filled (*i.e.*, diverted) from any fish bearing stream unless the diversions are screened according to NOAA Fisheries' fish screen criteria. A water overflow or by-pass device must also be installed to prevent excessive water diversion.
 - Consider placing ponds where they can be naturally filled by snow melt, rainfall, or overland surface flows, or through an existing domestic water supply.
 - Costs (*e.g.*, labor, materials, and supplies) associated with the construction of ponds that will be stocked with native and/or non-native fish are not reimbursable with Fish and Wildlife Service restoration program funding.

Prescribed Burns

1. A prescribe burn plan must be reviewed and approved by the Fish and Wildlife Service before conducting the burn. The plan must set biological and ecological goals based on local site conditions and evaluate factors that may affect the outcome of the prescribed burn. Always consider non burning alternatives whenever possible.
2. A prescribed burn must be conducted in a manner that is consistent with appropriate Federal, State, county, and local regulations, including smoke management regulations.
3. All permits and official authorizations must be secured before conducting a prescribe burn.
4. Adjacent landowners and the local fire department must be notified of all burn activities in advance.
5. A contingency plan should be developed for reestablishing control of a prescribed burn in situations where the burn escapes containment boundaries. The plan must also address the reestablish of native vegetation in these areas within the season of disturbance.
6. Prescribed burns are not authorized within riparian³⁴ and wetland areas, and must also be located at least 100 feet away from the edge of perennial and ephemeral stream channels.
7. Prescribed burns adjacent to riparian areas should occur during periods when appropriate moisture content will reduce unintended spread to riparian areas. Spring burns are preferred over

³⁴ "Riparian areas" are defined as two site potential tree heights (of native, site potential vegetation) located from the channel migration zone (defined as the area defined by the lateral extent of likely movement along a stream reach as shown by evidence of active stream channel movement over the past 100 years, *e.g.*, alluvial fans or floodplains formed where the channel gradient decreases, the valley abruptly widens, or at the confluence of larger streams). These areas are plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent lotic and lentic water bodies. Riparian areas have one or both of the following characteristics: 1) distinctively different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. These areas are usually transitional between wetland and upland areas.

Fall burns since they produce “cooler” fires resulting in a mosaic of treated and untreated areas. Soil moisture is also more available in the Spring resulting in quicker plant regrowth. However, seasonal timing of a prescribed burn must meet its primary purpose.

8. Qualified personnel in the use of fire must be involved in all aspects of a prescribed burn.
9. Project personnel assisting with a prescribed burn must have access to proper protective clothing (Nomex), boots, gloves, helmets, goggles, face shields, and two-way radios with a weather channel.
10. Appropriate fire suppression equipment must always be located at the project site during a prescribed burn.
11. Chemical retardants, foam, and other additives must be prevented from entering any water source, except in situations where overriding immediate safety exist.
12. All participants must attend a planning session before completing a prescribed burn and be informed of contingent burn plans in the event of a wildfire.
13. Potential affects to aquatic habitats must be considered when a prescribed burn will occur near these areas (*e.g.*, wetlands, permanent or ephemeral streams).
14. A prescribed burn must not occur in areas with moderate to high erosion potential, unless complete revegetation will occur thirty days before the rainy season.
15. Prescribed burning of slash material or invasive/non native vegetation must be planned and managed to maximize the benefits and reduce the detrimental effects of a burn.
16. Develop a site plan for rapid native revegetation after a prescribed burn.
17. Sedimentation and erosion controls, as appropriate, must be installed at all prescribed burn sites. Controls must remain in place and be maintained until vegetation is established at these sites.

Soil Stabilization

1. Designs for soil bio-engineered stabilization projects must be reviewed and approved by the Fish and Wildlife Service before completing project activities.
2. Whenever possible, soil stabilization efforts must employ natural or bio-engineering techniques.
3. The following materials must not be used for stabilization:
 - broken pieces of asphalt and concrete.
 - metal refuse and debris (*e.g.*, metal refuse containers, car bodies, and tires).
 - organic waste materials (*e.g.*, discarded lumber, pressure treated wood products, and herbaceous vegetation).
 - stream channel materials (*e.g.*, woody debris and gravels collected within the channel), unless materials were initially removed during construction activities.
4. Straw used as mulch must not be moldy, caked, decayed, or otherwise of low quality. Ensure that the mulch does not contain invasive or non native plant seeds or other reproductive parts.
5. Stream bank protection techniques depend on the mechanisms of stream bank failure operating at site- and reach-scale.³⁵ Appropriate techniques must be employed to minimize or eliminate

³⁵ For guidance on how to evaluate streambank failure mechanisms, streambank protection measures, and use of an ecological approach to management of eroding streambanks, see, *e.g.*, Washington Department of Fish and

adverse affects to natural stream and floodplain functions by limiting actions that are expected to have long-term adverse effects on aquatic habitats. The following bank protection techniques are approved for use individually or in combination:

- Planting woody trees and shrubs or other planting variations (*e.g.*, live stakes, brush layering, fascines, and brush mattresses).
- Planting herbaceous vegetation, where available records (*e.g.*, historical accounts and photographs) show that trees and shrubs did not exist on the site within historic times.
- Installing deformable soil reinforcements consisting of soil layers or lifts strengthened with fabric and vegetation.
- Installing coir logs (*i.e.*, long bundles of coconut fiber), straw bales, straw logs, or other similar non-toxic biodegradable materials used individually or in stacks to trap sediment and provide a growth medium for plants.
- Reshaping stream banks and grading slopes to reduce bank slope angles without changing the location of the bank toe; increase roughness and cross-section; and provide more favorable vegetative planting surfaces.
- Installing floodplain roughness (*e.g.*, floodplain tree and large woody debris rows, live siltation fences, brush traverses, brush rows, and live brush sills) to reduce the likelihood of avulsion in areas where natural floodplain roughness is poorly developed or has been reduced.
- Installing floodplain flow spreaders (consisting of one or more rows of trees and accumulated debris) to spread flow across the floodplain.
- Install flow-redirection structures³⁶ such as barbs, vanes, or bendway weirs, when designed as follows, unless otherwise approved by the Fish and Wildlife Service.
 - ▶ No part of the flow-redirection structure may exceed bank full elevation, including all rock buried in the bank key.
 - ▶ Build the flow-redirection structure primarily of wood or otherwise incorporate large wood at a suitable elevation in an exposed portion of the structure or the bank key. Placing the large woody debris near streambanks in the depositional area between flow-direction structures to satisfy this requirement is not authorized, unless those areas are likely to be greater than one meter in depth, sufficient for salmon rearing habitats.
 - ▶ Fill the trench excavated for the bank key above bankfull elevation with soil and top with native drought tolerant vegetation.
 - ▶ The maximum flow-redirection structure length must not exceed one-quarter of the

Wildlife, Washington Department of Transportation, and Washington Department of Ecology, *Integrated Streambank Protection Guidelines*, various pagination June 2002 (<http://www.wa.gov/wdfw/hab/ahg/strmbank.htm>), and Federal Interagency Stream Restoration Working Group, *Stream Corridor Restoration: Principles, Processes, and Practices*, various pagination October 1998 (http://www.usda.gov/stream_restoration/newgra.html).

³⁶ See *e.g.*, Natural Resources Conservation Service Technical Notes (Engineering - No. 12 and 13, respectively), *Design of Stream Barbs*, July 2001 and *Design of Rock Weirs*, February 2001 (<http://www.id.nrcs.usda.gov/technical/engineering/index.html>).

- bankfull channel width.
- ▶ Place rock individually with an excavator without end dumping the rock from a haul vehicle.
 - ▶ If two or more flow-redirection structures are built in a series, place the flow-redirection structure farthest upstream within 150 feet or 2.5 bankfull channel widths from the flow-redirection structure farthest downstream.
 - ▶ When appropriate, plant native woody riparian vegetation at disturbed sites and in areas adjacent to the project to improve the riparian habitat.
6. Whenever possible, use large wood as an integral component for all stream bank protection treatments³⁷. Minimize or eliminate the use of sheet pile, riprap, gabions, cable, concrete, and/or similar materials in stream bank protection projects.
- Large wood should be intact and not decayed with untrimmed root wads (where available) to provide functional refugia habitat for fish. Use of decayed or fragmented wood is not acceptable.
 - Rock may be used instead of large wood for the following purposes and structures. The size of rock that is used must not impair natural stream flows into or out of secondary channels. Whenever possible, place topsoil over the rock and plant with native woody vegetation.
 - ▶ As ballast to anchor or stabilize large woody debris components of an approved bank treatment.
 - ▶ To fill scour holes to protect the integrity of the project, if the rock is limited to the depth of the scour hole and does not extend above the channel bed.
 - ▶ To construct a footing, facing, head wall, or other protection necessary to prevent scouring, downcutting, fill slope erosion, or another type of failure at an existing flow control structure (*e.g.*, culverts and water intakes), utility line, or bridge support.
 - ▶ To construct a flow-redirection structure as described above (*see item 5*).

³⁷ See, *e.g.*, Washington Department of Fish and Wildlife, Washington Department of Transportation, and Washington Department of Ecology, *Integrated Streambank Protection Guidelines*, Appendix I: Anchoring and placement of large woody debris, June 2002 (<http://www.wa.gov/wdfw/hab/ahg/strmbank.htm>); Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (<http://www.nwr.noaa.gov/1salmon/salmesa/4ddocs/lrgwood.pdf>), and Natural Resources Conservation Service Technical Notes (Engineering - No. 15), *Incorporation of Large Wood Into Engineering Structures*, June 2001 (<http://www.id.nrcs.usda.gov/technical/engineering/index.html>).

Silvicultural Treatments³⁸

Juniper Tree Removal: Riparian and Upland Habitats

1. Riparian and upland juniper tree harvest plans must be reviewed and approved by the Fish and Wildlife Service before completing project activities.
2. Silvicultural activities in riparian areas are limited to juniper tree removal.
3. Juniper tree removal in riparian or upland areas must not result in significant soil disturbances that may cause increased sedimentation and erosion.
4. Only fifty percent of the juniper trees greater than ten inches in diameter at breast height may be removed in a riparian project area in order to limit the reduction in shade to adjacent permanent or ephemeral water bodies. The remaining juniper trees may be removed when native vegetation is planted or released in these areas to reestablish baseline shading conditions before the removal of juniper trees.
5. At least ten percent of the juniper trees greater than ten inches in diameter at breast height must be retained for wildlife in an upland project area.
6. Removed juniper trees may be used for soil bio-engineered stabilization and fish habitat structures, as appropriate.
7. Slash materials should be gathered by hand or with light machinery to reduce soil disturbance and compaction. Avoid accumulating or spreading slash in upland draws, streams, and springs. Slash control and disposal activities must be conducted in a manner that reduces the occurrence of debris in aquatic habitats.

Conifer/Hardwood Silvicultural Treatments: Upland Habitats

1. Upland silvicultural treatment plans must be reviewed and approved by the Fish and Wildlife Service before completing project activities.
2. Silvicultural treatments must not occur if they remove or degrade occupied or suitable unsurveyed habitats for federally listed terrestrial species.
3. Silvicultural treatments that would reduce vegetative habitat and cover must not occur in snowshoe hare habitat. Snowshoe hare habitat is considered areas where live limbs (*e.g.*, tree, brush, and limbs) can be reached by hares at snow depth.
4. Silvicultural treatments may occur in upland project areas that are at least 500 feet (*i.e.*, measured as a straight line distance from the nearest edge of the stand to the stream channel) from a fish bearing stream that contains federally listed aquatic species. The timber stand must also be on a slope of less than twenty percent to the stream channel.
5. Silvicultural treatments may occur in upland project areas that are at least 250 feet or two site potential tree heights away (*i.e.*, which ever is greater) away from a fish bearing stream that does

³⁸ “Silvicultural treatments” refers to removing or girdling dominant hardwood or conifer trees, removing understory vegetation to release existing hardwood or conifer trees; pre-commercial thinning timber stands to reduce hardwood or conifer stocking rates; planting hardwood or conifer seedlings to establish or reestablish timber stands; and removing ground fuels to reduce fuel loading.

- not contain federally listed fish species. The timber stand must also be on a slope of less than twenty percent to the stream channel.
6. Silvicultural treatments may occur in upland project areas that are at least 125 feet or two site potential tree heights (*i.e.*, whichever is greater) away from a non-fish bearing stream. The timber stand must also be on a slope of less than twenty percent to the stream channel.
 7. If the status of a stream (*i.e.*, whether it contains federally listed species) is unknown, then silvicultural treatments in upland project areas must adhere to requirements addressed in item 4 above.
 8. Timber yarding techniques used during silvicultural treatments must not cause excessive soil disturbances and compaction.
 9. Slash materials should be gathered by hand or with light machinery to reduce soil disturbance and compaction. Avoid accumulating or spreading slash in upland draws and springs. Slash control and disposal activities must be conducted in a manner that reduces the occurrence of debris in aquatic habitats.
 10. Silvicultural treatments on upland project sites should maintain a visual barrier of undisturbed vegetation next to open roads to minimize or eliminate wildlife disturbances.
 11. A project specific biological assessment must be written for silvicultural treatments that do not meet the criteria above. This process may result in NOAA Fisheries and the Fish and Wildlife Service issuing biological opinions under the Endangered Species Act for the project.

Revegetation Techniques

1. Native vegetation must be planted on disturbed project sites, where appropriate, and protected from further disturbance until new growth is well established. Non native vegetation may be used, but is subject to the conditions addressed in Appendix A1 under Restoration Materials (*see items 1, 2, and 3*).
2. Temporary or permanent fencing must be installed, as necessary, to prevent livestock access to revegetated sites.
3. Native vegetation should be salvaged, as appropriate, from areas where soil disturbance will be occurring on a project site and replanted later at the site.
4. Vegetative planting techniques must occur during the optimal planting period for the respective plant species and not cause major soil disturbance whether planting is done by manual labor or mechanical equipment.
5. Purchase plant materials from reputable suppliers or growers. These materials must be properly stored, handled, and planted.
6. Seeds used to grow seedlings should have been collected in an area where the environmental conditions (*e.g.*, elevation and range) closely match those on project sites. Refer to a tree seed zone map and ensure that every purchased box or bag of seedlings are clearly marked with the seed zone and elevation.
7. Improve seedling growth by removing competing plant species (*e.g.*, grasses) around them.
8. Employ the proper methods to protect seedlings from animal, insect, and environmental damages. Periodically examine seedlings for damages and diseases.

9. Surface application of plant fertilizers must be applied at agronomic rates, but not within fifty feet of any aquatic habitat.
10. Control and removal of invasive and non native plant species must be completed in a manner that eliminates the accidental dispersal of seeds or reproductive plant parts to other locations. Project personnel must complete the following tasks:
 - clean all equipment, vehicles, and tools used at a project site before going to a new location.
 - shake out all work clothes worn before leaving a project site.
 - change work clothes (*e.g.*, coveralls, gloves, and hats) if workers will be going to a new location.
 - launder work clothes frequently.
 - properly dispose of all invasive and non native plant materials removed during a treatment in a timely manner.

Appendix A3. Project design standards for instream habitat restoration.

General Requirements

1. Knowledgeable and trained personnel (*e.g.*, fisheries biologist, hydrologist, or geomorphologists) must be involved in the design and implementation of all instream restoration activities.
2. Appropriate pollution and erosion controls must be implemented as they apply to specific instream habitat restoration activities.
3. Landowners receiving basal area credits under the Oregon Department of Forestry Forest Practice Administrative Rules for large woody debris placements cannot be reimbursed for any project cost with Fish and Wildlife Service restoration program funding.
4. A project specific biological assessment must be written for a re-channelization project on a fish bearing stream containing federally listed anadromous fish species. This process may result in NOAA Fisheries issuing a biological opinion under the Endangered Species Act for the project. The Fish and Wildlife Service must review and approve the designs for these projects adjacent to non anadromous stream reaches.

Techniques and Materials

1. Materials used for instream structures should be the same type of materials that historically occurred at the site. The Fish and Wildlife Service must review and approve the use of other type of materials before project implementation.
2. Durable rock and wood materials must be used for instream structures.
3. Boulders and large wood used for instream structures need to be appropriately sized and placed to minimize or eliminate the movement of these materials during high flow events. Size standards must be determined by qualified professionals and based on individual stream reaches and their seasonal discharge rates.
4. Down coarse woody debris³⁹ and boulders in adjacent riparian and upland habitats may be incorporated into an instream structure. However, these materials must remain at or near their original locations to maintain the natural (or current) characteristics of the local area. Methods of selection, collection, and use must be reviewed and approved by the Fish and Wildlife Service before completing the activity.
5. Existing individual instream boulders and large wood may be repositioned in the stream channel or incorporated within new or naturally occurring instream structures. However, the repositioning or use of these materials must not occur if they are providing adequate fish habitat in their current locations.
6. Additional boulder and wood materials may be added to naturally occurring instream structures to create more complex structures. The structural integrity of original structures must not be compromised when completing this activity.

³⁹ “Coarse woody debris” consists of snags, fallen logs, wind blown trees, and large branches.

7. Naturally occurring instream structures must not be removed if they are providing adequate fish habitat, unless there is a safety concern to existing infrastructures or other property (*e.g.*, culverts and bridges). The Fish and Wildlife Service must review and approve the removal of these structures before completing the activity. Appropriate materials that are removed must be replaced in the same stream reach as close as possible to its original location.
8. Cable should not be used to anchor boulders and large wood within the stream channel. Use larger materials (*i.e.*, key pieces) to ballast or stabilize smaller materials or bury them in the stream bank. The Fish and Wildlife Service must review and approve the use of cable in stream habitats before project implementation.
9. Do not use full spanning rock weirs for instream structures, unless they are placed in an incised and/or widened channel where the goal of the placement is to agrade and narrow the channel by recruiting stream bedload at the site. Use large wood in place of these weirs if the appropriately sized wood pieces are available and can be maintained in the stream channel.
10. The installation of an instream structure must not result in a fish passage barrier to juvenile or adult fish or other aquatic species, especially during critical life cycle periods.
11. An instream structure altering the stream hydrology must not adversely affect adjacent or down stream properties, culverts, and bridges. Do not place instream structures 0.25 miles upstream of a culvert or bridge without obtaining landowner approval.
12. Natural alcoves and side channels enhanced by installing boulder/large wood structures for rearing and off-channel refuge habitats must not cause the entrapment of fish and other aquatic species. Surface water in these areas must be able to passively flow back to the stream channel as water levels recede.
 - A project specific biological assessment must be written for these activities on a fish bearing stream containing federally listed anadromous fish species. This process may result in NOAA Fisheries issuing a biological opinion under the Endangered Species Act for the project.
 - The Fish and Wildlife Service must review and approve the designs for these activities on non anadromous stream reaches.
13. Soil disturbance along stream channels must be minimized or eliminated whenever possible.
14. Undisturbed vegetated buffer zones must be retained along stream channels, to the maximum extent possible, to reduce sedimentation rates and channel instability.
15. Native vegetation must be protected to the maximum extent possible when constructing temporary access trails to a stream. Shrub and tree removal within trail footprints must be completed so that there is not a significant reduction of shade along the stream channel.
16. Salmon carcasses used for stream nutrient enrichment must be certified free of diseases by an Oregon Department of Fish and Wildlife pathologist and in compliance with regulations under the Oregon Department of Environmental Quality. The Oregon Department of Fish and Wildlife must also have identified the project stream reach as appropriate for salmon carcass placement.

Appendix A4. Project design standards for fish passage improvements.

General Requirements

1. Knowledgeable and trained personnel (*e.g.*, fisheries biologist, hydrologist, or engineer) must be involved in the design and construction of all fish passage improvements.
2. Fish passage improvements must be designed, constructed, and maintained to avoid disrupting the migration and movement of fish and other aquatic species.
3. Materials used for fish passage improvements must be clean, non-erodible, and non-toxic to aquatic species.
4. Appropriate pollution and erosion controls must be implemented as they apply to specific fish passage improvements.
5. The amount of excavation required for a fish passage improvement must be minimized to prevent changes to the stream channel.
6. Grade control structures must be considered when there is a potential for stream channel incision⁴⁰ above or below an existing fish passage barrier.
7. A project specific biological assessment must be written for the installation or upgrade of a tide gate. This process may result in NOAA Fisheries issuing a biological opinion under the Endangered Species Act for the project.

Artificial Fishways

1. An artificial fishway is defined as any non-culvert related fish passage structure constructed within a stream channel to aid in the passage of juvenile and/or adult fish or other aquatic species. This includes stand alone fishways and those incorporated into approved irrigation diversions. The structure must also be a semipermanent or permanent installation and constructed of wood, rock, concrete, and/or metal. Simple boulder-step pool weirs are not defined as an artificial fishway if they are designed and constructed to meet NOAA Fisheries' fish passage criteria⁴¹ and Oregon Road/Stream Crossing Restoration Guide⁴². A closed or open by-pass fish conveyance (*e.g.*, piped or ditched system) installed within an irrigation diversion is not defined as an artificial fishway if fish are returned to the original stream a short distance downstream of the diversion.
2. A project specific biological assessment must be written for the installation or upgrade of an artificial fishway on a fish bearing stream containing federally listed anadromous fish species. This

⁴⁰ See *e.g.*, Janine Castro - Fish and Wildlife Service, *Geomorphologic Impacts of Culvert Replacement and Removal: Avoiding Channel Incision*, February 2003, to help in determining channel incision potential (<http://pacific.fws.gov/jobs/orojitw/standard/proj-std.htm>).

⁴¹ NOAA Fisheries, *Anadromous Salmonid Passage Facility Guidelines and Criteria* (draft document) (http://www.nwr.noaa.gov/1hydro/hydroweb/docs/release_draft.pdf).

⁴² Oregon Department of Forestry and Oregon Fish and Wildlife Department, *Oregon Road/Stream Crossing Restoration Guide*, June 1999 (http://www.dfw.state.or.us/odfwhtml/infocntrfish/management/oregonrd_stream.pdf).

process may result in NOAA Fisheries issuing a biological opinion under the Endangered Species Act for the project. The Fish and Wildlife Service must review and approve the designs for these activities on non anadromous stream reaches.

Culverts and Bridges

1. Designs for culvert and bridge installations must be reviewed and approved by the Fish and Wildlife Service before completing project activities.
2. All culvert installations must be in compliance with NOAA Fisheries' fish passage criteria and Oregon Road/Stream Crossing Restoration Guide.
3. Culverts must be installed at right angles to the stream channel whenever possible.
4. Culvert inlets and outlets must be properly protected (*e.g.*, rock armored). Use a filter fabric under the protective materials to prevent future scouring actions and erosion.
5. Open-bottom and arch culverts are the preferred culvert types when replacing existing round corrugated metal culverts.
6. Multiple side-by-side culverts must not be installed at a road-stream crossing within the main channel to improve fish passage. Install an appropriately sized single culvert or bridge to improve fish passage at the location. Note: This does not preclude the installation of side relief culverts on road fills to prevent roadbed scouring on high stream flows.
7. Concrete sloped head walls or angled wing walls are not recommended on corrugated metal culvert installations. Boulder armoring around a culvert inlet and outlet is the preferred alternative.
8. Concrete slurry must not be used as a matrix to anchor culverts or rock armoring.
9. Depending on local site conditions, appropriately sized non angular boulders should be placed inside the culvert to allow for the development of low velocity micro habitats and help collect and maintain stream bedload within the culvert.
10. The installation of a boulder or log weir to back water at the culvert outlet is not recommended as a permanent solution to correct an improperly installed or undersized culvert.
11. An existing culvert to be upgraded in a stream with a gradient of six percent or greater must be replaced with a bridge.
12. Bridge designs and installations must conform to Federal and State engineering and safety standards for their intended use.
13. Bridge abutments must be designed and installed in a way that does not alter stream flows or channel stability and be located above the bankfull elevation. Abutments must be properly protected (*e.g.*, rock armored) to prevent future scouring actions and erosion.
14. Bridge abutments and culverts must not be backfilled with vegetation, debris, or mud. Use clean rock and gravel that is appropriately sized and placed in the proper portions to backfill the structure. Fill materials must be compacted using vibrating compaction equipment.
15. Maintenance schedules must be developed for culvert and bridge installations to ensure they remain in proper functioning condition.
16. Fill excavated during the temporary or permanent removal of a culvert must be placed and stabilized at an appropriate upland disposal site. Grade the sides of the stream crossing at a 2:1 or greater slope to reduce excessive sedimentation and erosion.

17. Install armored relief dips or side relief culverts in the road fill during culvert installations, as appropriate, to prevent roadbed scouring on high stream flows or if there is a moderate to high potential for debris to plug a culvert. These structures should always be installed if additional fill is added to the road base to increase the road fill height to accommodate a larger culvert installation.
18. Bridge designs must incorporate necessary elements to allow for wildlife movement over or under bridges whenever possible.

Irrigation Diversions

1. A project specific biological assessment must be written for the installation of an infiltration gallery or lay-flat stanchion in a fish bearing stream containing federally listed anadromous fish species. This process may result in NOAA Fisheries issuing a biological opinion under the Endangered Species Act for the project. The Fish and Wildlife Service must review and approve the designs for these structures on non anadromous stream reaches.
2. Designs for irrigation diversions listed below will need to be reviewed and approved by the Fish and Wildlife Service and/or NOAA Fisheries before project implementation, without the need for a project specific biological assessment. This includes designs for headgates, headgate/sluice gate combinations, fish screening, diversion dams/structures, and water delivery systems (*i.e.*, open ditch or closed pipe systems). Irrigation diversions include cross vanes, “W” weirs, “A” frame weirs, central pumping stations, and individual pump intakes.
3. Diversion dams/structures may be removed or improved where they are resulting in fish passage barriers, downstream scour, sediment concerns due to deposition behind the dam, or unacceptable habitat modifications. They should be removed if they are abandoned, in need of extensive repairs, or are considered unnecessary to meet water demands.
4. Multiple diversions may be consolidated into one permanent diversion.
5. Abandoned open ditches and other similar structures must be plugged or backfilled, as appropriate, to prevent fish from swimming or being entrained into them.
6. Project cooperators and landowners must coordinate their efforts with appropriate local governments, irrigation districts, and Federal and State agencies. Projects should be supported by watershed based analyses with the involvement of multiple landowners and users.
7. The design of an irrigation diversion structure must enable the landowner to comply with all appropriate Oregon Water Resources Department rules and regulations. A new or replacement diversion structure cannot be sized to exceed the amount of the landowner’s legal water right(s).
8. Appropriate fish passage for juvenile and adult salmonids and other aquatic species must be incorporated into irrigation diversions. Diversions must be operated and maintained in a manner to allow the passage of aquatic species during operational and non-operational periods. Requirements under Artificial Fishways (*see this appendix*), as appropriate, must be followed during the irrigation diversion design process.
9. Irrigation diversions must be installed with an appropriate flow meter or flume to measure water withdrawals whenever possible.
10. Fill excavated during the temporary or permanent removal of an irrigation diversion or water control structure must be placed and stabilized at an appropriate upland disposal site.

11. General operation and maintenance procedures for an irrigation diversion must be outlined in a Fish and Wildlife Service landowner agreement to ensure that they will be functioning as intended.

Fish Screen Requirements

1. Irrigation diversion intake and return points must be designed to prevent all salmonid life stages from swimming or being entrained into the irrigation system. Diversions, including temporary and permanent pump intakes, must meet NOAA Fisheries' fish screen criteria. NOAA Fisheries' fish screen criteria applies to federally listed salmonid species under their jurisdiction as well as bull trout, Oregon chub, and Warner sucker under Fish and Wildlife Service jurisdiction.
2. All fish screens must be sized to match the landowner's documented or estimated historic water use and legal water right(s).
3. Periodic maintenance of fish screens (*e.g.*, cleaning debris buildup and replacement of parts) must be conducted to ensure they are properly functioning.

Appendix A5. Project design standards for road and trail improvements.

General Requirements

1. Knowledgeable and trained personnel (*e.g.*, park manager, hydrologist or engineer) must be involved in the design and implementation of all road and trail improvements.
2. Appropriate pollution and erosion controls must be implemented, as needed, on road and trail improvements to prevent erosion.
3. Road and trail improvements should be inspected at regular intervals, especially after heavy rainfall, to ensure they are properly functioning.

Techniques and Materials

1. A road or trail entrance closed by ditching must have the disturbed areas stabilized and revegetated (*e.g.*, seeded and mulched) as soon as possible.
2. An abandoned or decommissioned road or trail must be revegetated with native vegetation to the extent needed to prevent erosion.
3. Till compacted road and trail surfaces, as needed, to promote vegetation establishment and growth.
4. Ensure that drainage patterns on a altered road or trail will not result in increased sediment transport to downslope habitats. Use the most effective methods (*e.g.*, water bars, rolling dips, adding durable surface materials, and reshaping the road surface) to keep water from accumulating on a road or trail surface.
5. Fill excavated during the temporary or permanent removal of a road or trail culvert must be placed and stabilized at an appropriate upland disposal site. Grade the sides of the stream crossing at a 2:1 or greater slope to reduce erosion potential.
6. Install water energy dissipaters on all cross drainage culvert outfalls (*e.g.*, culvert extensions and rock piles) to prevent downslope erosion.
7. Cross drains should be inspected for damage or blockage before and during the rainy season.
8. Do not sidecast excavated road or trail materials and avoid accumulating or spreading these materials in or near aquatic habitats.
9. Road and trail improvements must be completed and stabilized before the rainy season.

Appendix A6. Project design standards for surveys, assessments, and monitoring activities.

General Requirements

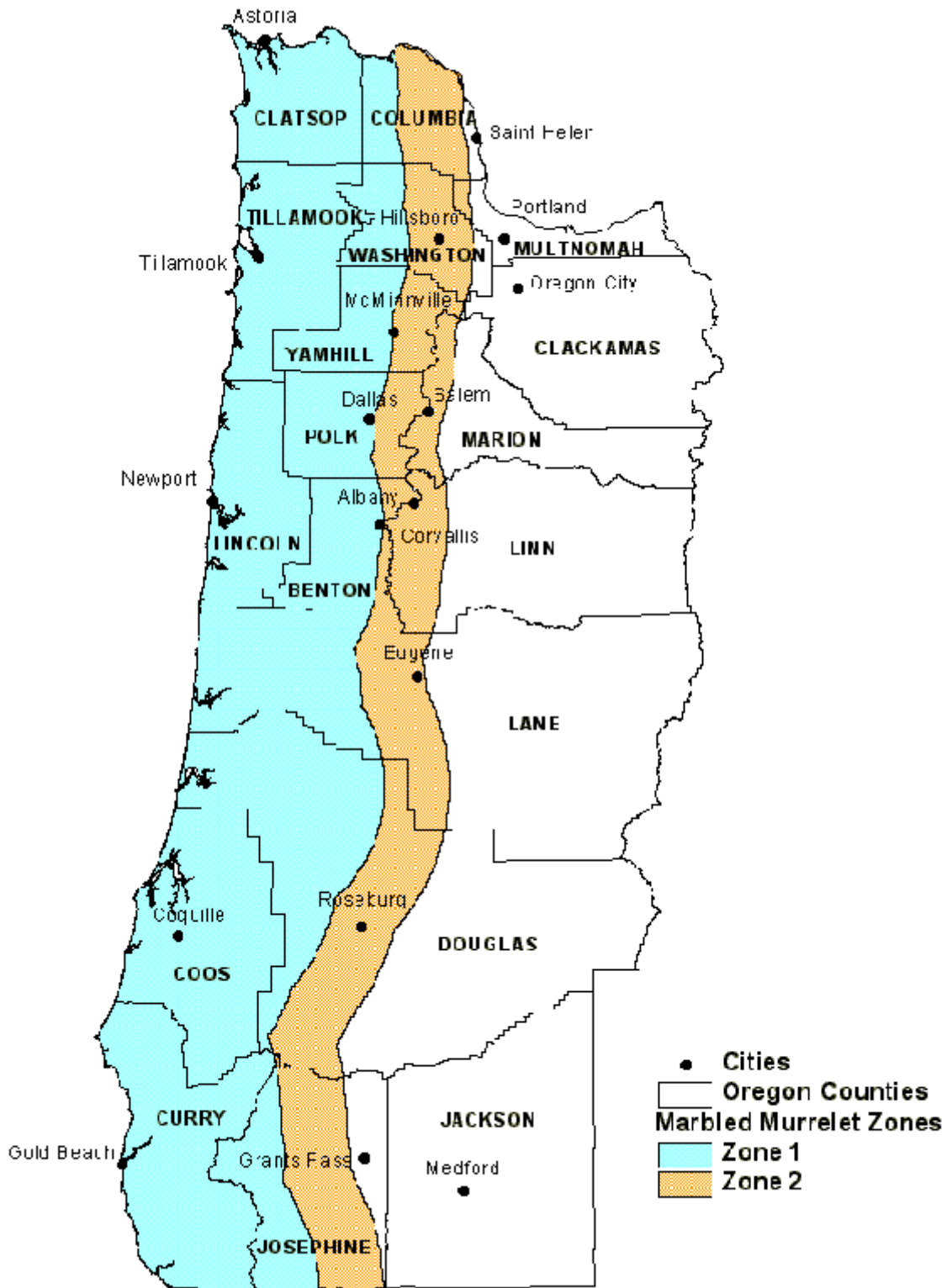
1. Knowledgeable and trained personnel (*e.g.*, educational instructors, wildlife or fisheries biologist or hydrologist) must be involved in the design and implementation of surveys, assessments, and monitoring activities.
2. Survey, assessment, and monitoring activities requiring the physical capture and handling of federally listed species must only be conducted by qualified biologist(s) covered under a current 10(a)(1)(A) permit or other valid ESA coverage.

Techniques and Materials

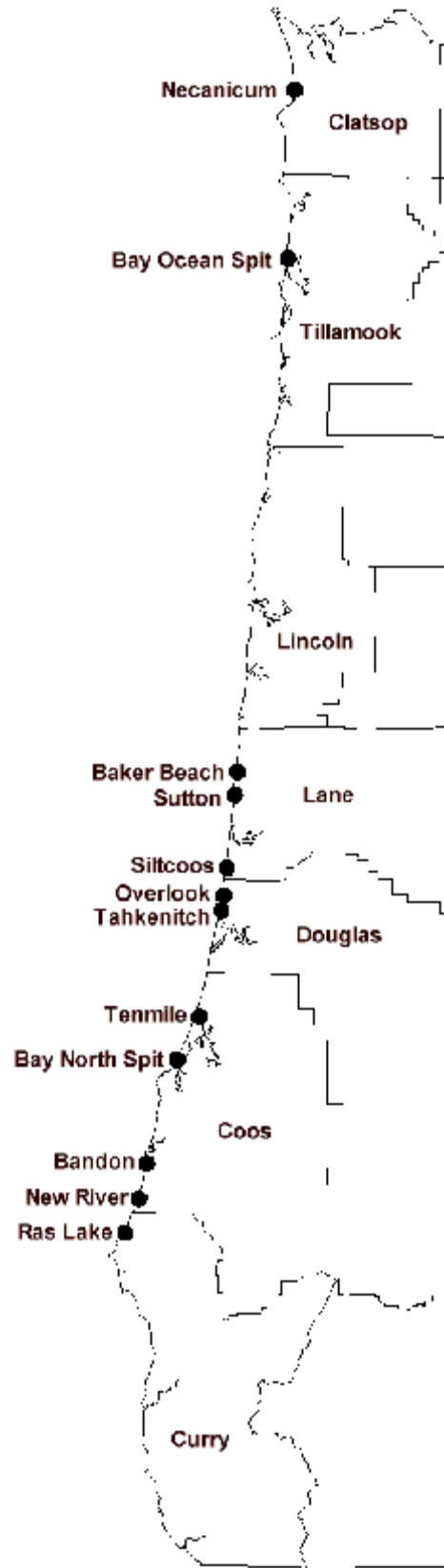
1. Project personnel must stay out of a stream channel as much as possible and avoid disturbing spawning areas and redds when entering the stream.
2. In the event that federally listed fish species are accidentally captured during surveys, assessments, or monitoring activities, they must be released immediately at the capture location.
3. Macroinvertebrate or other instream sampling should be completed during the Oregon guidelines for the timing of in-water work to the extent possible.
4. Project personnel working in a stream must not cause a significant increase in the turbidity from the suspension of fine sediments.
5. Project personnel must avoid conducting activities within a stream channel when federally listed fish or other aquatic species are actively spawning.
6. Equipment and materials use during surveys, assessments, and monitoring activities must not be toxic to terrestrial or aquatic species.
7. Project personnel should coordinate with Federal, State, and local agencies and organizations to avoid the duplication of survey, assessment, and monitoring activities. Obtain all required permits from appropriate agencies before completing these activities.
8. Make survey, assessment, and monitoring data and results available to other interested parties, to the extent possible, by publishing and distributing reports or providing the information on an Internet web site.

Appendix A7. Project design standards for wildlife habitat structures.

1. Wildlife nesting structures should be:
 - built for specific native avian and mammalian species.
 - designed for easy cleaning and maintenance.
 - properly suspended or supported.
 - protected from wind driven rain.
 - properly ventilated.
 - designed to eliminate predation or placed in protected areas.
 - built without perches to prevent house sparrow and starling occupancy.
 - constructed with pine, plywood, cedar, redwood, or cypress (cedar preferred).
2. Do not use pressure treated or creosote-based wood products for any part of a nesting or feeding structure.
3. Clean parasites, wasps, hornets, and mice from nesting structures on a periodic basis.
4. Open nesting structures during non breeding periods to reduce mice occupancy.
5. Locate nesting structures to meet natural territorial spacing requirements for the specific species that will be using the structures.
6. Bat roosting and nesting structures should not be placed over open waterways or busy roadways.
7. Limit general public access to nesting structures by locating them in secure or inaccessible areas to reduce vandalism and disturbance.
8. Leave bark and branches on large woody materials used for instream structures to help reptiles and amphibians obtain better leg holds when climbing on these materials.
9. Retain or provided down and decaying coarse woody debris to provide for terrestrial wildlife habitats and nutrient recycling.
10. Retain or develop snags (*i.e.*, standing dead trees), as needed, on project sites for cavity dependent wildlife species. Guidance for snag creation is as follows:
 - Snags should be at least six feet high and six inches in diameter at breast height for small and large cavity nesting birds, and up to twenty inches in diameter for large cavity nesting mammals.
 - Snags should be created by girdling selected trees at their base with a chainsaw.
 - Create snags in areas where they would occur naturally due to habitat conditions, windfall, fires, or other natural causes.
 - Use a combination of conifer and hardwood trees for snags.
11. Construct brush piles along habitat edges to provide cover and shelter for a variety of wildlife species. Guidance for brush pile construction is as follows:
 - Use large logs and rocks for the base layer to provide tunnels and openings at ground level.
 - Stack lighter woody materials (*e.g.*, limbs and slash) in a criss-cross pattern on top of the base layer.
 - Brush piles should be four to eight feet high and fifteen to twenty feet wide to provide adequate wildlife cover and shelter.
 - Construct several brush piles within the same area.
 - Do not place brush piles under tree canopies due to potential wildfire hazards.
 - Brush piles should last eight to ten years, depending on the size and type of materials used to build them.



Appendix B. Locations of marbled murrelet zones 1 and 2 in Oregon (U.S. Department of Agriculture and U.S. Department of Interior 1994, page C-10).

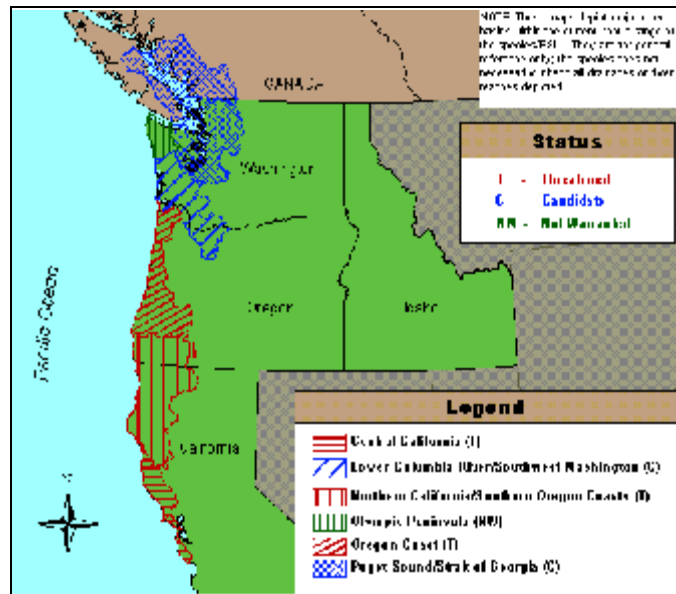


Appendix C. Primary western snowy plover nesting areas along the Oregon coast.

Appendix D. Maps of evolutionarily significant units (ESU's) for Pacific salmon and steelhead⁴³.



ESU's for chum salmon.

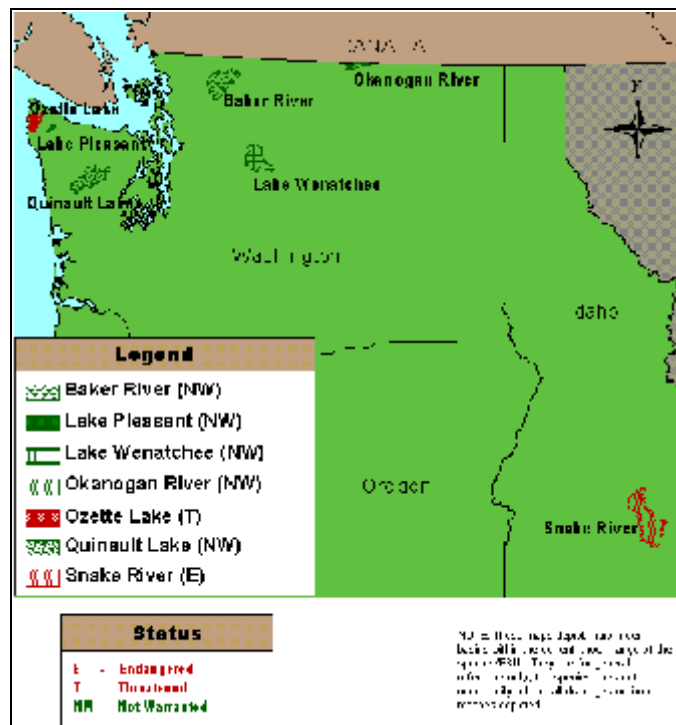


ESU's for coho salmon.

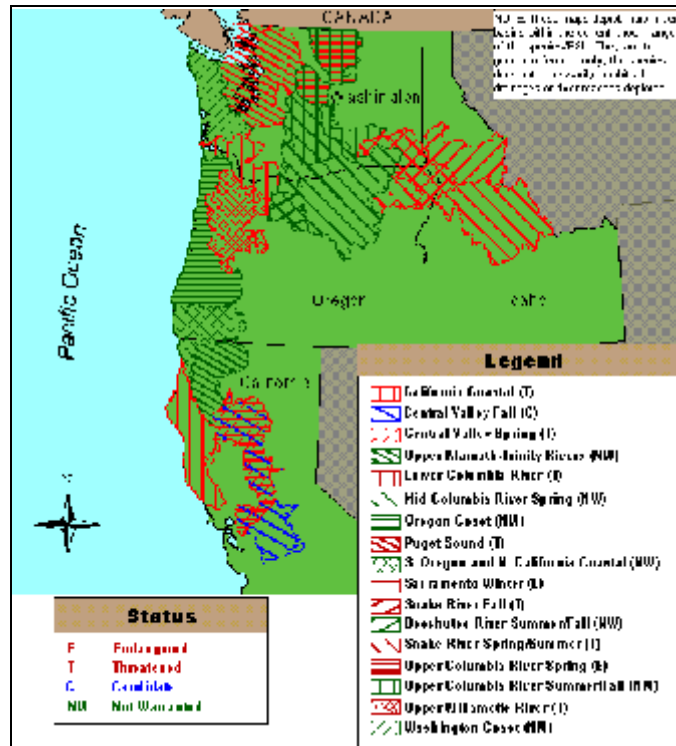
⁴³ Reference source - <http://www.nwr.noaa.gov/1salmon/salmesa/index.htm>



ESU's for steelhead.



ESU's for sockeye salmon.



ESU's for Chinook salmon.

Appendix E. The extent of potential habitat and noise disturbances from the implementation of restoration activities.

Project Category I - Riparian Habitat Restoration						
Restoration Activity ^(a)	Temporary Habitat Disturbance ^(b,c)			Temporary Noise Level Disturbance ^(d)		
	< 30 Days	30-60 Days	61-90 Days	< 60 dBA	60-90 dBA	> 90 dBA
Installation of livestock fencing	① ②				X	
Installation of livestock watering facilities	① ②				X	
Installation of livestock crossings	① ②				X	
Breaching, removing, and constructing berms and dikes		①	②			X
Installation of bio-engineered stream bank stabilization structures		①	②		X	
Installation of wildlife habitat structures	① ②			X		
Planting native riparian plant species	① ②			X		
Silvicultural treatments	①		②		X	
Control and removal of invasive/non native plant species	①	②			X	
Stormwater management	①	②			X	
Project Category II - Wetland Habitat Restoration						
Installation of livestock fencing	① ②				X	
Installation of livestock watering facilities	① ②				X	
Installation of livestock crossings	① ②				X	
Breaching, removing, and constructing berms and dikes		①	②			X
Converting former wetlands and restoring current wetlands		①	②			X
Installation of wildlife habitat structures	① ②			X		
Planting native wetland plant species	① ②			X		

Restoration Activity ^(a)	Temporary Habitat Disturbance ^(b,c)			Temporary Noise Level Disturbance ^(d)		
	< 30 Days	30-60 Days	61-90 Days	< 60 dBA	60-90 dBA	> 90 dBA
Control and removal of invasive/non native plant species	①	②			X	
Project Category III - Instream Habitat Restoration						
Installation of wood and boulder instream structures	①	②			X	
Hydrologic modifications of natural alcoves and side channels	① ②				X	
Re-channeling of streams into their historic locations			① ②			X
Salmon carcass placements	① ②			X		
Project Category IV - Fish Passage Improvements						
Installations and modifications of artificial fishways	① ②				X	
Re-engineering of irrigation diversion structures		① ②				X
External and internal modifications to roadway culverts	① ②				X	
Realignment of roadway culverts to stream flows	②	①				X
Replacement of undersized roadway culverts with appropriately sized culverts	②	①				X
Replacement of roadway culverts with bridges	②	①				X
Permanent removal of roadway culverts, tide gates, and other artificial fish passage barriers		① ②				X
Project Category V - Upland Habitat Restoration						
Installation of livestock fencing	① ②				X	
Installation of livestock watering facilities	① ②				X	
Installation of bio-engineered stabilization structures	①		②			X
Installation of wildlife habitat structures	① ②			X		
Planting native upland plant species	① ②			X		

Restoration Activity ^(a)	Temporary Habitat Disturbance ^(b,c)			Temporary Noise Level Disturbance ^(d)		
	< 30 Days	30-60 Days	61-90 Days	< 60 dBA	60-90 dBA	> 90 dBA
Conversion of altered habitats to historic oak savannahs, short and tall grass prairies, or conifer/hardwood forests	①	②			X	
Silvicultural treatments	①		②		X	
Control and removal of invasive/non native plant species	①	②			X	
Stormwater management	①	②			X	
Project Category VI - Coastal and Estuarine Habitat Restoration						
Installation of wood and boulder structures		① ②			X	
Reestablishment of natural coastal dune processes	① ②				X	
Planting native coastal/estuarine plant species	① ②			X		
Installation of wildlife habitat structures	① ②			X		
Control and removal of invasive/non native plant species	①	②			X	
Project Category VII - Road and Trail Improvements						
Closure of roads and trails	① ②				X	
Abandonment of roads and trails	①	②			X	
Decommissioning of roads and trails	①		②			X
Improvements on roads and trails	① ②				X	
Project Category VIII - Surveys, Assessments, and Monitoring Activities						
Physical and biological data collection	① ②			X		

^(a) - Refer to Chapter 3 for a detailed description of restoration activities under each project category.

^(b) - Refers to the estimated length of time after project completion to stabilize soils, establish or reestablish native vegetation, and reduce or eliminate decreases in water quality. A project site should return to at least stable conditions during the indicated time for the respective restoration activity. Appropriate project design standards (Appendix A) will be implemented to reduce habitat recovery times.

short-term: < 30 days **mid-term:** 30-60 days **long-term:** 61-90 days

^(c) - ① refers to aquatic habitats ② refers to terrestrial habitats

^(d) - Noise levels (decibels [dBA]) were estimated based on the typical types of equipment needed to complete a restoration activity (Figure 2). The duration and intensity of local daily noise levels will depend on the extent of the restoration activity. Moderate noise levels associated with a restoration activity will be fluctuating and intermittent. High noise levels will also be fluctuating, but these noise levels will be more continuous in nature

due to the extent and duration of a restoration activity. Noise level determinations were based on worst case scenarios for the specific restoration activity. The decibel is a logarithmic scale of sound pressure or intensity. Decibel intensity increases by units of ten; each increase is ten times the lower figure (*e.g.*, 20 dBA is ten times the intensity of 10 dBA, 30 dBA is 100 times the intensity of 10 dBA etc.).

low: < 60 dBA **moderate:** 60-90 dBA **high:** > 90 dBA

Appendix F. General information to be included in the annual report for each Service program covered under the biological assessment.

Annual Report Fiscal year _____	
Program name	
Number of completed projects	
Habitats	Amount restored or enhanced
Riparian (acres)	
Wetland (acres)	
Instream (miles)	
Instream - fish passage (number/miles)	
Upland (acres)	
Coastal (acres)	
Estuarine <input type="checkbox"/> acres <input type="checkbox"/> miles	
Roads and trails (miles)	
Surveys, assessments, and monitoring <input type="checkbox"/> acres <input type="checkbox"/> miles	
Listed species affected: check appropriate boxes	
<input type="checkbox"/> Canada lynx <input type="checkbox"/> Columbian white-tailed deer	
<input type="checkbox"/> Marbled murrelet <input type="checkbox"/> Western snowy plover <input type="checkbox"/> Bald eagle <input type="checkbox"/> Brown pelican <input type="checkbox"/> Northern spotted owl	
<input type="checkbox"/> Vernal pool fairy shrimp <input type="checkbox"/> Fender's blue butterfly <input type="checkbox"/> Oregon silverspot butterfly	

<input type="checkbox"/> Willamette daisy <input type="checkbox"/> Gentner's fritillary <input type="checkbox"/> Water howellia <input type="checkbox"/> Western lily <input type="checkbox"/> Large-flowered meadowfoam <input type="checkbox"/> Bradshaw's lomatium <input type="checkbox"/> Cook's lomatium <input type="checkbox"/> Kincaid's lupine <input type="checkbox"/> MacFarlane's four o'clock <input type="checkbox"/> Rough popcornflower <input type="checkbox"/> Nelson's checker-mallow <input type="checkbox"/> Spalding's catchfly <input type="checkbox"/> Howell's spectacular thelypody
<input type="checkbox"/> Warner sucker <input type="checkbox"/> Oregon chub <input type="checkbox"/> Bull trout <input type="checkbox"/> Chinook salmon (Snake River) <input type="checkbox"/> Chinook salmon (Lower Columbia River) <input type="checkbox"/> Chinook salmon (Upper Willamette River) <input type="checkbox"/> Coho salmon (Southern Oregon) <input type="checkbox"/> Coho salmon (Oregon Coast) <input type="checkbox"/> Chum salmon (Columbia River) <input type="checkbox"/> Sockeye salmon (Snake River) <input type="checkbox"/> Steelhead (Middle Columbia River) <input type="checkbox"/> Steelhead (Snake River Basin) <input type="checkbox"/> Steelhead (Lower Columbia River) <input type="checkbox"/> Steelhead (Upper Willamette River)