# AMENDED
# PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

## Klamath Basin Ecosystem Restoration Office Projects, 2000 to 2010

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# Programmatic Environmental Assessment
# Summary

This Environmental Assessment (EA) provides compliance with the National Environmental Policy Act (NEPA) for restoration actions undertaken by the U.S. Fish and Wildlife Service's Klamath Basin Ecosystem Restoration Office (ERO) in Klamath Falls, Oregon. These restoration activities are needed due to the large-scale loss of wetland and riparian habitat and degraded water quality. The purpose of these restoration efforts is the improvement of conditions of the watershed with specific regard to habitat and water quality, resulting in, among other benefits, improved conditions for the endangered fish species (bull trout and Lost River and shortnose sucker) populations of the basin. The geographic scope of this EA is defined as the Upper Klamath River Basin, including the entire watershed from Iron Gate Dam upstream to the headwaters. This EA is intended to provide NEPA compliance for restoration projects conducted between the years 2000 and 2010, and extended by amendment to 2015.

The ERO was established in 1993 to sponsor and assist with a variety of restoration activities in the Klamath Basin. The ERO funds and provides technical assistance to restoration projects involving private landholders, concerned groups, and other state, federal, and tribal agencies.

Four alternatives are presented in this EA. The proposed alternative (Alternative 1) consists of a comprehensive program of ecosystem restoration, promoting projects in both riparian areas and in upland habitats. This would continue the current program in effect since 1994. Compliance under NEPA would primarily be carried out via a single, programmatic document saving time and funds. The U.S. Fish and Wildlife Service proposes to fund and administer the following projects types:

- **Riparian Projects:** fencing for livestock management; native plant establishment and diversification; non-native plant removal/control; erosion control; contour reestablishment; impoundment removal; wildlife habitat improvements.

- **Wetland Projects:** fencing; wetland restoration and enhancement; wildlife habitat improvements.

- **Upland or Road Projects:** road abandonment, decommissioning, and obliteration; road drainage improvements and storm proofing; reestablishment of historic contours; silvicultural treatments; native plant establishment/diversification; non-native plant removal/control; fencing; landslide treatments; culvert/stream crossing upgrades; erosion control; wildlife habitat improvements.

- **Instream Projects:** habitat complexity and diversity improvements; hydrologic regime improvements; coarse woody debris supplementation; natural or artificial barrier removal, modification and/or creation; fish screens installation.

Alternative 2 would concentrate restoration efforts only on riparian, instream, and wetland areas. Road projects would be conducted only within the riparian corridor, as defined. Compliance under NEPA would also be conducted programmatically.

Alternative 3 would cease all restoration activities conducted and funded by the ERO in the Klamath Basin. This alternative would serve as a benchmark against which the effects of the restoration alternatives discussed above can be compared.

Alternative 4, the "No Action" Alternative, would continue current management policies, providing NEPA compliance on a project-by-project basis and requiring independent analysis for each project.

The affected environment of the region is described in detail. The environment has been changed significantly since the 1890's due to logging, agriculture, and urban development. An extensive system of dams, canals, and drainage structures has resulted in the conversion of approximately 80% of pre-settlement wetlands to agricultural uses. Riparian corridors have been similarly impacted, and upland forest regions have been affected by logging, road construction, and other factors. These changes have contributed to problems with the water quality in the region, contributing to the listing of several fish species as threatened or endangered; loss of habitat has affected a large number of other species as well.

The environmental effects of each alternative are analyzed. Some short-term negative impacts could occur as a result of the projects authorized by both Alternative 1 and Alternative 2, but these would be strongly offset by the expected beneficial results to water quality and habitat conditions. Alternative 1 would be expected to have a greater overall effect on the environment than Alternative 2, since many of the underlying factors with which restoration efforts are concerned originate in upland conditions (i.e., sedimentation and hydrologic functionality). Alternative 3 would result in conditions remaining much as they are currently, although other programs and organizations are making efforts at restoration activities. The environmental impacts of individual projects anticipated under Alternative 4 would be generally the same as for similar projects under Alternative 1. The primary difference between the two alternatives would be the higher efficiency and improved cumulative analysis resulting from a programmatic approach as proposed in Alternative 1.

Public participation in the NEPA process has been, and will continue to be, solicited and welcomed. Compliance with state and federal laws and regulations such as the Clean Water Act, National Historic Preservation Act, and the Endangered Species Act, as well as guidelines for contaminant surveys, will be carried out as detailed.

While these projects are expected to play an important role in the restoration of the region, none of these alternatives are expected to have a significant impact when compared with the loss of wetland, riparian, and upland habitats that have occurred over the past century. Impacts which do occur would be of a cumulatively beneficial nature. Other restoration efforts are being carried out in the area by other governmental and private groups, and it is expected that these combined efforts will achieve important beneficial results for the ecosystem.

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# I. PURPOSE AND NEED

## 1.1 Introduction

The mission of the U.S. Fish and Wildlife Service (Service, USFWS) is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people (USFWS, 1999). The Ecosystem Restoration Office (ERO), located in Klamath Falls, Oregon, was established in 1993 to plan and coordinate habitat restoration activities between existing federal, state, and local agencies and private landowners, and to conduct outreach to the public. The ERO provides financial and technical assistance in developing projects to improve the ecosystem of the Upper Klamath Ecoregion. Other Service offices in Northern California are responsible for similar programs in the Lower Klamath Basin; however, their activities are not covered by this document.

***The purpose and need for these proposed actions is to restore sustainable ecological functions to the Upper Klamath Basin (UKB) Ecoregion and to promote administrative efficiency by streamlining the NEPA compliance procedure and to come to a better understanding of the overall, cumulative impacts of the proposed restoration activities. The goal is to reestablish habitat function through restoration, enhancement, creation, and/or management activities that are designed to benefit native fish and wildlife and to improve water quality, with a focus on water chemistry, temperature and sedimentation effects.*** These activities are defined as follows (USFWS, 1997):

***1) Habitat Restoration:*** The rehabilitation of degraded or lost habitat to the original community that likely existed historically, including natural hydrology, topography, and native vegetation; or the rehabilitation of degraded or lost habitat to an ecological community different from what existed before, but which partially replaces original habitat functions and values and consists primarily of native vegetation.

***2) Habitat Enhancement:*** The alteration of existing, degraded habitat to improve and/or increase specific fish and wildlife habitat functions and values.

***3) Habitat Creation:*** The development of habitat types in order to mimic habitats which occur naturally in the immediate area and did not previously exist on the site.

***4) Habitat Management:*** The periodic, routine, short-term actions that manipulate the physical, chemical, or biological characteristics of habitat to replace or replicate natural events (e.g., wildfire, floods, and drought) that occurred on the landscape prior to cultural intervention.

The funding for these projects comes from several sources, including the Partners for Fish and Wildlife Program (Partners), the Jobs-in-the-Woods Watershed Restoration Program (JITW), the Hatfield Restoration Program (Hatfield), and the U.S. Bureau of Reclamation's (Reclamation, USBOR) Oregon Resource Conservation Act (ORCA). While these programs contain differences in the specific types of projects, geographic area, and other project restrictions, they have in common an emphasis on the restoration of lands. Since 1994, approximately 1 million dollars has been allocated each year by the ERO for restoration activities from the Partners, Hatfield, and JITW programs. The ORCA projects are administered by Reclamation's Klamath Basin Area Office, and have totaled approximately 1 million dollars annually since 1999. This level of funding is expected to continue into the future, although the loss or addition of funding sources resulting in fluctuating funding levels may occur. Additional funding sources which may become available in the future may be utilized. Those programs would be covered under this document only if the types of projects authorized are within the range of the projects discussed in this Environmental Assessment (EA). Substantial increases in funding, and in the number, types, or size of projects funded, would require renewed evaluation and a supplemental or new National Environmental Policy Act (NEPA) document.

The ERO also funds a number of assessment, inventory, and information and education projects annually. These projects types are considered exempt from further NEPA analysis under Department of Interior (DOI) categorical exclusions rules (USDI, 1984) and are not considered further in this document.

## 1.2 Scope and Purpose of this Document

Between 1994 and 1999 (fiscal years), the ERO has provided funding and technical assistance for approximately 200 restoration projects. Of these, about 1/3 have been conducted on federal lands or done in cooperation with other federal agencies. Several of these have consisted of large-scale projects (the Lower Williamson River Delta restoration project being the most prominent example). Otherwise, projects have been small to medium in scale and usually conducted on private lands at the request of the landholder. Federal agencies engaging in actions on federally owned lands or providing funds for actions on private lands are required to evaluate the potential environmental consequences of those actions under NEPA, an important piece of environmental legislation enacted in 1969, as amended and regulated by the Council of Environmental Quality (CEQ, 1986).

Since 1994, the ERO has complied with these regulations on a project-by-project basis. The use of this project-by-project approach to NEPA compliance was initially appropriate for the ERO's restoration activities and for evaluating the impacts of individual projects. However, considering the number of restoration projects expected to be implemented in the next ten years, it was decided that a more comprehensive analysis would be more appropriate for NEPA compliance purposes. A programmatic approach was adopted as the most efficient manner (with regard to paperwork and duplication of effort) to describe and evaluate restoration projects which share a strong similarity in terms of techniques and likely outcomes, and which are being conducted in a relatively small geographic area with consistent environmental characteristics. The purpose and objectives, types, and impacts of these projects can be characterized in a general (or programmatic) nature based on the observed environmental impacts associated with the past five year's worth of ERO restoration efforts. Individual projects will be evaluated to determine if the scope and impacts of that project are within the scope and impact analysis of this document.

Individual projects are evaluated and reviewed by biologists from the Service and other federal agencies with regard to general environmental affects, potential benefits to endangered species, and social and economic consequences. This process provides a high degree of continuity in the planning and implementation of these projects. Given the similarity of the nature and purpose of the programs discussed, and in the interest of streamlining compliance requirements and reducing paperwork, the Proposed Action described in this document will provide compliance for the entire range of projects discussed. Projects outside of the scope of this document or those substantially different from those described will require supplementary or separate NEPA documentation. This analysis may be incorporated as a part of that additional documentation.

The underlying purpose of this EA is to describe the environmental impacts of proposed restoration projects and to comply with the procedural requirements of NEPA legislation. The EA will be used to determine whether to prepare a Finding of No Significant Impact (FONSI) or prepare an Environmental Impact Statement (EIS). If the EA shows that the proposed projects do not have a significant impact on the human environment, a FONSI will be prepared. If the EA indicates that the proposed action constitutes a major federal action significantly affecting the quality of the human environment, then an EIS will be required.

The UKB as described in this document refers to the entire watershed of the Klamath River upstream of the Iron Gate Dam, located near the town of Hornbrook, California (see Map A). This document will be used to provide compliance for ERO projects from the year 2000 through 2010, and amended to include projects through 2015.

Reclamation's Klamath Basin Area Office located in Klamath Falls, Oregon, provides funding for the ORCA program, and administers projects funded through that program. This program has essentially the same goals as those programs administered by the ERO, and the project types are similar. Reclamation is included in this document as a cooperating agency. This document will be used by both the USFWS and Reclamation to analyze these programs, but each agency will make official decision records separately. This document is intended to provide NEPA compliance for those projects utilizing federal funds administered by the ERO and Reclamation which occur on private and federal lands. Reclamation intends to adopt this EA and use it to make a decision regarding implementation of projects funded by the ORCA program.

Other federal agencies in the basin, including the U.S. Forest Service (FS) and the U.S. Bureau of Land Management (BLM), utilize ERO-sponsored funding to carry out restoration projects on the lands they administer. These agencies currently conduct an independent NEPA analysis for these projects, in compliance with their agency guidelines. In the future, this EA may be utilized by other agencies and may be incorporated by reference to those agencies' NEPA documents.

### 1.3 Proposed Action

The ERO proposes to implement the full range of restoration projects discussed in this document in order to progress towards the goal of restoring sustainable ecological functions to the UKB Ecoregion.

## 1.4 Purpose of Proposed Restoration Activities

The mission of the ERO is to promote restoration projects within the UKB, especially with regard to watersheds and wetlands. This is accomplished by providing funds and technical assistance to private landowners, concerned groups, and cooperating federal, state, tribal, and local governments to carry out a wide variety of restoration projects. Project selection is in part based on the ability of the project to result in improved water quality, improvements to fish and wildlife habitat (particularly regarding threatened, endangered, or "sensitive" species), and restoration and improvements to wetlands used by fish and wildlife. An additional purpose of these programs is to provide jobs and economic development to timber dependent communities impacted by the listing of the northern spotted owl as a threatened species (specifically for JITW).

## 1.5 Need for the Proposed Restoration Activities

Between 1905 and the 1960's, wetlands in the region were reduced from approximately 350,000 acres to 75,000 acres (USBOR, 1992), primarily by the creation of agricultural lands. Map B shows many of the original lakes and wetlands as they were in 1905; Map C is a contemporary image of the same area. Water quality has been degraded by increased sedimentation and changes in water chemistry and temperature. Wildlife habitat has been reduced proportionately to wetland loss, especially for migratory and resident waterfowl. Riparian corridors have been affected by both natural and man-made influences, resulting in bare and denuded streambanks and downcut stream channels. Upland areas have also changed due to road construction, landslides, timber activities, and livestock use. Upland impacts have manifested themselves in various ways, including further impacts to water quality. Many of these areas have been influenced by the invasion of non-native species, especially exotic animals, plants, and fish. As a result of declining timber harvests, many timber-based and associated jobs were lost, resulting in social and economic disruption for many of the local communities. These conditions have resulted in a need for wetlands, riparian, and uplands restoration programs, as well as a need for job creation to help stimulate local economies. The purpose and need for these restoration projects has not changed since the EA was first developed and the FONSI signed in March 2000.

## 1.6 Relationship to Other Restoration Programs

The need for restoration projects has been recognized since the 1980's, and a variety of federal, state, and private organizations have initiated restoration programs. Several of these programs continue in conjunction with current ERO efforts. In addition to the restoration activities of the ERO, other federal agencies have similar restoration programs. The BLM's Klamath Falls Area Office annually performs 2-3 miles of riparian fencing projects, 2-3 miles of road obliteration, 1 culvert replacement, and 2000-3000 acres worth of prescribed burns (Eckert, pers. comm.). The Winema National Forest performs 3-5 miles of fencing, 10 miles of road obliteration, and perhaps 5 culvert replacements annually (McNeil, pers. comm.). The Fremont National Forest annually conducts 5-15 miles of road decommissioning, 3000-5000 acres of understory thinning and burning, and perhaps 50 acres of watershed improvements which can consist of juniper removal, check dam removal, and streamside willow planting (Montgomery, pers. comm.).

A portion of the funding for these projects is provided by the programs sponsored by the ERO. These agencies only conduct projects on federally owned lands, and each agency performs NEPA compliance separately. The Natural Resource Conservation Service (NRCS) funds restoration projects on private lands, restoring about 1000 acres of wetlands, 5 miles of riparian fencing, 2 miles of streambank stabilization, and approximately 5,000 acres of upland projects annually (Conroy, pers. comm.). In addition, state, tribal and private restoration efforts are also being conducted in the basin.

In addition to these efforts, several large-scale projects have been initiated in recent years. Prominent among these is the BLM's Wood River Restoration Project (restoring historic stream channels and approximately 3,000 acres of wetlands), Reclamation's Agency Ranch (7,000 acres used for seasonal water storage), and The Nature Conservancy's Williamson River Delta Restoration Project (a 9,700-acre farm, approximately 7,500 acres of which are planned for wetlands restoration in the next decade). The ERO has contributed funds to several of these projects; separate NEPA documentation has been performed as necessary by the cooperating land management agency.

# II. ALTERNATIVES

The alternatives described below are largely predicated upon the funding sources from which the ERO provides funds. They represent a reasonable range of alternatives within the larger parameters set forth by these programs under which ecosystem restoration could be accomplished.

## 2.1 Alternative 1: Programmatic Approach to Restoration Projects (Proposed Action)

This alternative would provide for the implementation of a wide range of ecosystem restoration activities, authorizing all of the discussed project types within the guidelines and limits discussed in this document. Standards and Guidelines (S & G's), as specified in Appendix C, would be utilized to ensure that these projects minimize any potential adverse impacts to the environment. During the evaluation and approval process for each project, separate clearance procedures required by the Clean Water Act, the Endangered Species Act (ESA) and National Historic Preservation Act (NHPA) will be undertaken, in consultation with the U.S. Army Corps of Engineers, Service endangered species biologists, and the State Historic Preservation Office, respectively. All state and local regulations and permits will be acquired as necessary.

Utilizing a programmatic approach to analyze the affects of this program allows for a comprehensive, ecosystem-wide evaluation of the proposed restoration activities, recognizing the connection and inherent relationship between differing segments of the environment. A programmatic approach also provides for a higher degree of efficiency in the processing of the paperwork, since individual assessments will not be necessary under this programmatic EA.

The specific projects can be grouped into one or more broad categories as listed below. The specifics on these activities are discussed in Appendix D, *Description of Restoration Activities and Analysis of Impacts*.

- **Riparian Projects:** fencing for livestock management; alternative watering sources for livestock; non-native plant removal/control; native plant establishment/diversification; erosion control; wildlife habitat improvements.

- **Wetland Projects:** fencing; wetland restoration and enhancement; wildlife habitat improvements.

- **Instream Projects:** habitat complexity and diversity improvements; hydrologic regime improvements; coarse woody debris and boulder supplementation; artificial barrier removal, modification, and creation; fish screen and fish passage installation; non-native fish removal; fish collection and rearing.

- **Upland Projects:** reestablishment of historic contours; silvicultural treatments including prescribed burning, thinning, tree planting, and juniper clearing; native plant establishment/diversification; non-native plant removal/control; fencing; alternative watering sources for livestock; landslide treatments and erosion control; wildlife habitat improvements.

- **Road Projects:** road abandonment, decommissioning, and obliteration; road drainage improvements and storm proofing; culvert/stream crossing upgrades.

### 2.2 Alternative 2: Implementation of a Limited Range of Restoration Projects

This alternative would differentiate between upland and bottomland projects, authorizing only those activities occurring in wetland or riparian habitats. Upland projects as discussed above would not be considered. Any other project type such as road projects would be conducted only within riparian and wetland areas (defined as areas with wet soils directly influenced by streams and/or containing vegetation dependant on moist soil conditions). This alternative focuses the restoration efforts of the ERO on riparian and wetland areas, allowing more attention, and funds, to be spent addressing the more immediate issues of water quality, wetlands loss, and riparian degradation. Under this alternative, opportunities to address upland issues such as logging roads, deforested stands, and landslides which affect streams, primarily through sedimentation and subsurface flows, would be lost.

This alternative would also utilize a programmatic approach for compliance and paperwork, adding to the administrative efficiency of the projects being considered.

The types of projects considered under this alternative are listed below. The specifics on these activities are discussed in Appendix D, *Description of Restoration Activities and Analysis of Impacts.*

- **Riparian Projects:** fencing for livestock management; alternative watering sources for livestock; non-native plant removal/control; native plant establishment/diversification; erosion control; wildlife habitat improvements.

- **Wetland Projects:** fencing; wetland restoration and enhancement; wildlife habitat improvements.

- **Instream Projects:** habitat complexity and diversity improvements; hydrologic regime improvements; coarse woody debris and boulder supplementation; artificial barrier removal, modification, and creation; fish screen installation; non-native fish removal; fish collection and rearing.

- **Road Projects (within riparian corridors):** road abandonment, decommissioning, and obliteration; road drainage improvements; storm proofing; culvert/stream crossing upgrades.

## 2.3 Alternative 3: Cease Restoration Activities

This alternative would serve as a benchmark against which the other programs would be compared. Under this alternative, new restoration projects would not be considered or funded by the ERO. Previously contracted or obligated projects would be completed, given the legal complications from which a breach of contract might otherwise result. Current trends in water quality and habitat loss would continue, with the likely continued reduction of habitat for threatened, endangered and "sensitive" species populations, and concurrent wildlife and vegetation losses.

## 2.4 Alternative 4: Continue Current Non-Programmatic Approach to Restoration Activities (No Action Alternative)

Under this alternative, the current means of analysis for proposed restoration activities on a case-by-case basis would continue. Individual project type, size, and number would be expected to remain unchanged. The environmental impacts of the individual projects would likewise be the same as similar projects conducted under a programmatic agreement. The primary difference would be that the amount of time dedicated towards administering the NEPA process for individual projects would remain high, especially when compared with a programmatic approach, resulting in decreasing administrative efficiency. The ability to analyze the cumulative effects of these programs would likewise be diminished. The amount of paperwork and time consumed in the NEPA process for individual projects would be considerably greater when compared with a programmatic approach, decreasing administrative efficiency. The ability to analyze the cumulative effects of these programs would likewise be diminished.

## 2.5 Alternatives Considered but Eliminated from Detailed Study

***(1) Easement Alternative***: Acquisition of easements is not covered under any of the currently used programs. Easements would require NEPA documentation independent of this document, although projects similar to those listed above may be covered if conducted on those easements.

***(2) Habitat/Land Acquisition Alternative:*** Land purchases fall outside the parameters of the programs goals and are not authorized by any of the four current funding sources.

***(3) Fish Population Enhancement Alternative:*** Establishing a full-scale fish hatchery for endangered species would assist to restore population levels of endangered fish species; however, such improvements would not be sustainable without the necessary improvement of essential habitat and water quality. Costs would be prohibitive and outside the scope of funding, and generally the Oregon Department of Fisheries and Wildlife has jurisdiction over such issues. However, a more manageable and affordable aspect of this alternative has been added to Alternative 1 (the preferred) whereby any life stage of listed or non-listed fish may be captured and reared for purposes of understanding the species more clearly and to aid the recovery or protection of the species.

(4) Limited Range Without Wetland Projects Alternative: This alternative is identical to Alternative 2, except that upland-type rather than wetland projects are considered. This alternative was rejected because although upland projects are important, they do not benefit endangered species as fully as wetland projects do.

## Table 1: Summary of Alternatives

| | ALT. 1 | ALT. 2 | ALT. 3 | ALT. 4 |
|---|---|---|---|---|
| **Riparian Projects:** | | | | |
| Fencing for livestock management | X | X | | X |
| Non-native plant removal/control | X | X | | X |
| Native plant establishment/diversification | X | X | | X |
| Erosion control | X | X | | X |
| Alternative watering sources for livestock | X | X | | X |
| Wildlife habitat improvements | X | X | | X |
| **Wetland Projects:** | | | | |
| Fencing | X | X | | X |
| Wetland restoration and enhancement | X | X | | X |
| Wildlife habitat improvements | X | X | | X |
| **Instream Projects:** | | | | |
| Habitat complexity and diversity improvements | X | X | | X |
| Hydrologic regime improvements | X | X | | X |
| Coarse woody debris and boulder supplementation | X | X | | X |
| Artificial barrier removal, modification, and creation | X | X | | X |
| Fish screens installation | X | X | | X |
| Non-native fish removal | X | X | | X |
| Fish collection and rearing | X | X | | X |
| **Upland Projects:** | | | | |
| Reestablishment of historic contours | X | | | X |
| Silvicultural treatments | X | | | X |
| Prescribed burning | X | | | X |
| Tree thinning | X | | | X |
| Tree planting | X | | | X |
| Juniper clearing | X | | | X |
| Native plant establishment/diversification | X | | | X |
| Non-native plant removal/control | X | | | X |
| Fencing | X | | | X |
| Landslide treatments | X | | | X |
| Erosion control | X | | | X |
| Alternative watering sources for livestock | X | | | X |
| Wildlife habitat improvements | X | | | X |
| **Road Projects:** | | | | |
| Abandonment, decommissioning, and obliteration | X | X | | X |
| Road drainage improvements and storm proofing | X | X | | X |
| Culvert/stream crossing upgrades | X | X | | X |

# III. AFFECTED ENVIRONMENT

## 3.1 <u>Introduction</u>

This section of the EA describes the environment (natural, physical, and societal) of the UKB. In order to simplify the discussion, this section is divided into definable elements of the environment. Unfortunately, the boundaries of many of these elements are hard to define, so a certain amount of necessary cross-over exists (i.e., with fisheries and hydrology). Attempts were made to limit redundancy while not minimizing the interconnections that exist in the environment. These sections describe the environment as it is at present, including historical changes (whether man-made or naturally occurring) which resulted in these changes.

## 3.2 <u>General Description</u>

The UKB is nestled between the eastern foothills of the Cascade Range and the Great Basin Desert region of eastern Oregon. This includes the Upper Klamath River, the Butte Valley, and the Lost, Williamson, and Sprague Rivers and their tributaries. This area includes most of Klamath County, Oregon, a large part of Modoc County, California, and small portions of Lake and Jackson Counties in Oregon and Siskiyou County in California. Landholding falls under a wide range of ownership, including federal (National Park Service, FS, BLM, and several National Wildlife Refuges), state (Oregon Department of Forestry and Oregon Department of Natural Resources), the Klamath Tribes, and private landholders. The area encompasses approximately 12,000 square miles, or approximately 7.5 million acres. The primary town in the area is Klamath Falls in Oregon.

The elevation of the town of Klamath Falls, near the center of the basin, is approximately 4100 feet above sea level. The highest peak in the area, Mount McLoughlin, rises to 9495 feet. Crater Lake National Park is in the northwest corner of the region, Lava Beds National Monument and Tule Lake National Wildlife Refuge are to the south, and the Winema, Fremont, Modoc, and Klamath National Forests occupy the forested mountains surrounding the basin. Historically, the lowlands consisted of extensive wetlands and broad, shallow lakes -- Upper Klamath Lake and its surroundings being the prime example. Otherwise, much of the lowland landscape was characterized by lowland Great Basin shrub types. The forests are composed of a mix of hard and soft woods. As a result of extensive wetlands draining in the first half of the twentieth century, much of the former wetlands are now active agricultural lands.

***Historical Background:*** Ample evidence exists of human habitation dating back almost 9,000 years. Flakes, projectile points, and other artifacts are found throughout the region. Historically, three Native American tribal groups have inhabited the area. The Modocs and the Klamaths (two groups closely related by language and tradition), are thought to have inhabited the UKB for the previous 7,000 years. The Modocs resided in the southern part of the region, surrounding Tule Lake. The Klamath people lived along the shores of Upper Klamath Lake and along the Williamson and Sprague Rivers. The Yahooskin Band of the Snake Indians, a group closely related to the Paiute Tribe, entered the area more recently and occupied lands east of the basin, but are now considered a part of the Klamath Tribe (Bettles, 1995). Primarily hunters and gatherers, these peoples practiced little agriculture. Fish (especially sucker species), small and large game, and a wide variety of vegetation were used by these peoples for food, clothing, and shelter (Howe, 1968). Contact with white culture, as was all too often the case, led to conflicts, initially resolved by the establishment in 1864, of a reservation along the Williamson and Sprague Rivers. Some members of the Modoc group, led by Kintpuash or Captain Jack, returned to the area south of Tule Lake, precipitating the Modoc War of 1873. After a six-month siege in the lava flows of what is now Lava Beds National Monument, this group surrendered and was sent to Oklahoma. The Klamath Reservation continued to exist until it was disbanded in 1954, as part of an assimilation policy by the U.S. Government. But in 1975, a fully functioning tribal government was reestablished, and The Klamath Tribes were recognized by the federal government in 1986. The 1990 census showed the tribe to consist of 2,370 members, many of whom are settled in the area around the town of Chiloquin, Oregon (Klamath Chamber of Commerce, 1999).

European influence in the region dates back to the 1700's with Russian traders establishing posts along the coast and Spanish missionaries exploring from the south. In the 1820's, American fur traders entered the region. Some settlement followed, but it was not until the 1860's, with the establishment of Fort Klamath at the northern end of Upper Klamath Lake, that any extensive influx of settlers occurred. Linkville, later renamed Klamath Falls, was founded soon afterward. Following the conclusion of the Modoc Indian War in 1873, an influx of settlers entered the region, with ranching and farming being the primary employment. After the railroad arrived in 1909, rapid development of the timber and other industries occurred (Klamath Chamber of Commerce, 1999).

In the early 1900's, Reclamation instituted the Klamath Project, an extensive system of dikes, canals, and dams constructed throughout the basin to drain the marshes and provide irrigation water to previously dry fields. Construction projects continued until the 1960's and brought approximately 200,000 acres under irrigation (USBOR, 1997), creating prime farming and ranching lands. The Klamath Project is still an important element in the economy of the region. Many of the dams constructed on the Klamath River are also used as an important source of hydroelectric power. Agriculture quickly came to be the dominant economic activity in the lowlands, producing large quantities of potatoes, beets, and alfalfa as well as other products. Extensive grazing of cattle (and to a lesser extent sheep) also takes place, both in the cultivated valleys and on the public lands surrounding the basin. Timber harvesting became an important economic activity in the forests surrounding the basin, especially after major railway connections were established between the basin and outside markets in the early 1900's.

## 3.3 Physical Environment

### 3.3.1 Hydrology

The UKB has a range of hydrologic patterns within a relatively small geographic area. High levels of snowfall results in substantial release of water as the snowpack melts in the spring. Large amounts of water are thus released to flow down into the basin, either in streams or as groundwater. The streams begin in the mountains as classic mountain streams -- swift, clear, and cold. As they reach the middle elevations, they begin to slow and have a greater tendency to gather sediment, especially from disturbed streambank sites. Further downstream, these streams and rivers slow even further as they reach flat areas, meandering back and forth and often disappearing into dense marshlands. The highly porous soils of the region encourage groundwater seepage, providing the streams and flatland regions with an underground reservoir of water. These soils are highly prone to compaction and erosion once disturbed. The flatlands and marshes act as additional reservoirs, allowing spring flood waters to spread out over wide areas, dissipating the potentially harmful force of flood waters (USDA, 1998). This seasonal flooding allows sediment to settle in the lowland plains, creating the loamy soil so highly favored for agriculture in the area.

The streams of the UKB coalesce into several major rivers, the Williamson and the Sprague in the north and the Lost River system in the South. The Williamson and Sprague systems combine to feed Upper Klamath Lake, which is the origin of the Klamath River. Historically, the Lost River looped around between Clear Lake and Tule Lake, forming an essentially closed system. Through the construction of an elaborate set of dams, dikes and canals, the Lost River has lost much of it historic course, and has been connected to the Klamath River system. The Klamath River is one of only three in the western USA (along with the Columbia and Sacramento) with sufficient power and with the proper geography to cut through the Cascade Range and exit into the Pacific Ocean. Once out of the UKB, the river forms a dramatic canyon, strengthened as it runs to the sea by the Shasta, Trinity, Scott, and Salmon Rivers.

Riparian areas have historically been affected disproportionately from human activities on the landscape. Activities such as land leveling, tiling, ditching, filling, cultivation and logging practices, irrigation and drainage operations, and urbanization have significantly changed the quantity and quality of riparian systems. As a consequence of these alterations, some riparian areas do not fulfill their historic roles as catchment basins to prevent or minimize flooding, as sediment traps and nutrient/chemical filters, as rearing grounds for aquatic species, as sources of food and cover, or as migration corridors for both terrestrial and aquatic species. Changes in the hydrologic regime have resulted in a reduction in vegetative composition and diversity in wetland and riparian habitats. Grazing in riparian areas has resulted in denuded, weedy, and/or compacted riparian areas which no longer shade stream systems, provide structure, diminish storm surges, or filter surface water runoff prior to entering the stream channel (USDA, 1998).

Instream habitats include pools, sloughs, and side channels associated with a specific reach of a stream system. Currently, some of these instream habitats may not be fully functioning due to absent or insufficient instream and riparian vegetation or structure, high water temperatures, high turbidity levels, or other factors. Degraded hydrologic conditions result in altered habitat function and are suspected to contribute to the current declines in native aquatic species.

### 3.3.2 Air Quality

Air quality in the region is highly variable, varying both by location and in quality. Crater Lake National Park and the Sky Lakes Wilderness Area, both of which are at high elevations and on the edge of the basin, are classified as Class 1 Air Sheds, with excellent air quality and visibility.

In contrast, the valley floor and much of the basin frequently suffer from low air quality, specifically in the form of particulate and carbon monoxide emissions. Mountain ranges to the west and winds out of the same direction create an inversion effect, which retains emissions in the low-lying areas. Fires, both wild forest fires and prescribed burns, contribute to low visibility in the late summer and early fall. Vehicle emissions and wood stove fires severely affect air quality in the winter (Ross, pers. comm.).

### 3.3.3 Water Quality

Changes in water quality have the potential for severely affecting many plant and animal species, although most have at least some tolerance for variations in water characteristics. Many of the species considered “at risk” in the Klamath Basin have had their living habitat altered by changes in the chemical composition, temperature and amount of sediment carried in the water. Human activities, such as agriculture, logging, road construction, urban development, and water impoundment and diversion, have contributed to these changes. Natural events such as climate change and landslides are also important factors in water quality issues. The combination of these activities has caused major changes in the water quality of the UKB during the last century.

***Chemical:*** Due in part to the volcanic-based soils of the region, stream flows and much of the surface water in the region is unusually high in phosphorous and nitrogen content (OR DEQ, 1996). This, when combined with other factors such as water depth and temperature, allows for an abnormally high productivity level (or eutrophication) in some of the waters of the region, specifically in Upper Klamath Lake and its tributaries. A eutrophic body of water is unusual, but not necessarily detrimental; life has abounded in and around Upper Klamath Lake for millennia despite, or perhaps because of, its eutrophic state. In the last 100 years, however, eutrophication has been accelerated by the increased loading of ammonia, nitrogen and phosphorous into the waters, an occurrence linked to the loss of wetland areas and land use changes (USGS, 1996). This has led to Upper Klamath Lake being classified as hypereutrophic, and has drastically changed the characteristics of the lake. The resulting displacement of the diverse community of green algae and diatoms by the current near monoculture of blue-green algae gives rise to massive algal blooms in summer. These blooms, which cause “dramatic variations in dissolved oxygen and pH” (Kann and Smith, 1999) are suspected to be a major factor in the decline of sucker species in Upper Klamath Lake. These changes have contributed to markedly degraded water quality conditions important to fish and other organisms such as aquatic mollusks, potentially resulting in massive fish kills (Buettner, pers. comm.). The Tule Lake and Lost River systems are considered to be eutrophic or hypereutrophic, as well (OR DEQ, 1996).

***Temperature:*** Water temperature is of concern in particular with regard to coldwater fish and invertebrate species, such as bull trout and redband trout and some species of aquatic mollusks. These species are specifically adapted to colder temperatures, although they have a relatively high tolerance for temperature variations (USDA, 1998). Both Lost River and shortnose suckers tolerate high temperatures, but are susceptible to interactions between high water temperature and poor water quality, which encourages the development of potentially fatal bacteria outbreaks. High water temperatures have been a trend for several decades, resulting from, in part, the loss of vegetation along stream and river channels and along lakefronts (OR DEQ, 1998).

This is caused by a variety of factors, including logging along streambeds, the impact of cattle and sheep both by grazing on riparian vegetation and trampling, and the development of housing, roads, and urban areas.

***Sedimentation:*** Increases in the amount of sediment in the waters of the UKB stem from many of the same factors discussed above. Areas impacted by extensive logging and catastrophic wildfires are subject to extensive erosion (Chamberlin et. al., 1991) and overgrazing of livestock can strip banks of their native vegetation, exposing bare soil and allowing it to contribute to sediment loads (Platts, 1991). Roads frequently follow streams, allowing rainfall and snowmelt to wash roadbed materials into the adjoining streams (Furniss et. al., 1991). "Sediments fill in deeper pools that provide hiding cover for fish and smother aquatic plants that provide cover and forage substrate. Suspended sediments shade rooted aquatic macrophytes and encourage phytoplankton production instead" (USDA, 1998). Sediment also fills in the small spaces in the gravel of streambeds, the preferred site for egg laying for sucker and other fish species, thereby preventing the use of these areas. Freshly hatched fish may also be trapped and smothered under this sediment layer (Hicks, 1991). Gravel areas are also important habitat for macroinvertebrates that provide food for fish.

## 3.4 <u>Natural Environment</u>

### 3.4.1 Fisheries

The UKB was once, in the Pleistocene epoch (10-25,000 years ago), dominated by a single large lake -- Lake Modoc -- which stretched from near Tule Lake to Fort Klamath, covering 1,096 square miles. Upper Klamath Lake is the largest remnant of that historic body of water. Although it may always have had an outlet, it provided enough isolation for the evolution of unique species and stocks of fish. Eventually, coastal stocks, such as salmon, steelhead, and Pacific lamprey, invaded the basin and influenced genetic development, but at the same time these species were shaped by the environment of the UKB (Kostow, 1995). As a result, the basin is home to a number of unique species and stocks of fish including three unique catastomid (sucker family) species; another 12 species are recognized as native to the UKB (Bond, 1994).

***Anadromous Fish:*** Anadromous (fish which spend part of their lives in saltwater but which return to freshwater, inland areas in order to spawn) salmon and steelhead once utilized the UKB in Oregon. Spring chinook salmon spawned as far as Bly on the South Fork Sprague River and steelhead were documented up to Link River. By the early 1900's, the majority of these runs were being diverted by fish-racks at Klamathon for fish culture activities. Completion of Copco Dam just south of the state line in 1917, brought the end to runs of anadromous fish to Oregon's portion of the Klamath Basin (Fortune et. al., 1965).

***Lost River and shortnose suckers:*** Surveys for Lost River and shortnose suckers carried out in the Klamath Basin prior to and after the construction of Reclamation's Klamath Project and Link River Dam indicated that sucker populations were very large. Both species are endemic to the UKB. Cope (1884) noted that Upper Klamath Lake sustained "a great population of fishes" and "was more prolific in animal life" than any body of water known to him at that time. Gilbert

(1898) noted that the Lost River sucker was “the most important food-fish of the Klamath Lake region.” At that time, spring sucker runs “in incredible numbers” (Gilbert, 1898) were relied upon as a food source by the Klamath and Modoc Indians and were taken by local settlers for both human consumption and livestock feed (Cope, 1879; Coots, 1965; Howe, 1968). Sucker runs were so numerous, in fact, that a cannery was established on the Lost River (Howe, 1968) and several other commercial operations processed “enormous amounts” of suckers into oil, dried fish, and other products (Andreasen, 1975). Even through the 1960’s and 1970’s, runs of suckers up the Williamson and Sprague Rivers were large enough to support a popular sport fishery. The first concerns were expressed over declining sucker populations in the 1960's (Vincent, 1968; Golden, 1969). Surveys conducted in 1984-1986 indicated a major decline in Lost River and shortnose sucker populations (Bienz and Ziller, 1987) and the fishery was closed in 1987. Both Lost River and shortnose suckers were federally listed as endangered species on July 18, 1988 (Federal Register, 53:27130-27134).

Not all of the factors responsible for the decline of these species are clear, but they are thought to include the damming of rivers, dredging and draining of marshes, instream flow diversions, over-harvest, introductions of non-native fish, forestry and road building practices, grazing, and a shift toward hypereutrophication and poor water quality in Upper Klamath Lake and waters downstream (USFWS, 1993).

***Bull Trout:*** On 10 June 1998, the USFWS listed the Klamath River population segment of the bull trout (*Salvelinus confluentus*) and the Columbia River population segment as threatened. Bull trout populations are threatened by habitat degradation, passage restrictions at dams, and competition from non-native brown and brook trout (USFWS, 1998).

Bull trout populations are known to exhibit two distinct life history forms in the Klamath Basin: resident and fluvial. Resident bull trout spend their entire life cycle in the same (or nearby) streams in which they were hatched. Fluvial populations spawn in tributary streams where the young rear from one to four years before migrating to a river, where they grow to maturity (Fraley and Shepard, 1989).

Historical references indicate that bull trout were once widely spread throughout much of the UKB. Records report bull trout in Sevenmile Creek and the Williamson River (Cope, 1879; Gilbert, 1897). Bull trout have also been reported in the Wood River (Dambacher et. al., 1992; Buchanan et. al., 1997). Creel census data from 1953, record angler catches of large bull trout from Long Creek (Buchanan et. al., 1997). No adfluvial bull trout have been recorded from Upper Klamath or Agency Lakes.

Bull trout appear to have more specific habitat requirements than other salmonids (Rieman and McIntyre, 1993). Habitat characteristics including water temperature, stream size, substrate composition, cover, and hydraulic complexity have been associated with their distribution and abundance (Bottom et. al., 1985; Dambacher et. al., 1992; Jakober, 1995; Rieman and McIntyre, 1993). Elevated water temperatures can act as an impediment to movement and temperature may be a strong determinant of bull trout distribution (Williams and Mullan, 1992; Shepard et. al., 1984). Warm temperatures downstream of reaches occupied by bull trout are likely to preclude the downstream expansion of their distribution. Water temperature also appears to be a critical factor in spawning and early life history of bull trout (Fraley and Shepard, 1989; McPhail and Murray, 1979; Riehle, 1993).

The current abundance, distribution, and range of bull trout in the UKB is greatly reduced from historic levels and bull trout have been extirpated from at least one, and possibly three streams since the 1970's. Klamath Basin bull trout sub-populations are considered at high risk of extirpation, because each sub-population consists of only the resident form, and currently survives in fragmented and partially degraded habitats. Low numbers of individuals, low reproductive potential, interspecies competition and predation from brook and brown trout, and hybridization from brook trout are also factors in their decline (Light et. al., 1996).

***Redband Trout:*** Redband trout (*Onchorhynchus mykiss*) in the closed Great Basins have been petitioned for listing under the ESA, effective in 1999. In the Klamath Basin, the Service is currently conducting an informal population status review.

The Oregon basin redband trout occupy streams and lakes in seven Pleistocene lake beds in Oregon and northern California. Populations in each of these basins are completely isolated by natural geological features, except for those in the UKB. The Klamath Basin redband trout populations have adfluvial or resident life histories. The Klamath Basin includes several lake/marsh/stream subsystems. The Upper Klamath Lake system supports the most functional adfluvial life history system among the Great Basins. The Wood, Lower Williamson, and Sprague Rivers still provide access to Klamath Lake and regular, annual migrations of redband trout still occur. In the Williamson and Sprague headwater areas, migration corridors between Klamath and Sycan Marshes and their adjacent streams are less functional due to irrigation diversions and thermal blockages. Great Basin redband trout have also been impacted by the introduction of non-native species, particularly hatchery raised rainbow trout which are capable of interbreeding with local endemic redband.

***Human Impacts:*** The major human impact over the last 150 years has been the fragmentation and loss of components of the marsh/lake/stream systems. The upper basin floor was developed for agriculture, a process which included extensive diking, channeling, draining, and loss of marshlands. Irrigation diversions were constructed on most streams and caused dewatering and physical blockages for both upstream and downstream migrating trout. Cattle grazing also contributed to channel destruction in some locations. Changes in water quality, temperature, and sedimentation are also suspected to have adversely impacted fish populations.

### 3.4.2 Wildlife

***Invertebrates:*** Knowledge of most invertebrates and their status is minimal (Cooperrider and Garrett, 1997). Mollusk (snails, slugs, mussels, and clams) diversity in the UKB is unusually high (Frest and Johannes, 1998) and there are nearly 30 species of freshwater mollusks found only in the UKB. Most freshwater mollusk species are sensitive to pollution regardless of source (Burch, 1989). Most of the mollusks in the UKB are coldwater forms, preferring clear, cold, unpolluted water with dissolved oxygen near saturation (Frest and Johannes, 1998). Prior to considerable human disturbance, the UKB contained an abundance of mollusk habitat. Grazing, water diversions, and similar alterations to springs, rivers, and other wetland habitats have influenced the loss of many mollusk communities in the UKB. However, Frest and Johannes (1998) report that Upper Klamath Lake retains the most intact mollusk fauna of any of the pluvial lake systems in the western USA.

Those macroinvertebrates serve as a primary food source for many fish, birds, amphibians and bats and are concentrated in lakes, marshes, rivers, springs and riparian areas. Although many macroinvertebrates have a terrestrial stage to their life cycle (i.e., *Odonata*), the egg, pupal, and larval stages occur in the aquatic stage 95% of the year. Although no macroinvertebrates are federally listed in the UKB, benthic types are a primary food used by Lost River and shortnose suckers (Scoppettone et. al., 1995; Markle and Simon, 1993), bull trout (Bowerman, pers. comm.), and migratory waterbirds (Pederson and Pederson, 1983).

Each aquatic microhabitat produces a unique community of macroinvertebrates (Thorp and Covich, 1991). The type of macroinvertebrate community (the diversity of species and the species abundance) is a function of the physical and chemical characteristics of the aquatic microhabitat (Cummins, 1966). The presence or absence of a specific macroinvertebrate community in some aquatic habitats may serve as an indicator of water quality and riparian function (EPA, 1999). In turn, the presence or absence of specific fish and birds which are species-specific in macroinvertebrate selections may indicate quality of the aquatic or riparian habitat. Macroinvertebrate communities can be affected when gravel habitat becomes buried by increases in sedimentation (Cordon and Kelley, 1961; Waters, 1995), loss of riparian habitat, non-point source and point source pollution from run-off, and a permanent loss of wetlands (Cooperrider and Garrett, 1997).

Since 1998, the ERO has been acquiring data in the Sycan and Sprague Rivers using the Rapid Bioassessment protocol for sampling macroinvertebrates developed by EPA (EPA, 1999). The Fremont National Forest sampled macroinvertebrates on the South Fork Sprague in 1995 (USDA, 1995), the Winema National Forest sampled Sycan River below Sycan Marsh in 1989 (USDA, 1997) and the BLM sampled Spencer Creek in the middle 1990's (Bail, pers.comm.). This data can be used as a baseline with which to monitor future restoration projects.

***Amphibians & Reptiles:*** Several species of amphibians in the UKB have been identified as sensitive or declining, leading to the belief that many of the amphibians in this region are at risk (Cooperrider and Garrett, 1997). Presently, in the UKB, the Oregon spotted frog is only known to occur in five small populations (Hayes, 1997) and is currently a candidate species for federal listing. The non-native bullfrog occurs throughout permanent, deepwater habitats at lower elevations in the UKB and competes with and is a predator upon native amphibians (St. John, 1987; Leonard, et al., 1993). The diversion of springs and elimination of marshes, streams and riparian habitats has eliminated considerable amphibian habitat in the UKB (Hayes, 1997). There are 17 species of reptiles found in the UKB. The gopher snake and two species of garter snakes are probably the most frequently observed snakes in the UKB and most commonly seen near riparian areas. Several other species of lizards and snakes occur in the UKB as well, including the colorful California mountain kingsnake and the western rattlesnake.

***Birds:*** The UKB is an essential component of the Pacific Flyway, and the area is heavily used by migratory and resident birds of all types. Waterfowl populations have declined in the UKB as the populations are only about 1/4 to 1/8th of historic populations (Hainline, pers. comm.), although the UKB still supports a large seasonal population. Both Lower Klamath and Tule Lakes have been considerably reduced in size by Reclamation projects, resulting in large losses of critical wetland habitat (Mauser, pers. comm.) Several species of colonial waterbirds, including great egrets, great blue herons, and black-crowned night herons were nearly extripated from the region as a result of hunting for their feather plumes (used to make ladies hats), until President Theodore Roosevelt established the Lower Klamath National Wildlife Refuge as the nation's first waterfowl refuge in 1908. Many species of waterfowl and neotropical migratory birds are suspected to have declined across the UKB due to habitat loss (Cooperrider and Garrett, 1997). A diversity of marsh and shorebirds occur in the UKB. However, populations of yellow rail, least bittern, long-billed curlew, and tricolored blackbird are declining within UKB. The spread of juniper woodlands across former grasslands and sagebrush habitats has probably altered the abundance and distribution of many shrub-associated species, including sage and sharp-tailed grouse. Native quail and grouse have all suffered declines associated with the loss of their habitats (Cooperider and Garrett, 1997). However, the recent delisting of the peregrine falcon and the anticipated delisting of the American bald eagle represent a considerable success for wildlife conservation efforts; bald eagles are abundant in the basin during winter months.

***Mammals:*** The reduction of habitat throughout the region has affected a variety of mammal species. Carnivores have been especially impacted. The gray wolf and grizzly bear are no longer found in the basin. The Canada lynx is proposed for federal listing, and another three species are considered at risk. A diversity of rodent species occurs in the UKB. Among these is the white-footed vole, which is a species of special concern in the area. Bats are among the most sensitive mammals to alterations in riparian ecosystems (Brown and Berry, 1991; Taylor, 1995) as changes in their habitat can drastically alter species populations. Five of fourteen species of bats in the UKB are considered at risk. Game species have also been impacted by the loss of riparian habitat, in both upland and bottomland areas. Pronghorn antelope and sage grouse have been affected by the depletion of water and changes in the fire regime on the plains and hills in the eastern part of the basin (Anglin, pers. comm.).

***Threatened and Endangered Species:*** For a complete list of Service listed, proposed, and candidate species, as well as those categorized as species of special concern, please see Appendix B.

### 3.4.3 Vegetation

The UKB has several distinct vegetation zones based on the dominant plant species found in the area. These zones are distinguished largely by elevation and exposure. Riparian and wetland areas occur throughout these zones, but have distinct characteristics which are uniform throughout the UKB. Wetlands, due to their importance in the programs under discussion, are considered at some length.

***Wetlands:*** The term "wetlands" is used to describe the wide variety of habitats more commonly described as bogs, swamps, fens and marshes. Wetlands are defined as those areas having predominantly water-loving (hydrophylic) plants at least periodically, where the soils are saturated most of the year, and which are submerged for at least two weeks a year (Guard, 1995). Standing water can be as deep as 2 - 3 feet, but is usually considerably less. Wetland habitats vary greatly, and are usually distinguished by the amount and duration of immersion in water. In deeper water, free-floating and submergent species such as pondweed, watercress, and duckweed are common, and there are also a few species which are rooted in the mud underwater, notably the wocus lily. Closer to shore are species able to survive seasonal fluctuations in water levels, such as the buttercups, speedwells, smartweeds, water parsley, plantains, several grass species as well as sedges, rushes, and cattails. Floodplains and slightly higher ground are often dominated by shrub swamp -- featuring Hooker's and Geyer's willows, serviceberry, and exotic hawthorn and Russian olives. Forested wetland communities are dominated by aspen, ash, dogwoods, and stinging nettle.

Wetlands play a critical role in hydrologic flow, water quality, and fish and wildlife habitat. Many wetlands are low-lying areas adjacent to streams and lakes. During springtime high flows, these streams often overflow, flooding the nearby terraces. This lessens the potentially destructive flows of water proceeding downstream, helping to minimize downstream erosion. As the waters recede, these wetlands slowly release the accumulated water back into the stream or into the overall water table, thus acting as impromptu water storage areas. In addition, the heavy soils most frequently associated with wetlands act as sponges, absorbing water and only slowly giving it up. This acts to provide many streams in the UKB with a continuing flow of water though the dry summer months, providing essential habitat to many aquatic and riparian species. Wetlands act as water filtration systems, preserving and improving water quality. Wetland vegetation traps or consumes pollutants and waste products, and the slow-moving water allows particles to settle out, reducing the amount of sediment and nutrients in stream flows (Gearheart, 1995). Healthy wetland vegetation also stabilizes soil, acting with riparian vegetation to help prevent erosion. Wetlands in the UKB provide highly valuable wildlife habitat and the UKB is a critical stopover for waterfowl using the Pacific Flyway as well as supporting a large seasonal population. The wetlands of the region also provide highly valuable habitat to raptors, particularly bald eagles. The Klamath Basin is home to one of the largest populations of wintering bald eagles in the lower 48 states. Mammals, amphibians, reptiles, fish, and aquatic mollusks all use wetlands and many are dependent on them for their survival.

It is estimated that prior to white settlement, there were 350,000 acres of wetlands in the UKB. By the 1960's, there were approximately 75,000 acres (USBOR, 1985). Thus, approximately 80% of the wetlands in the UKB had been drained, diked, and converted to agricultural use, and removed from their historical role in the landscape. The vast majority of this loss has been in the southern portion of the UKB, where extensive portions of Lower Klamath and Tule Lakes were converted to agricultural lands in the first half of the twentieth century. Over 200,000 acres of land were under irrigation by the Klamath Project alone as of 1979, much of this as converted wetlands (USBOR, 1999). Extensive lands in the northern portion of the basin, including wetlands surrounding Upper Klamath Lake, and Sycan and Klamath Marshes, have also been converted and drained for agriculture.

***Riparian:*** Streamside vegetation varies to some degree on the elevation and flow characteristics of the stream, but some general statements can be made. Streams in the mountains generally possess fast-moving water which cuts deeply into the channel. This results in a narrow corridor of riparian vegetation along the stream, with the dominant forest type nearby (USDI/USDA, 1997). Vernal pools, ponds, and lakes may form, creating wetlands where the water is shallow and forming narrow riparian areas with surrounding forest along steeper banks (Lake of the Woods being a prominent example of the latter). Sedges, rushes, water-tolerant grasses, cattails, and willows are common at streamside; aspen, maple, and oak are found further up the banks (Yocom and Brown, 1971). Streams and rivers at lower elevations in the UKB tend to be slower moving, with wider riparian vegetation bands. The rivers' edges are still dominated by sedges, rushes and grasses; the banks are typically dominated by large willows and cottonwoods. Throughout riparian corridors, this vegetation is critically important to stabilize the streambank, regulating natural- and human-caused erosional forces and thus keeping sediment out of the water course. It also provides valuable forage and habitat for a wide variety of wildlife.

In many areas in the UKB, grazing, logging, and development have negatively affected riparian corridor vegetation. Selected streams and rivers adjacent to grazing lands have unstable banks due to a loss of native vegetation. Logging activities have disturbed natural hydrologic patterns, resulting in increased surface flows of water and increased sedimentation (USDI/USDA, 1997; USDA, 1998). Subsurface water seeps into many of the streams throughout the season, providing streams, and the vegetation along them, a steady water source after the snow melts. Disturbing these subsurface flows interrupts this cycle and places stress on the plants in the summer and fall as streams become reduced to trickles, especially in a region with only little rainfall. Urban development has also increased pressure on riparian corridors. Much of the Lost River system has been tamed and rerouted into an extensive system of dikes and canals possessing little riparian vegetation on their banks (USDI, 1999). Many of the rivers feeding Upper Klamath Lake have been similarly channeled, mostly in the lowland areas deemed suitable for agriculture.

***Sagebrush grasslands:*** Historically, many of the valley bottoms of the UKB were composed of cold desert shrub communities which dominate much of the Intermountain West region. In the UKB, this vegetation type is dominated by big mountain sagebrush commonly associated with native bunchgrasses, usually Idaho fescue and wheatgrass (USDI/USDA, 1997). At first glance, this habitat type seems stark and desolate, but in reality, there is a surprising diversity of plant species found here, ranging from rabbit brush shrubs to small annual flowers.

In the UKB, the desert shrub community has been reduced by at least 25% over the last century (USDI/USDA, 1997) as sagebrush lands have been converted to agricultural purposes. In many locations the only areas with pre-settlement vegetation are the hills in the south part of the basin, as all of the flatlands are now farmland. Many of the hills to the north and east of Klamath Falls have been developed for housing, furthering the loss of native vegetation.

Much of the sagebrush desert remaining has been substantially altered by a variety of factors. The invasion of exotic species, including cheat grass, leafy spurge, Russian thistle, several knapweeds, and toadflax, has changed the natural species composition. The suppression of brushfires throughout the west has allowed sagebrush to dominate at the expense of native bunchgrasses, degrading wildlife habitat for grazing species such as pronghorn. Wildfire suppression has also been a factor in the expansion of western juniper far beyond its historical abundance. Juniper is very hardy and is known to consume large amounts of water, and may be responsible for lowering water tables other species are dependent upon (USDI/USDA, 1997).

***Forests:*** The forests surrounding the basin are primarily characterized by eastside types and westside types where elevations range from about 4,000 to 7,000 feet with some mountain peaks above 9,200 feet. From the summit of the Cascade Mountain Range east to Highway 97, the forest is comprised of marshlands and meadows to fir and mixed conifer (westside type). Tree species vary greatly and include Shasta red fir, grand fir, white fir, Douglas-fir, sugar pine, incense cedar, ponderosa, lodgepole, and western white pines. Hardwoods present around meadows and streams would include willows, aspen, and cottonwoods. On the eastside, which is characterized by broad, flat valleys alternating with generally low north-south ridges, the forest is comprised of marshlands and meadows to stands of ponderosa pine, lodgepole pine, and western juniper. Subalpine communities occur at the higher elevations (USDA, 1990).

Forest composition, structure, and disturbance patterns have changed significantly with the disruption of natural fires through fire suppression. Human intervention has brought about these changes through a combination of timber harvesting, fire suppression, and/or livestock grazing. Lack of frequent, non-lethal underburns has resulted in an increase in fuel loading, duff depth, stand density, and a fuel ladder that can carry fire from the surface into the tree crowns. The increase in fire intervals, without equivalent fuel reductions, has resulted in much higher fuel loads, fireline intensities, and fuel consumption when fires do occur. This causes much higher mortality of the dominant overstory, as well as higher potential for soil heating and death of tree roots and other understory plants (USDI/USDA, 1997).

***Threatened and Endangered Species:*** In the UKB, Applegate's milkvetch (*Astragalus applegatei*) is the only currently federally listed endangered plant species. Applegate's milkvetch is a member of the legume family, and is found in only very limited numbers near the town of Klamath Falls. Existing populations and potential habitat have been limited due to habitat changes brought about by the draining of wetlands, regulation of floods, urban development, and invasions of non-native species. A recovery plan has been in effect since 1998, with the goal of achieving six self-sustaining populations. Currently, there are three known populations, only one of which is considered large enough to be self-sustaining (Gisler and Meinke, 1998).

## 3.5 Social Environment

The population of the area under consideration is approximately 70,000, extrapolated for the region from Klamath County's 1997 census figures of 61,000 (Klamath, 1999). The dominant economic activities are still agriculture and timber harvesting, although light industry and service sector jobs have been increasing in importance for the past decade. Tourism is also becoming an increasingly important source of jobs and revenue throughout the area. The timber industry has been declining in recent years, and the listing of the northern spotted owl as endangered in 1990 slowed timber activities occurring on federally owned lands in the region and contributed to the loss of a number of timber industry jobs. Overall unemployment in Klamath County is considerably higher than the national average; most recent figures show an unemployment rate of 8.1% (Klamath, 1999).

The affected environment has not changed since the EA was first developed in March 1999 and the FONSI signed in March 2000.

# IV. ENVIRONMENTAL CONSEQUENCES

This section discusses the short- and long-term effects of the alternatives defined above. Here the consequences of the overall program of restoration activities will be analyzed. This section looks at the direct, indirect, and cumulative impacts of the program options. The effects of the specific projects are analyzed in Appendix D, *Description of Restoration Activities and Analysis of Impacts*. Appendix C defines the Standards and Guidelines (S & G's) which will be followed to minimize the impacts of these actions.

As defined by CEQ regulations, consequences (or effects), include:

***(1) Direct effects:*** These effects are caused by the action and occur at the same time and place.

***(2) Indirect effects:*** Indirect effects are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

***(3) Cumulative impacts:*** Impacts that are cumulative on the environment result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ, 1986).

## 4.1 Consequences of Alternative 1: Proposed Alternative

This alternative would authorize the full use of a programmatic approach to ecosystem restoration activities, authorizing all of the discussed project types within the guidelines and limits discussed. More detailed descriptions of these activities and their expected impacts are described in Appendix D, *Description of Restoration Activities and Analysis of Impacts*. The S & G's, as described in Appendix C, would be utilized to ensure that these projects minimize any potential adverse impacts to the environment. This programmatic approach allows for a comprehensive, ecosystem-wide approach to restoration, recognizing the connection and inherent relationship between differing segments of the environment. The use of a programmatic EA is the most efficient means for analyzing the cumulative effects of these projects, especially given the similarity of the project types and the consistency of the environment in the UKB.

### 4.1.1 Direct Effects

***Hydrology:*** Direct effects resulting in changes to the hydrology would occur from instream projects utilizing a variety of structures designed with large woody debris and other natural materials. These would be designed to alter stream and river flows, resulting in deflected, rechanneled, and dispersed flows. Flow deflections would improve and promote natural vegetation composition and diversity, decrease flow velocities, and increase water storage and recharge rates (the type of structures and their effect are described in more detail in Appendix D). Wetland restoration projects may lead to changes in stream hydrology and subsurface flow due to diversion of streamflow into previously farmed areas. If water levels in the wetlands exceed surrounding stream or lake subsurfaces, flow from the wetlands outward is expected.

***Air Quality:*** Many of these projects will result in temporary degradation of air quality, primarily as a result of construction activities (exhaust fumes, dust, etc.). Silvicultural treatments may involve prescribed burns and/or the burning of slash piles, which will result in smoke and ash in the air for short periods of time. Burning activities will be conducted only under conditions and seasons appropriate to such activities, and in full compliance with federal, state, and local regulations. Burn permits will be acquired as necessary.

***Water Quality:*** Short-term disturbance to water quality may occur, again as a result of construction activities. This disturbance will primarily take the form of stirred up silt and some soil slumping into streams. By following the attached S & G's, these impacts will be minimized, though a certain amount of disturbance is inevitable.

***Fish:*** Fish species would suffer from some short-term decrease in water quality, as well as be directly disturbed by construction activities as part of many restoration projects. Through the utilization of S & G's, these projects would be designed to minimize or eliminate these disturbances altogether, and would be not likely to adversely affect these species. Many of the instream project types would have immediate and beneficial impacts on fish species by adding cover and sheltering areas for fish, as discussed in Appendix D. Although not extensively studied, existing data suggests that efforts to replicate known favorable habitat conditions in degraded areas will provide fish species with improved feeding, resting, spawning and rearing habitats (Reeves et. al., 1991). The installation of fish screens would prevent fish from entering canals and diversions where they may be injured or killed. Fish screens and other access-limiting structures may also be utilized to restrict non-native and undesirable fish species from protected stream reaches. The removal of non-native fish species would help prevent the hybridization of species, limit competition for food and cover, and remove potential predators, especially of larval and juvenile stages. The removal of artificial barriers, including small dams, or construction of fish passage structures would provide access to new habitat and may be designed to connect previously isolated habitats. Collection and rearing of fish may result in incidental take of listed species, but the long-term benefits include a greater understanding of fish ecology.

***Wildlife:*** Wildlife of all varieties would similarly be affected by construction and other potentially disruptive activities. Prescribed burns and other silviculture treatments may affect upland species, and riparian area species may suffer temporary disruptions due to restoration projects instituted in riparian and wetland corridors. Very small numbers of individuals may be killed or injured as a direct result of work performed. The adherence to the S & G's would minimize these impacts, both through guidance on work practices and the timing of project activities to least interfere with wildlife species. Wildlife would benefit from the addition of nesting and roosting structures in both upland and riparian areas. Vegetation thinning and clearing would result in improved foraging habitat for various species, while revegetation projects would provide additional cover, food sources, and nesting habitat.

***Vegetation:*** Vegetation would likewise be negatively impacted by construction activities, which may result in trampling, crushing, and removal of some or all vegetation at project sites. The attached S & G's also address this issue, and would minimize these impacts. Direct beneficial effects to vegetation would occur as a result of seeding and transplanting of plant species at work sites, resulting in improved species diversity and density. Existing vegetation would benefit from the removal of non-native species and highly water-consumptive species such as juniper, and the thinning of trees to reduce competition, lower water consumption, and open the canopy to sunlight. No projects would be conducted in known locations of Applegate's milkvetch which would have potential adverse impacts, and surveys would be conducted under Section 7 of the ESA in potential habitat. Restoration projects may be designed to provide habitat in conjunction with recovery efforts for this species.

***Social/Economic:*** Some of the funding sources currently used have provisions to encourage the employment of local workers, many of whom were displaced by recent declines in the timber trade. These projects would provide needed employment opportunities to these workers, a factor especially important given the current high unemployment rate in the UKB. Materials and supplies would be purchased locally, to the extent possible, providing an additional economic benefit to the area. Training in a variety of construction techniques for habitat restoration would be provided to these workers, providing them with additional job skills. In order to prevent potential adverse impacts to cultural resources, archeological clearances for all work sites would be obtained in coordination with State Historical Preservation Offices.

### 4.1.2 Indirect Effects

***Hydrology:*** Many of the proposed projects would have indirect effects on the hydrology of the region. Upland projects such as reforestation, decompaction, and recontouring are designed to slow flows of surface water and allow moisture to seep into the soil and flow as sub-surface groundwater. This would restore a more gradual release pattern of water into streams and springs, allowing formerly perennial streams renewed sources of moisture and improve the timing of the flows in streams. Projects such as juniper control and native tree thinning would help reduce excessive water consumption, also releasing water for percolation into sub-surface flows. Lowering levels of sediment in streams (by landslide and streambank stabilization, road work, and fencing banks from grazing) would lower the scouring potential of stream flows, thus lessening the undercutting and gullying associated with high sediment loads. Creation of new or restoration of old wetland areas allows for spring flood surges to disperse, again slowing high and potentially destructive flows, and allowing for a gradual release of moisture to downstream areas. Road decommissioning and improvement projects also help with problems resulting from surge flows and spring runoff. Some roads are inappropriately designed and allow runoff to become channeled, instead of allowing more natural downhill flow patterns.

***Air Quality:*** No indirect impacts would result to air quality from this alternative.

***Water Quality:*** A primary focus of the restoration efforts in the basin is oriented towards improving water quality, although most of the benefits are indirect results of other activities. Improvements in the chemical composition of water would result from the establishment of wetlands which have well-established qualities for filtering sediment and chemicals out of water (Guard, 1995). Wetlands are especially good at absorbing nitrogen and phosphorus to a lesser extent, chemicals which are primarily responsible for the hypereuthropic conditions in the lakes of the basin. Wetlands desynchronize phosphorus flux, storing it in the summer growing season and releasing it in the winter and spring. Fencing around riparian and wetland regions restricts access by livestock, minimizing potential impacts from grazing and trampling. Establishment of rotational grazing patterns via fencing projects lessens concentrations of livestock in potentially sensitive areas and allows vegetation the opportunity to filter excessive nitrogen, sediment, and other potentially harmful chemicals out of the water prior to its flow further downstream.

Temperature improvements occur from the shading of streambanks by trees and other vegetation. This comes about both as a direct result of revegetation projects and from the exclusion (by fences and alternative grazing procedures) of livestock from riparian and wetland areas, which is often sufficient to encourage natural recruitment of native plant species. Shade does not in of itself lower water temperatures; rather it prevents solar radiation from heating the water, with an end result of lower water temperatures further downstream.

Alterations in stream patterns which slow flows would allow for sediments to drop out of the water column, decreasing sedimentation loads. Wetlands and floodplains act as filters for sediment as well as chemicals, further reducing sediment loads downstream. Restrictions of livestock along streambanks would help prevent streambank erosion, the muddying of water and stirring up of streambeds by livestock hooves, and the loss of streamside vegetation resulting from livestock consumption and trampling. Instream structures would act to slow flows and trap sediment, lessening sediment loads downstream.

Sedimentation would also be indirectly affected by upland and road projects. By encouraging sub-surface flows (as describe above) instead of surface runoff, less soil will be moved downwards with the water. Unless stopped, these particles will eventually enter streams, adding to the sediment load (FISRWG, 1998). Landslide stabilization and rehabilitation and other erosion control projects are also very important for the same reason. Road projects, either removal or improvement, would be designed to lessen the amounts of fine roadbed material which otherwise may be washed off roads and into the streams.

***Fish:*** Favorable conditions for fish species would result from improvements in water quality. Water chemistry and temperature are documented as being limiting factors for the special status fish of the region and could be further understood during rearing of captured fish, which might aid in the eventual recovery of listed fish. It is assumed that improvements in these characteristics would result in improved conditions for these fish species, which would assist efforts for species recovery. Reductions in sediment loads in streams would improve spawning habitat, improve fry survivability, and prevent sediment from adhering to fish gills and interfering with respiration. Streamside and wetlands revegetation projects would provide shade to fish, increase numbers of invertebrates used as food sources, and create resting and spawning habitat.

***Wildlife:*** The indirect effects of these programs would be largely beneficial to wildlife species. Revegetation projects would provide increased cover, forage, and living habitat for a wide variety of species. The restoration program would improve physical characteristics (e.g., width, depth, substrate, riparian zone) of streams, water quality (e.g., temperature, dissolved oxygen) and in many cases, the immediate upland habitats (Cooperrider and Garrett, 1997). It is expected that such habitat improvements would have a positive effect on the mollusk fauna and other invertebrates within the UKB. The restoration of riparian and wetland habitats has a strong potential to benefit reptiles and amphibians, in particular the Oregon spotted frog. Invertebrate populations would similarly benefit by the reestablishment of their primary habitat. Bald eagles would benefit primarily as a result of habitat improvements resulting in increases in prey species. Game animals would benefit from new sources of browse and cover resulting from riparian projects.

***Vegetation:*** Vegetation will benefit indirectly from changes in the hydrologic regime, changes which would allow more gradual release of water from improved sub-surface flows and from wetlands and floodplains. Some areas not directly impacted by revegetation projects would see natural recruitment of native vegetation as water availability rises. Erosion and landslide control projects would stabilize soils, allowing vegetation to become established on previously unstable slopes. Fencing projects would exclude livestock or minimize grazing, allowing native vegetation to become reestablished.

***Social/Economic:*** The indirect impacts on the social and economic environment are difficult to define. For each job created, there is a certain “trickle down” effect to the economy, as other people and businesses benefit from the spending of the employed. An even less tangible, but very important benefit results from improved public relations and perceptions of the public towards federal government programs; many federally funded restoration activities result in visible improvements to the landscape performed in cooperation with local landholders. Equally important is the education and outreach effect of these programs, promoting improved public understanding on the means, goals, and availability of restoration programs. Restoration of agricultural land may result in loss of jobs to those in this field.

## 4.13 Cumulative Effects

Ecosystem restoration is a relatively new field, and the long-term effects are not clearly understood. The assumption is that by restoring areas negatively impacted by natural processes and human activities during the last century, water quality and habitat conditions would be sufficiently improved so as to allow key indicator species (threatened, endangered, or sensitive) greater opportunities for recovery to sustainable population levels. In the UKB, the environment has been significantly impacted by the human activities of the past 100 years. As stated earlier, an estimated 80% of the original wetlands in the basin have been converted to farmland and grazing pasture. Riparian corridors have also been significantly impacted, though no exact figures are available for the extent of this impact.

The types, numbers, and sizes of projects funded annually by the ERO vary greatly from year to year. Since 1994, the ERO has been involved in almost 200 restoration efforts in the UKB conducted on both federal and private lands. These projects have resulted in the restoration of approximately 3,200 acres of wetland and the enhancement of another 42,000 acres. Riparian fencing projects have resulted in approximately 110 miles of new fence lines along riparian corridors, with associated revegetation. Upland work has resulted in 54 miles of road work, and 30 miles of fencing projects (see Table 2 below).

**Table 2: Estimated annual totals for ERO-funded restoration projects**
**(table based on current ERO project data; 1999 data is incomplete)**

| Project type | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | Total |
|---|---|---|---|---|---|---|---|
| Riparian fencing | 37.56 miles | 18.5 miles | 13.5 miles | 27 miles | 9.0 miles | 3.5 miles | 109.06 miles |
| Riparian vegetation | 425 acres | | | 25 acres | 155 acres | | 615 acres |
| Wetlands enhancement | 15741 acres | 12005 acres | 9800 acres | | 5020 acres | | 42566 acres |
| Wetlands restoration | 770 acres | 160 acres | | 860 acres | 820 acres | 660 acres | 3270 acres |
| Instream | | | 1.25 miles | 2 miles | | 1.5 miles | 4.75 miles |
| Soil stabilization | 2.5 miles | | 0.5 miles | | | 0.5 miles | 3.5 miles |
| Road work | 2 miles | 2.5 miles | 0.25 miles | 24.5 miles | 0.25 miles | 24.8 miles | 54.3 miles |
| Upland restoration | 15 acres | | | 505 acres | 1546 acres | 180 acres | 2246 acres |
| Upland fencing | 16 miles | 9.2 miles | | 5 miles | 0.5 miles | | 30.7 miles |

It is expected that funding will continue for these types of projects over the next ten years, and that projects would reflect trends similar to those above. These future projects would constitute an important element to the overall goal of ecosystem restoration, and contribute to improvements in water quality and in habitat conditions. In addition, these impacts are of a beneficial nature to the species concerned and to the environment as a whole. However, given the enormity of changes which have taken place in the basin in the last 100 years, continuing the current scope of restoration efforts would not constitute a significant impact to the overall environment. When compared with the loss of over 200,000 acres of wetlands, and habitat degradation from a variety of human and natural caused factors, current restoration efforts conducted by the ERO are important but not of a highly significant nature. This conclusion will require reevaluation when the time frame for this amended EA concludes in the year 2015.

As discussed in the introduction, the ERO is one of several organizations conducting restoration projects in the basin. The FS and BLM each have independent programs, and The Nature

Conservancy has a large project (approximately 8,000 acres) in progress along the north side of Upper Klamath Lake. Increasing public awareness of water quality issues has resulted in numerous private landholders conducting restoration projects on their land independent of government programs, as well as in cooperation with various federal, state, and local initiatives (i.e., NRCS). Although the overall results of these combined projects are difficult to accurately predict, it is assumed that they will result in beneficial results to the water quality of the region, especially in terms of the needs for the endangered fish species of the region. Other environmental and social benefits are also expected to be realized by these programs. The ERO's projects are an important contributing element to this as well as the overall goal of ecosystem improvement, and play an especially important role in positively influencing public opinion.

The proposed alternative offers the best opportunity for achieving the ERO's goal of promoting restoration, and for resolving the stated need and purpose of this restoration program. It allows for a wide range of projects, in both the uplands and in riparian and wetland areas, which promotes achieving sustainable ecological balance throughout the ecosystem. Furthermore, by utilizing a programmatic approach to the administrative requirements of NEPA legislation, this alternative would minimize the time and costs associated with administering the ERO environmental compliance processes, thus enhancing administrative efficiency.

### 4.2 Consequences of Alternative 2: Implementation of a Limited Range of Restoration Activities

This alternative would differentiate between upland and bottomland projects, authorizing only those activities occurring in wetland or riparian habitats. Upland projects as discussed above would not be considered. Any other project type such as road projects would be authorized only within the riparian or floodplain area. This alternative focuses the restoration efforts of the ERO on riparian and wetland areas, allowing more attention, and funds, to be spent addressing the more immediate issues of water quality, wetlands loss, and riparian degradation, at the expense of conditions away from streams and wetlands which may be less directly influencing these issues, primarily regarding sedimentation. This distinction between uplands and bottomlands fails to acknowledge the interconnectedness of the environment as a whole.

The direct effects of this program would be the same as for the full range of projects, for those project types implemented. The exclusion of upland projects would limit the adverse impacts to air quality from prescribed burns, to wildlife from burns and disturbance, and to vegetation by construction work which would not occur. Beneficial effects to wildlife resulting from thinning and revegetation, and to the native plant life due to those same revegetation efforts would likewise not occur. Potential employment from these projects would be lost, but would likely be made up were upland funds redirected to riparian projects.

Indirect effects would be similar to those for the full program, with important distinctions. Water quality would not benefit as much under this alternative, since many of the upland projects have as their primary focus the reduction of sedimentation into stream channels below the project area. Issues such as landslides, deforestation, and some grazing which occur away from defined riparian areas initiate the movement of sediment which eventually becomes suspended in streams. Failure to address these issues would result in sediment movement which could otherwise be prevented. Juniper stands may continue to influence the hydrology of upland areas, and roads would continue to allow sediments to be washed into streams. Uplands vegetation would continue to be affected by non-native species, excessive fuel loads, and deforestation. Current trends for upland wildlife would remain the same. Social and economic effects would be similar to those for the entire program, although indirect economic effects may be altered by the change in emphasis, and the orientation of education and outreach would necessarily be shifted away from upland issues.

Cumulative impacts would be similar to those for Alternative A, although a shift in emphasis away from upland projects would result in a less comprehensive approach to the restoration efforts being conducted. The overall effect would be similar, in that the environment would likewise not be significantly affected by these programs. However, beneficial results would still be discernable to water quality and habitat conditions. Projects and programs conducted by other agencies and organizations would presumably not be affected by this alternative.

This alternative would partially achieve the overall goal of ecosystem restoration, but only in those areas within the riparian corridor, excluding the uplands which are an important part of the ecosystem. A focus on the riparian corridor may result in more immediate, short-term gains in water quality, but would not resolve many of the deficiencies in the uplands which cause problems in riparian areas. A programmatic approach would also be utilized here, saving time and funds in administrative costs and increasing administrative efficiency.

### 4.3 Consequences of Alternative 3: Cease Restoration Activities

This alternative would result in no new restoration activities being sponsored by the ERO in the UKB. Although currently funded and previously agreed upon projects would be completed, no new projects would be instituted. This alternative is included primarily as a means of providing a benchmark against which the other alternatives can be compared, and represents a continuation of the environmental conditions and trends described in Section III, *Affected Environment*.

***Direct and Indirect Effects:*** Current trends and conditions in the environment as described in the *Affected Environment* section of this document would continue in the absence of ERO-sponsored restoration projects, although the beneficial results of other restoration programs would presumably continue to make improvements. Given the state of the economy in the region and the already high degree of land use, it is unlikely that major new urban or industrial development will occur which may worsen existing conditions.

***Hydrology:*** Current hydrologic conditions would continue into the future. Inadequate groundwater flows resulting from compaction and highly water consumptive non-native plant species may continue, resulting in insufficient recharging of springs and streams, especially during critical dry periods. Down-cutting and gullying of streams may continue and the potential for floods and high flow rates may remain unabated.

***Air quality:*** Air quality would be unaffected by this alternative.

***Water quality:*** Current trends with regard to high nutrient loads (particularly phosphorous and nitrogen) would continue while present land management practices remain. Water temperature would remain high, as streambanks remain denuded of shading vegetation. Sedimentation problems would likewise continue to increase as streambanks would be further eroded, adversely affecting the region's fish populations.

***Fish:*** Fish populations, especially the endangered suckers and bull and redband trout, would continue to be adversely affected by water quality problems already existing in the region. Recovery of these fish populations to acceptable levels is believed to require a substantial improvement in water chemistry, temperature, and sedimentation levels. Habitat conditions would likely remain at current conditions, assuming no major development occurs along the streams and rivers of the region. Changes in the economy or in land use patterns could result in renewed development along waterways, exacerbating current problems; but this is not likely in the time frame of this EA.

***Wildlife:*** Aquatic species such as aquatic mollusks and spotted frogs would likely continue to be adversely affected by water quality problems and habitat loss. Many of these species have had little attention paid to their status and continued degradation of their habitat could prompt federal listing of one or more of these species. Terrestrial species are unlikely to be adversely affected so long as conditions remain stable, although further development throughout the region could further trends in habitat loss.

***Vegetation:*** Wetlands areas would continue to be inadequate to perform their historic roles as floodplains, fish and wildlife habitat, and in the filtration of water, causing water quality conditions to remain in their current inadequate state. Riparian vegetation would continue to be sparse, allowing resultant streambank stabilization, sedimentation, water temperature, and fish and wildlife habitat problems to continue or potentially worsen. Non-native plant species would potentially continue to spread in riparian and wetlands areas, as well as areas defined as upland such as sagebrush grassland and forests. The spread of juniper thickets would continue, with associated water consumption issues. Forests would continue to have degraded conditions resulting from logging, grazing, and fire prevention strategies.

***Social/Economic:*** Present high levels of unemployment in the region would continue, although the numbers of workers typically employed by restoration activities is low so the overall impact on the economy would be minimal. No incidental economic affects would result from the purchase of supplies and equipment, nor would a trickle-down affect occur as workers spend their incomes. Training and educational opportunities would not take place, continuing misunderstandings between the public and land management agencies. Archeological resources would not be disturbed by project construction; on the other hand, the absence of project-related archeological surveys may result in not identifying potentially significant cultural resources.

***Cumulative Effects:*** The absence of ERO sponsored restoration projects would not necessarily affect projects sponsored by other agencies or independent organizations. However, many of these organizations partially utilize ERO funds for their projects, and the absence of this funding source would likely lessen the number and size of their projects. As discussed earlier, the FS, BLM, and other federal and state land management agencies have independently funded and administered restoration projects which would continue. In addition, The Nature Conservancy has several large-scale projects oriented towards restoring wetlands around Upper Klamath Lake, and private efforts are conducted throughout the basin. Over time, it is hoped that the combined influence of these projects, even in the absence of ERO-funded projects, would result in major improvements in the habitat and water quality conditions in the UKB, although the absence of ERO-sponsored projects would slow this process and limit projects conducted on private lands, an important aspect of the ERO program.

This alternative would not meet the goals of the ERO, nor achieve the need and purpose for restoration projects as set forth in this document. The primary purpose of the inclusion of this alternative has been to set a benchmark against which the proposed restoration activities can be compared. Given the presence of several federally listed species in the area, some restoration activities would still have to take place to achieve compliance with the ESA and other state and federal mandates.

### 4.4 Consequences of Alternative 4: Provide Compliance on an Individual Project Basis (No Action)

This option would continue the current practice of performing NEPA compliance on a project-by-project basis as opposed to conducting a programmatic EA for the entire range of restoration activities.

Conducting compliance on a project-by-project basis would allow for detailed analysis of the impacts of each project to be examined closely and with specific attention to the characteristics of the work site. However, this requires substantial staff time and costs relating to administrative details which can be avoided by utilizing a programmatic approach. Efficiency would be greatly diminished and NEPA compliance may be less consistent when working with individual projects. Moreover it would enhance the difficulties in regarding the ecosystem as a whole, and makes an evaluation of the cumulative effects of these projects more piecemeal and less comprehensive.

Continuing this approach to NEPA compliance is not expected to make a major difference in the type, size, or number of restoration projects which will be approved annually. Nor will it affect the environmental impacts of these projects once on-the-ground work commences. The environmental impact of these individual projects will generally be the same as similar projects conducted under the programmatic EA, as described above.

The use of this project-by-project approach to NEPA compliance was appropriate initially for the ERO's restoration activities and for evaluating the impacts of individual projects. However, it was decided that a comprehensive NEPA analysis was appropriate for assessing the near future impacts of continuing the ERO's restoration program for the next ten years (through 2015), hence the development of this programmatic analysis.

The individual projects foreseen under this alternative would also meet the goals of the ERO and achieve the need and purpose of this restoration program as set forth. In order to be in compliance with NEPA, however, this project-by-project approach would require inefficient and repetitive paperwork and analysis. Writing project-specific EAs would be inefficient, time-consuming and costly, probably resulting in fewer projects being implemented annually and lessening the overall beneficial impacts to the ecosystem resulting from this program. This alternative would not affect other ongoing restoration programs.

### 4.5 Supplement Analysis

Parameters have been established for each project type to determine if this amended EA covers the action or if further analysis is needed. These parameters were added for a simple purpose -- to make this document more useful and to ensure that the extent of its coverage is clear. If a project falls beyond these parameters, an individual EA or an EIS will be developed.

The scope of this amended EA has not changed, nor has the affected environment changed since the FONSI was signed in March 2000. Therefore, a new or supplemental EA is not required.

**Table 3: Comparison of Impacts (Direct & Indirect)**

| | **Alternative 1:** ***Proposed Action: Full Range of Restoration Projects (Programmatic NEPA)*** | **Alternative 2:** ***Limited Restoration Projects (Programmatic NEPA)*** | **Alternative 3:** ***Cease Restoration Projects*** | **Alternative 4:** ***Continue Project-by-Project Compliance*** |
|---|---|---|---|---|
| **Hydrology** | Slow flows, recharge subsurface flows, water conservation, lessen flood and scour potential. | Slow flows, lessen flood and scour potential, lowered water conservation. | Higher flow rates, higher flood and scour potential. | Same as Alt. #1 for individual projects |
| **Air Quality** | Short-term dust, exhaust fumes, smoke from prescribed burns; no long-term effects. | Dust, exhaust fumes along riparian corridors. No smoke and no long-term effects. | No effects. | Same as Alternative 1 |
| **Water Quality** | Short-term disturbance from construction, long-term lowering of sediment loads, chemical content, and water temperature. | Same as Alternative 1, except less lowering of sediment loads. | Continued inadequate water chemistry, temp., and sediment conditions. | Same as Alternative 1 |
| **Fish** | Short-term disturbance from construction. Improved spawning, feeding, and resting habitats. Protect endangered fish from hazards and predator/non-native species. Restore access, improve water quality and vegetative cover, and better understand fish ecology. | Same as Alternative 1, except lower improvement in water quality. | Slower recovery of endangered species and less protection from hazards and/or non-natives. No improvements in habitat. | Same as Alternative 1 |
| **Wildlife** | Short-term disturbance from construction. Improved nesting and roosting areas, forage habitat, cover, and food sources. | Short-term disturbance from construction. Improvements would only benefit riparian corridor species. | Continued degraded habitat and slower improvement of water quality conditions. | Same as Alternative 1 |
| **Vegetation** | Crushing and destruction from construction. Improved species composition and density. Lessened competition from non-natives and water consumptive species. Improved watering regimes and exclusion of grazing and trampling livestock. | Crushing and destruction from construction. Improvements would only benefit riparian corridor species. | Continued trampling and damage from livestock. No removal of non-native and/or invasive species. Continued accumulation of fuel loads in understory. | Same as Alternative 1 |
| **Social/ Economic** | Local employment of workers, local expenditure for supplies and materials. Training in restoration techniques. Public relations and education and outreach to public. | Similar to Alternative 1, though projects would not be conducted in upland areas. | No additional relief to continued high unemployment rates in region. No training and/or education programs. | Same as Alternative 1 |

# V. CONSULTATION AND COORDINATION

## 5.1 Public Participation

To comply with NEPA guidelines, efforts have been made to inform the public of the preparation of the EA. A scoping letter was sent on October 4, 1999 to approximately 400 concerned individuals and organizations in the local and regional area, summarizing the purpose of the EA and soliciting comments on the restoration program. A newspaper article regarding this process appeared in the Klamath Falls Herald and News on October 10, 1999. Public meetings were not organized due to the lack of interest generated by the scoping letter. The availability of this EA will be advertised in local newspapers, and the EA will be made available for a 30-day comment period, after which a decision will be made by the Service. Copies of the mailing list, scoping letter, and any correspondence received regarding this EA will be available at the Klamath Basin USFWS Office. Because the amended EA is similar in purpose and scope as the original EA and the political climate remains relatively unchanged, no further public involvement is planned during the amendment process.

## 5.2 Permits and Clearances

***Natural Historic Preservation Act:*** All projects funded by the ERO will be in conformance with the NHPA, which requires the USFWS to consider the affects of any federally funded project on cultural resources. A Programmatic Agreement (PA) exists between the USFWS and the State Historic Preservation Offices for California and Oregon, which regulates the compliance with the NHPA. Record searches and/or on-the-ground field surveys will be conducted as appropriate for all projects funded by the ERO.

***Endangered Species Act:*** The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), requires federal agencies to conserve endangered or threatened species. Section 7 of that Act requires that federal agencies consult with the Service to insure that any action authorized, funded, or carried out by that agency is not likely to jeopardize the continued existence of any endangered species or result in adverse modification of designated critical habitat. To facilitate that consultation, a biological assessment is prepared for major construction projects if any of those species or their critical habitat is present in the proposed action area. All projects funded by the ERO will be in compliance with the Act.

***Clean Water Act:*** All projects will be in compliance with local, state and federal requirements relating to Section 404 of the Clean Water Act prior to commencing ground-disturbing activities. All necessary permits will be obtained, including the 404 permit, as appropriate.

***Hazardous Materials Determinations:*** Prior to conducting projects, a Level 1 Environmental Contaminants Survey will be conducted by certified personnel to determine the existence of any hazardous materials at the work site. A Level 2 survey will be conducted if hazardous materials or materials of a suspicious nature are discovered, and if necessary projects will be redesigned or abandoned in accordance with the procedures set forth in the Department of the Interior Manual, Chapter 341 FW3.

All other pertinent federal, state, and local laws and regulations will be upheld and all appropriate permits will be obtained from the regulating agency.

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# APPENDIX A:  Activity Description and Impacts

| **Restoration Activity/*Project Category*[1]** | **Activity Description/Impact Analysis[2,3]** |
|---|---|
| **1.** Installation of wood and/or boulder instream structures (*Instream)* | **1.** Installations will consist of weir, cluster, deflector, revetment, and cover structures designed with large woody debris and/or boulder materials. Structures will be either non-affixed or affixed[4] depending on site location and design criteria. Placements will mimic the natural input of nutrients into aquatic systems, create needed spawning and rearing habitats for fish and aquatic wildlife species, increase instream structural complexity and diversity, and restore former hydrologic regimes. Structures would be used for short-term establishment of natural processes and will only be used for long-term solutions if they are self-sustaining. |
| **2.** Installation of instream structures to establish natural hydrologic regimes in riparian/wetland habitats *(Riparian/Wetland)*<br><br>(Flosi and Reynolds 1994, Seehorn 1992) | **2.** Installations of wood and/or boulder instream structures will attempt to restore the former natural hydrologic functions in riparian and wetland habitats by the deflection of stream flows into adjoining floodplain areas. Flow deflections will improve and promote natural vegetation composition and diversity, decrease flow velocities, and increase water storage and recharge rates.<br><br>➢These types of installations may cause temporary decreases in water quality through increased sedimentation and turbidity and will impact riparian/wetland vegetation to create the access for structure placement. However, follow-up native vegetative plantings and bank stabilization structures/techniques will eliminate or reduce these conditions. Excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in down slope habitats. The realization that improperly installed structures may cause adverse impacts to streams and streambanks are known and documented. |
| **3.** Hydrologic modifications to stream side channels *(Instream)* | **3.** To increase rearing habitats, side channels will be modified by opening or improving stream flows through these areas. The natural channel diversity and complexity will be restored by modifying hydrologic regimes and installing instream structures. In addition, the excavation and removal of channel and bank sediments will improve instream habitat characteristics and increase the hydrologic capacity of streams. Structures would be used for short-term establishment of natural processes and will only be used for long-term solutions if they are self-sustaining. |
| **4.** Development of off-channel refuge areas *(Instream)* | **4.** Off-channel refuge areas (e.g., alcoves, backwaters, sloughs) will be developed to provide resting areas for aquatic species during high stream flow events. Instream structures will be installed, as necessary, to reduce flow velocities and provide appropriate protective cover. Structures would be used for short-term establishment of natural processes and will only be used for long-term solutions if they are self-sustaining.<br><br>**5.** Streams will regain their sinuosity which decreases the flow rate and allows for the development of riparian and |

[1] - Literature citations reference typical techniques and materials that may be used for restoration activities under the indicated Project Category.
[2] - Refer to Appendix B for the duration of habitat disturbances for each restoration activity.
[3] - Refer to Appendix E for a listing of Best Management Practices and guidelines.
[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

## APPENDIX A: Activity Description and Impacts

| **Restoration Activity/*Project Category*[1]** | **Activity Description/Impact Analysis[2,3]** |
| --- | --- |
| **5**. Reshaping ditched/straightened stream channels, abandoning and/or plugging straightened reaches, and/or relocation of streams to historic channels *(Instream)* | associated wetland areas and instream habitat complexity. The associated effects will help prevent flooding events, reduce peak flows and trap sediments.<br><br>➢All of the above activities will cause temporary decreases in water quality through increases in sedimentation and turbidity, and will impact riparian/wetland vegetation through removal. However, follow-up native vegetative plantings and bank stabilization structures/techniques will eliminate or reduce these conditions. Excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in down slope habitats. |
| **6.** Installation of bioengineered streambank stabilization structures and the implementation of sedimentation and erosion reduction techniques *(Instream, Riparian/Wetland, and Fish Passage)*<br><br>**7.** Installation of bioengineered soil and slope stabilization structures and the implementation of sedimentation and erosion reduction techniques *(Upland)*<br><br>(Natural Resources Conservation Service 1996, Soil Conservation Service 1992) | **6.** Natural stabilization materials (e.g., vegetation, boulders, rip-rap, woody debris, and fiber matting) will be installed to redirect or reduce stream flows to eliminate or reduce streambank erosion. Streambank slopes may be graded back to a 2:1 slope ratio at the minimum to eliminate or reduce bank erosion and to ensure that structures and techniques will function properly. The extent of areas impacted by structures/techniques will depend on the degree of unstable banks. Structures will be placed and appropriately anchored within the toe and bank zones of stream channels and will provide cover for fish and aquatic wildlife species. Structures will be used for short-term establishment of natural processes and will only be used for long-term solutions if they are self-sustaining.<br><br>**7.** Comparable structures and techniques used for streambank stabilization will also be used to stabilize upland and forest soils and slopes that will provide direct water quality benefits to down slope stream, riparian, and wetland habitats by reducing sediment loading.<br><br>➢Installations in both of the above systems may cause temporary decreases in water quality (sedimentation and turbidity) and will impact riparian/wetland and upland vegetation. However, follow-up native vegetative plantings and stabilization structures/techniques will eliminate or reduce these conditions. Excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in down slope habitats. |
| **8.** Restoration and/or enhancement | **8 & 9.** The restoration, enhancement, creation and/or management will improve the wide array of wetland functions that |

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

| **Restoration Activity/*Project Category*[1]** | **Activity Description/Impact Analysis[2,3]** |
|---|---|
| of natural wetlands and their functions *(Riparian/Wetland)*<br><br>**9.** Creation and/or management of wetlands and their functions *(Riparian/Wetland)*<br><br>(Soil Conservation Service 1992) | are important for the overall health of any watershed. Wetland activities may involve, but are not limited to, the excavation and removal of fill materials (note: hydric soils, if present, will not be removed during fill removals), development of appropriate berms/impoundments with or without the installation of water control structures, planting of native wetland vegetation, plugging and/or removing drain tiles in agricultural fields, excavating pools and ponds, and de-leveling areas that have been laser leveled. Structures will be used for short-term establishment of natural processes and will only be used for long-term solutions if they are self-sustaining. Various types of wetland habitats and hydrologic regimes may be restored or created under these restoration activities. Hydric soils may be retrieved and stockpiled from other sites with necessary permits and used for the reestablishment or creation of wetlands.<br><br>➢As with any activity involving extensive earth disturbances, there will be a temporary decrease in water quality caused by increased sediment loading, but follow-up native vegetative plantings and stabilization structures/techniques will eliminate or reduce this condition. Excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in down slope habitats. |
| **10.** Installation or development of wildlife foraging, breeding, nesting, and basking structures<br>*(Instream, Riparian/Wetland, Fish Passage and Upland)* | **10.** To enhance terrestrial and aquatic habitats holistically, various habitat components and structures will be installed or developed for interim use by Sensitive Species until native plant communities become established. These may include, but are not limited to, bat roosting/breeding structures, avian nest boxes, turtle basking logs, hardwood snags, brush/cover piles, large downed woody debris, and raptor perches.<br><br>➢The installation of fish and wildlife structures may be part of instream, riparian/wetland, fish passage, and/or upland restoration activities and should not cause additional impacts to terrestrial and aquatic habitats. Any instream or riparian/wetland structures will have similar impacts as those listed under Activities 1 and 2 (see above). These improvements will provide extended benefits to a variety of fish and wildlife species. Structures will be used for short-term establishment of natural processes and will only be used for long-term solutions if they are self-sustaining. |
| **11.** Installation of streambank | **11.** Installation of fences, watering facilities, and stream crossing will eliminate or reduce livestock degradation of |

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[2] - Refer to Appendix B for the duration of habitat disturbances for each restoration activity.
[3] - Refer to Appendix E for a listing of Best Management Practices and guidelines.
[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

# APPENDIX A: Activity Description and Impacts

| Restoration Activity/*Project Category*[1] | Activity Description/Impact Analysis[2,3] |
|---|---|
| and/or cross-pasture fencing for livestock exclusion and/or grazing management, off-channel livestock watering facilities, livestock stream crossings *(Riparian/Wetland)* | streambanks and riparian/wetland vegetation. Fences will be installed by hand and/or with mechanical augers/post pounders. Site preparations may involve the removal of native or nonnative vegetation along proposed fence lines; vegetation removal may be done by manual, mechanical, prescribed fire, and/or chemical means. Riparian/wetland buffer zones between streambanks and fence lines will be planted with native shrubs and trees where natural vegetation is not expected to occur in the short-term. Reestablishment of native the plant community will provide streambank stabilization, sediment retention/stabilization, stream shading, nutrient production, wildlife habitats, and future sources of large woody debris. Watering facilities will be installed in pastures next to streams and will consist of various low volume pump feed systems. Either above ground or underground piping will be installed between watering devices and streams. Livestock stream crossings may consist of railroad flat cars or steel/wooden plank bridges placed on concrete abutments at appropriate locations. Crossing abutments may be placed on developed berms, as appropriate, to protect structures from high stream flow events. Crossing installations may also consist of appropriately fenced and armored streambank sections. Watering facilities and livestock crossings will eliminate or reduce the need of direct livestock access to specific stream reaches, thus preventing further aquatic degradations. |
| **12.** Installation of livestock exclusion fencing and/or cross fencing for grazing management, livestock watering facilities *(Upland)*<br><br>(Bureau of Land Management 1989) | **12.** Installation of fences and watering facilities in upland habitats will be comparable to riparian/wetland installations, except watering facilities may be ground water drawn instead of a direct stream feed. Limiting or excluding livestock from unstable soils and slopes will provide protection from future sedimentation and erosion hazards, and will promote an increase in the composition and diversity of native vegetation.<br><br>➢ Fence installations in both of the above examples may cause temporary decreases in water quality and will impact riparian/wetland and upland vegetation. However, follow-up native vegetative plantings and stabilization structures/techniques will eliminate or reduce these conditions. Fence designs and installations (i.e., wire type and wire spacing) will be compatible with wildlife uses in project areas to the extent possible. Installations will also improve pasture management strategies associated with livestock grazing. |
| **13.** Closure, abandonment, or decommissioning of roads *(Riparian/Wetland and Upland)*<br><br>**14.** Drainage improvements on | **13.** To eliminate or reduce sedimentation and erosion hazards to down slope habitats, selected roads will be altered to prevent vehicular use and to stabilize soils, slopes, and roadbeds. Roads may be gated, tanked, removed, planted with native vegetation, or modified through other road related activities.<br><br>**14.** Water drainage patterns on roadways will be modified, as needed, to eliminate or reduce sedimentation and erosion |

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[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

APPENDIX A: Activity Description and Impacts

| **Restoration Activity/*Project Category*[1]** | **Activity Description/Impact Analysis[2,3]** |
|---|---|
| roads for sedimentation and erosion control *(Riparian/Wetland and Upland)* | hazards to down slope habitats. Drainage improvements may consist of water bars, road culvert alterations/removals, cross drain installations, revegetation of fill and cut slopes, sidecast removals, road prism shaping, or other road related activities.<br><br>➢Depending on the type of road related activities, the above installations or modifications may cause temporary decreases in down slope water quality and will impact riparian/wetland or upland vegetation in the immediate area around the work site. Follow-up native vegetative plantings and stabilization structures/techniques will eliminate or reduce these conditions. Excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in down slope habitats. |
| **15.** Planting of native vegetation *(Riparian/Wetland, Fish Passage, and Upland)*<br><br><br><br><br><br><br><br><br><br>**16.** Silviculture treatments *(Riparian/Wetland and Upland)*<br><br><br><br><br><br><br>(Rose et al. 1996a and 1996b) | **15.** Native vegetative plantings will occur on a variety of project sites, including areas where soil or slope disturbances have occurred. Plantings will consist of conifers, hardwood trees, shrubs, grasses, sedges, rushes, submerged/floating plants, herbs, and forbs. Specific project locations will dictate the appropriate planting regimes on disturbed areas. The use of nonnative vegetation will be strictly limited and will apply to situations where native vegetation (i.e., grasses) is not commercially available. All nonnative vegetation must be a close subspecies or variety to native species or reproductively altered (i.e., sterilized) to avoid future ecological complications with native species.<br><br>➢Native vegetative plantings should only cause minor disturbances to soils, since most plantings will be done by hand. Plant growth will be rapid because planting activities will only occur during optimal seasonal growth periods.<br><br>**16.** Silviculture treatments may include removing, girdling, and chemically injecting hardwood trees and conifers to release established hardwoods/ conifers; thinning or stock reduction; planting seedlings to promote or reestablish hardwood/conifer stands; and treating under story vegetation (i.e., by manual, mechanical, prescribed fire, and/or chemical means) to aid in tree release or site preparation. Hardwoods and conifers felled in timber stands may be removed from the stand, remain on site for nutrient recycling, or used for other restoration activities. These practices would be conducted on a limited basis to allow hardwoods currently established to continue shade and organic inputs to the stream.<br><br>➢Silviculture treatments may cause soil and slope disturbances depending on extent and type of treatments. Disturbed areas will be stabilized during and after project completion until appropriate levels of natural plant growth has been established to stabilize the sites. These requirements will eliminate or reduce any decreases in water quality from sediment loading. |
| | |

[1] - Literature citations reference typical techniques and materials that may be used for restoration activities under the indicated Project Category.
[2] - Refer to Appendix B for the duration of habitat disturbances for each restoration activity.
[3] - Refer to Appendix E for a listing of Best Management Practices and guidelines.
[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

## APPENDIX A: Activity Description and Impacts

| **Restoration Activity/*Project Category*[1]** | **Activity Description/Impact Analysis[2,3]** |
|---|---|
| **17.** Controlled disturbances/Management practices *(Upland)* | **17.** Controlled disturbances may include, but are not limited to, prescribed fire, haying, brushing, or grazing to maintain a particular successional plant community. In some instances, early and mid-successional communities are not maintained due to land use activities that suppress natural disturbances (e.g., fire suppression).<br><br>➢Disturbance treatments would be planned to set back or maintain the current plant community. Use of fire as a management tool will be implemented in accordance with local codes and standards. Precautions will be taken to ensure that fire does not spread beyond the prescribed area. Grazing will be limited to the minimal Animal Unit Months (1AUM = the amount of forage for a 1200 lb. cow plus one calf for one month) required to maintain the desired seral-stage plant community and to minimize the chance of soil compaction. Haying or brushing will have minimal impacts on soils or adjacent lands. Frequency of treatments will be planned in accordance with vegetative responses. Service cost-share funding for such practices will be limited to the 5-year period following initial restoration activity of a given project. |
| **18.** Control or removal of invasive plant species *(Riparian/Wetland and Upland)*<br><br>(Oregon State University 1996, Taylor 1990) | **18.** Invasive plant species (e.g., Himalaya blackberry, Rubus discolor, Scotch broom, *Cytisus scoparius*, Teasel, *Dipsacus sylvestris*) that interfere with fish and wildlife uses, habitat uses, or out compete native vegetation will be controlled or removed as necessary. Control and removal activities will be completed by mechanical, agricultural, prescribed fire, biological, and/or herbicidal methods. Mechanical, agricultural, and prescribed fire methods will be the preferred means for control or removal activities. Biological agents will not be used unless they have been properly approved for use by appropriate federal and state agencies. Herbicides will be used, where appropriate, for control or removal activities.<br><br>➢Project personnel must be qualified to use herbicides and must contact the local or state agricultural extension agent for assistance in herbicide selection and use. Manufacturers' instructions and warning must always be adhered too. Herbicides will only be applied by wick or hand spray applicators to protect non-target species and the surrounding habitats. Unsprayed buffer zones will be required around all aquatic habitats and other sensitive areas. Control or removal areas with soil or slope disturbances will be replanted with native vegetation and stabilization structures/techniques will be implemented to eliminate or reduce sediment loading in down slope habitats. Invasive plants removed will be brought to a county approved disposal site or chipped and composted off site to prevent spread of these invasive plants. Landowners will follow-up with invasive plant control and removal activities after completion of projects. |
| **19.** Installation or modification of | **19.** Installations or modifications will be primarily directed at providing fish passage to habitats beyond man made barriers |

[1] - Literature citations reference typical techniques and materials that may be used for restoration activities under the indicated Project Category.
[2] - Refer to Appendix B for the duration of habitat disturbances for each restoration activity.
[3] - Refer to Appendix E for a listing of Best Management Practices and guidelines.
[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

| Restoration Activity/*Project Category*[1] | Activity Description/Impact Analysis[2,3] |
|---|---|
| fishways *(Fish Passage)*<br><br>(Flosi and Reynolds 1994, U. S. Army Corps of Engineers 1990) | (e.g., dams and spillways). 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, Alaskan steep passes, and step-and-pool weirs. Modifications to fishways may include deepening plunge pools, redirecting water flows to provide proper water levels and flow velocities during critical migration periods, 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 inappropriate fish access.<br><br>➢Design criteria for any fishway will be tied to site specific conditions and the fish species being impeded; design details of fishways will be reviewed and approved by biologists from the National Marine Fisheries Service, Oregon Department of Fish and Wildlife and/or U.S. Fish and Wildlife Service. As with any instream or riparian/wetland activity, the potential exists for decreased water quality due to sediment loading and the loss of riparian/wetland vegetation. These conditions will be temporary due to follow-up native vegetative plantings and the implementation of bank stabilizing structures/techniques. Excess fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in down slope habitats. |
| **20.** Re-engineering of irrigation diversion structures *(Fish Passage)* | **20.** The construction of annual instream gravel pushup dams in Oregon has resulted in fish passage barriers on mainstem rivers and side tributaries. The installations of the dams have resulted in the loss of riparian/wetland vegetation, benthic macro and microhabitats, instream structural complexity and diversity, increased sediment loading, and de-stabilization of streambanks. Restoration activities will involve the installations of underground infiltration galleries to provide a reservoir for above ground streambank pumping stations. These installations would eliminate the need for gravel pushup dams while still providing the required seasonal irrigation withdrawals. In addition, flash board check dams may also be removed and replaced with infiltration galleries to provide unobstructed fish passage.<br><br>➢The installation of infiltration galleries and associated pumping stations will result in a temporary increase in sediment loading and loss of riparian/wetland vegetation. However, follow-up native vegetative plantings and bank stabilization structures/techniques will eliminate or reduce these conditions. Excess streambed substrate materials removed during gallery installations will be replaced and leveled within the non-wetted stream channel sections. Excess non-streambed fill materials removed during the completion of the above activities will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading in down slope habitats. |
| **21.** Removal or lowering of | **21.** The degree of the alterations to jams and culverts will be determined on an individual site basis. Natural instream log |

[1] - Literature citations reference typical techniques and materials that may be used for restoration activities under the indicated Project Category.
[2] - Refer to Appendix B for the duration of habitat disturbances for each restoration activity.
[3] - Refer to Appendix E for a listing of Best Management Practices and guidelines.
[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

## APPENDIX A: Activity Description and Impacts

| **Restoration Activity/*Project Category*[1]** | **Activity Description/Impact Analysis[2,3]** |
|---|---|
| culverts or log jams, and/or removal of tidegates *(Fish passage)* | jams that impede fish passage will be removed or lowered as necessary. The areas around culvert removal sites will be contoured to surrounding slope conditions and stabilized. Culverts that are lowered will be excavated, repositioned, and fill materials/roadways replaced through bioengineering or combination bioengineering and hard engineering techniques. Native plant species indigenous to the area will be used. The removal or lowering of log jams and culverts and the removal of tidegates will improve fish passage, prevent streambank and roadbed erosion, and eliminate or reduce sediment loading. |
| **22.** External and/or internal modifications to culverts *(Fish passage)* | **22.** External and internal culvert alterations may include the installation of baffles to redirect or reduce flow velocities, step-and-pool weirs at culvert outlets, trash/debris racks, or erosion protection structures at culvert outlets or inlets. Appropriate culvert alterations will improve fish passage and increase protection to streambanks and roadway crossings. Structures will be used for short-term establishment of natural processes and only used for long-term solutions if they are self-sustaining. |
| **23.** Realignment of culverts to stream flows *(Fish passage)* | **23.** Misaligned culverts will be excavated, realigned, and fill materials/roadways replaced through bioengineering or combination bioengineering and hard engineering techniques. Native plant species indigenous to the area will be used. Dynamic changes in stream flow patterns through culverts have caused streambank erosion, undermining of roadbeds, and the washout of culverts. Realigning culverts to current stream flows will eliminate or reduce these conditions. |
| **24.** Replacement of undersized culverts with appropriately sized culverts *(Fish passage)* | **24.** Culverts determined to be undersized, with respect to current hydrologic flows, will be replaced with appropriately sized culverts. These culverts will be excavated, replaced, and fill materials/roadways replaced through bioengineering or combination bioengineering and hard engineering techniques. Native plant species indigenous to the area will be used. Hydrologic flows through undersized culverts have caused streambank erosion, undermining of roadbeds, washout of culverts, and fish passage impediments; installation of appropriate sized culverts will eliminate or reduce these conditions. |
| **25.** Replacement of culverts with bridges *(Fish passage)*<br><br>(Evans and Johnston 1980) | **25.** Stream crossings determined to be inappropriate for current culvert installations will be redesigned for steel/concrete reinforced bridge installations. Bridges will allow unobstructed fish passage, improved stream flows, and decreased sedimentation and erosion rates. Bridge designs and installations will conform to all federal and state standards.<br><br>➢Log-jam removal, culvert modification and removal, and traditional tidegates will result in temporary increases in sediment loading and vegetation loss. Bank stabilization techniques will eliminate or reduce these conditions. Excess fill will be deposited in appropriate upland areas and stabilized to eliminate future sediment loading to downslope habitats. Overall, these modifications will benefit anadromous and resident fish by improving passage, habitats, and water quality. |
| **26.** Fish collection and rearing | |

[1] - Literature citations reference typical techniques and materials that may be used for restoration activities under the indicated Project Category.
[2] - Refer to Appendix B for the duration of habitat disturbances for each restoration activity.
[3] - Refer to Appendix E for a listing of Best Management Practices and guidelines.
[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

# APPENDIX A: Activity Description and Impacts

| Restoration Activity/*Project Category*[1] | Activity Description/Impact Analysis[2,3] |
|---|---|
| *(Instream)* | **26.** Listed as well as non-listed fish may be captured by drift or dip nets, light traps, or other suitable means and reared in an artificial setting. The fish may be captured from any water body or wetland in the Klamath Basin, or outside the basin if deemed beneficial. The effectiveness of Artemia, plankton, razorback, Bio Flake, and other suitable diets will be tested. Water quality parameters such as temperature, dissolved oxygen, pH, ammonia, hardness, and alkalinity may be monitored. Existing fish hatchery experts will be consulted to streamline the process.<br><br>➢There may be incidental take of listed fish during the capture and rearing process. The long-term benefit will be to gain additional knowledge regarding the ecology of the target fish. |

[1] - Literature citations reference typical techniques and materials that may be used for restoration activities under the indicated Project Category.
[2] - Refer to Appendix B for the duration of habitat disturbances for each restoration activity.
[3] - Refer to Appendix E for a listing of Best Management Practices and guidelines.
[4] - Instream structures that are firmly buried or cabled in a stream channel or bank.

## APPENDIX B: Habitat and Noise Level Disturbances

| Restoration Activity [1] | Project Category | Temporary Habitat Disturbances [2,3] | | | Temporary Noise Level Disturbances [4] | | |
|---|---|---|---|---|---|---|---|
| | | short-term | mid-term | long-term | low | moderate | high |
| 1. Installation of wood and/or boulder instream structures (heavy machinery or helicopter) | Instream | ❶ | ❷ | | | Δ | Δ |
| 2. Installation of instream structures to reestablish natural hydrologic regimes in riparian/wetland habitats | Riparian/Wetland | ❶ | ❷ | | | Δ | |
| 3. Hydrologic modifications to stream side channels | Instream | ❶ | ❷ | | | Δ | |
| 4. Development of off-channel refuge areas | Instream | ❶ | ❷ | | | Δ | |
| 5. Reshaping ditched/straightened stream channels, abandoning and/or plugging straightened steam segments, and/or relocation of streams to historic channels. | Instream | ❶ | ❷ | | | Δ | |
| 6. Installation of bioengineered streambank stabilization structures and the implementation of sedimentation and erosion reduction techniques | Instream<br>Riparian/Wetland<br>Fish Passage | ❶<br>❷ | | | | Δ | |
| 7. Installation of bioengineered soil and slope stabilization structures and the implementation of sedimentation and erosion reduction techniques | Upland | ❶<br>❷ | | | | Δ | |
| 8. Restoration, and/or enhancement, and/or management of natural wetlands and their restored functions | Riparian/Wetland | | | ❶<br>❷ | | | Δ |
| 9. Creation and/or management of wetlands and their restored functions | Riparian/Wetland | | | ❶<br>❷ | | | Δ |
| 10. Installation or development of wildlife foraging, breeding, nesting, roosting, and basking structures | Instream<br>Riparian/Wetland<br>Fish Passage<br>Upland | ❶<br>❷ | | | | Δ | |

1 - Refer to Appendix A for a detailed description of restoration activities.
2 - ❶ refers to aquatic habitats, ❷ refers to terrestrial habitats
3 - Refers to the estimated length of time, both during and after project completion, necessary to stabilize soils, slopes, and streambanks; establish or reestablish native vegetation; and eliminate project caused water quality decreases at individual project sites.

**short-term: < 30 days; mid-term: 30-60 days; long-term: 61-180 days**

4 - Noise levels (decibels (dB)) were estimated based on the typical types of equipment needed to complete restoration activities (refer to Figure 1). The duration and fluctuation of daily noise levels will depend of the extent of the restoration activity. The decibel is a logarithmic scale of sound pressure or intensity. Decibel intensity increases by units of 10; each increase is 10 times the lower figure. (example - 20 dB is 10 times the intensity of 10 dB, 30 dB is 100 times the intensity of 10 dB etc.).

**low: < 50 dB; moderate: 51-90 dB; high: > 90 dB**

## APPENDIX B: Habitat and Noise Level Disturbances

| Restoration Activity [1] | Project Category | Temporary Habitat Disturbances [2,3] | | | Temporary Noise Level Disturbances [4] | | |
|---|---|---|---|---|---|---|---|
| | | short-term | mid-term | long-term | low | moderate | high |
| 11 a&b. Installation of: streambank and/or cross-pasture livestock exclusion fencing, and/or off-channel livestock watering facilities | Riparian/Wetland | ❶<br>❷ | | | | Δ | |
| 11 c. Installation of livestock stream crossings | Instream<br>Riparian/Wetland | | | ❶<br>❷ | | | Δ |
| 12. Installation of livestock exclusion fencing and/or livestock watering facilities | Upland | ❶<br>❷ | | | | Δ | |
| 13. Closure, abandonment, or decommissioning of roads | Riparian/Wetland<br>Upland | | ❶<br>❷ | | | | Δ |
| 14. Drainage improvements on roads for sedimentation and erosion control | Riparian/Wetland<br>Upland | ❶ | ❷ | | | | Δ |
| 15. Planting of native vegetation | Riparian/Wetland<br>Fish Passage<br>Upland | ❶<br>❷ | | | Δ | | |
| 16. Silviculture treatments | Riparian/Wetland<br>Upland | | | ❶<br>❷ | | | Δ |
| 17. Controlled disturbances/management practices | Riparian/Wetland<br>Upland | ❶<br>❷ | ❶<br>❷ | | Δ | Δ | |
| 18. Control or removal of invasive plant species | Riparian/Wetland<br>Upland | | ❶<br>❷ | | | Δ | |
| 19. Installation or modification of fishways | Fish Passage | ❷ | ❶ | | | | Δ |
| 20. Reengineering of irrigation diversion structures | Fish Passage | ❶<br>❷ | | | | | Δ |
| 21. Removal or lowering of culverts or log jams, and/or removal of tidegates | Fish Passage | ❶ | ❷ | | | | Δ |
| 22. External and/or internal modifications to | Fish Passage | ❶ | | | | | |

1 - Refer to Appendix A for a detailed description of restoration activities.
2 - ❶ refers to aquatic habitats, ❷ refers to terrestrial habitats
3 - Refers to the estimated length of time, both during and after project completion, necessary to stabilize soils, slopes, and streambanks; establish or reestablish native vegetation; and eliminate project caused water quality decreases at individual project sites.

**short-term: < 30 days; mid-term: 30-60 days; long-term: 61-180 days**

4 - Noise levels (decibels (dB)) were estimated based on the typical types of equipment needed to complete restoration activities (refer to Figure 1). The duration and fluctuation of daily noise levels will depend of the extent of the restoration activity. The decibel is a logarithmic scale of sound pressure or intensity. Decibel intensity increases by units of 10; each increase is 10 times the lower figure. (example - 20 dB is 10 times the intensity of 10 dB, 30 dB is 100 times the intensity of 10 dB etc.).

**low: < 50 dB; moderate: 51-90 dB; high: > 90 dB**

## APPENDIX B: Habitat and Noise Level Disturbances

| Restoration Activity [1] | Project Category | Temporary Habitat Disturbances [2,3] | | | Temporary Noise Level Disturbances [4] | | |
|---|---|---|---|---|---|---|---|
| | | short-term | mid-term | long-term | low | moderate | high |
| culverts | | ❷ | | | | Δ | |
| 23. Realignment of culverts to stream flows | Fish Passage | ❶ | ❷ | | | | Δ |
| 24. Replacement of undersized culverts with appropriately sized culverts | Fish Passage | ❶ | ❷ | | | | Δ |
| 25. Replacement of culverts with bridges | Fish Passage | | ❶ | ❷ | | | Δ |
| 26. Fish collection and rearing | Instream | ❶ | | | Δ | | |

1 - Refer to Appendix A for a detailed description of restoration activities.
2 - ❶ refers to aquatic habitats, ❷ refers to terrestrial habitats
3 - Refers to the estimated length of time, both during and after project completion, necessary to stabilize soils, slopes, and streambanks; establish or reestablish native vegetation; and eliminate project caused water quality decreases at individual project sites.

**short-term: < 30 days; mid-term: 30-60 days; long-term: 61-180 days**

4 - Noise levels (decibels (dB)) were estimated based on the typical types of equipment needed to complete restoration activities (refer to Figure 1). The duration and fluctuation of daily noise levels will depend of the extent of the restoration activity. The decibel is a logarithmic scale of sound pressure or intensity. Decibel intensity increases by units of 10; each increase is 10 times the lower figure. (example - 20 dB is 10 times the intensity of 10 dB, 30 dB is 100 times the intensity of 10 dB etc.).

**low: < 50 dB; moderate: 51-90 dB; high: > 90 dB**

# APPENDIX C: Description of Oregon's Sensitive Species

**APPENDIX C: Description of Oregon's Sensitive Species**

## PLANTS

### Applegate's Milk-Vetch

A member of the pea family (Fabaceae), Applegate's milk-vetch (*Astragalus applegateii*) is a slender, herbaceous perennial, often decumbent (lies flat on the ground), with stems to sixteen inches long, which have seven to eleven narrow, slightly strigose leaflets. The flowers, whitish to lilac in color, are small with petals only one-fourth of an inch long. The seed pods, up to one-half of an inch long, are faintly mottled. Applegate's milk-vetch blooms and produces seed pods from June to early August. It is distinguished from other sympatric *Astragalus* species by its slightly curved stems, the number and location of the flowers, and its apparent inability to colonize dry, disturbed areas (USDI 1993a).

Applegate's milk-vetch was discovered near Klamath Falls, Oregon in 1927, and is known to exist only in one or two sites in Klamath County in southern Oregon. The site of only population with more than 10 individuals is in an expanding industrial area of Klamath Falls.

Applegate's milk-vetch grows in flat, open, seasonally moist remnants of flood plain alkaline grassland of the Klamath Basin. The substrate is poorly drained, fine silt loam, with an underlying hardpan 10 to 20 inches below. The species may be adversely affected by lack of seasonal flooding, which may formerly have been instrumental in reducing competition and providing openings for colonization. Irrigation withdrawals and water control structures along the Klamath River have eliminated the area's natural flooding regimes. The "large" population of this species, comprising about 1000 plants on 6 acres, has been impacted by road construction; the area it occupies is zoned for commercial or industrial use. Applegate's milk-vetch was listed as federally endangered on July 28, 1993 (USDI 1993a).

In order to minimize damage to Applegate's milk-vetch or its habitat, the Project Design Criteria (PDCs) listed in Appendix D will be followed.

### Bradshaw's Lomatium

Bradshaw's lomatium (*Lomatium bradshawii*), a member of the carrot family (Apiaceae), grows from eight to twenty inches tall, with mature plants having only two to six leaves. Leaves are chiefly basal and are divided into very fine, almost threadlike, linear segments. The yellow flowers are small, measuring about 1 mm long and 0.5 mm across, and are grouped into asymmetrical umbels. Each umbel is composed of 5 to 14 umbellets, which are subtended by green bracts divided into three's. This bract arrangement differentiates *L. bradshawii* from other lomatiums. Bradshaw's lomatium blooms during April and early May, with fruits appearing in late May and June. Fruits are oblong, about one-half inch long, corky and thick-winged along the margin, and have thread-like ribs on the dorsal surface. This plant reproduces entirely from seed.

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 15 to 30 cm below the surface. This clay layer results in a perched water table during winter and spring, and so is critical to the wetland character of these grasslands, known as tufted hair-grass (*Deschampsia*) prairies. Insects observed to pollinate this plant include a number of beetles, ants, and some small native bees.

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. The greatest concentrations of remaining sites and plants occur in and adjacent to the Eugene metropolitan area. 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 cycles also permit invasion of trees and shrubs, and eventual conversion of wet prairies to woodlands. Bradshaw's lomatium was listed as federally endangered on September 30, 1988 (USDI 1988).

To eliminate or reduce adverse project impacts to Bradshaw's lomatium, the PDCs listed in Appendix D will be followed.

## Cook's Lomatium

Cook's Lomatium (*Lomatium cookii*) is a perennial herb that grows to a height of 8 to 15 inches, from a slender, twisted taproot. The species grows in vernal pools or other seasonally wet habitats, on soils that have a shallow hard or clay pan layer that maintains seasonally wet soils at the surface. The species is known from 4 remnant populations, in total occupying some 60 ha (150 ac). The plants occur in two disjunct clusters in southwestern Oregon: the Illinois Valley (Josephine County) and the Agate Desert (Jackson County).

Because Cook's lomatium was first collected only in 1981, estimates of historic population size are difficult. However, based on known historic distribution of vernal pools in the area, it may be that over 99 percent of the species' habitat has been lost (J. Kagan, pers. comm., 1997). The Nature Conservancy (TNC) owns and actively manages two sites in the Agate Desert, the Agate Desert Preserve (approximately 12.5 acres of habitat) and the recently acquired Whetstone Savannah Preserve (about 1.2 acres of habitat).

Cook's lomatium is imminently threatened by habitat destruction, primarily from residential and industrial development, including road and powerline construction. Within the past 10 years, numerous populations have been bisected by roads and powerlines and sewer lines, lost to department store and sports park complex and residential construction. Other factors contributing to habitat loss include off-road vehicle use, gold mining, and overgrazing.

Development in southwestern Oregon is escalating. Since the listing package was submitted, a large population [500 plants] in the Illinois Valley (Josephine County) was destroyed by a housing development during the summer of 1996. Additionally, one of three subpopulations north of Rough and Ready Creek in Josephine County (containing 250 plants) was lost to agriculture. Currently, the most serious threat is a proposed state prison for the City of Medford, to be sited within one of the largest population cluster adjacent to TNC's preserve for this species (D. Borgias, pers. comm., 1997).

The only Cook's lomatium site on federal land is located near French Flat and managed by the Bureau of Land Management (BLM). Gold mining operations threaten some 600 plants on BLM land. Mining activities could result in direct habitat loss, or could alter hydrologic regimes upon which the species depends.

With many plants, in cases of inevitable habitat loss, transplantation may be an option of last resort in preserving individuals and maintaining genetic diversity. However, transplantation does not appear to be feasible for Cook's lomatium. The plant's twisted taproot is so horizontally extensive above the pan layer and the root hairs so interwoven with the rocky substrate that a tremendous amount of material would have to be moved with the plant to avoid root injury and subsequent mortality. Where transplantation has been attempted, the plants have died (D. Borgias, pers comm., 1997).

In order to minimize damage to Cook's lomatium or its habitat, the PDCs listed in Appendix D will be followed.

## Gentner's Fritillary

A member of the Lily family (Family: Liliaceae), Gentner's fritillary (*Fritillaria gentneri*) flowers from April to June, producing striking racemes of reddish-purple flowers, with yellow streaks. This species occurs in rather dry, open woods of fir and oak, at low elevations. It is known only from a few scattered localities along the Rogue and Illinois River drainages, in Jackson and Josephine Counties, and is proposed for listing as an endangered species (USDI 1998a).

Prized by collectors, this rare lily is threatened by over-collection, especially as some populations are located adjacent to well-traveled roadways. Grazing and logging are also potential threats. In order to minimize damage to Gentner's lily or its habitat, the PDCs listed in Appendix D will be followed.

## Howell's Spectacular Thelypody

The following information on Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*) is from Meinke (1982) and USDI (1998b). Howell's spectacular thelypody is a biennial plant (Family: Brassicaceae) that grows to approximately 60 cm tall, with branches arising from near the base. Basal leaves are oblanceolate to spatulate and 2-10 cm long. Cauline leaves (leaves borne on stem) are lanceolate to linear lanceolate, entire, and usually sagittate (arrowhead-shaped) at the base (1-10 cm long). Flowering typically takes place from June through July. Sepals are erect, scarious at the margin, and green, purple or lavender in color. The four petals per flower are mostly spatulate, occasionally oblanceolate, and lavender to purple in color. Its petal shape and paired free filaments distinguish *T. howellii* ssp. *spectabilis* from *T. howellii* ssp. *howellii*.

This plant occurs in moist, moderately well-drained, somewhat alkaline meadow habitats, typically growing with salt tolerant species such as *Sarcobatus vermiculatus* (greasewood), *Elymus cinereus* (giant wild rye), and *Chenopodium* spp. (goosefoot). *Thelypodium howellii* ssp. *spectabilis* appears dependent on periodic flooding because it rapidly colonizes areas adjacent to streams that have flooded. It is known from 18 extant sites in the Baker-Powder River Valley located near the communities of North Powder, Haines, and Baker in Union and Baker Counties. The plant has been extirpated from about one-third of the historic sites, including the type locality in Malheur County, and is proposed for listing as a threatened species (USDI 1998b).

Threats to the taxon include 1) habitat loss due to modification or loss to urban and agricultural development; 2) habitat degradation due to livestock grazing and hydrological modification; 3) consumption by livestock; 4) use of herbicides or mowing during the growing season; and 5) competition with exotic species such as *Dipsacus sylvestris* (teasel), *Cirsium vulgare* (bull thistle), *C. canadensis* (Canada thistle), and *Melilotus officinalis* (yellow sweet clover).

To eliminate or reduce adverse Partners program project impacts to *Thelypodium howellii* ssp. *spectabilis*, the PDCs listed in Appendix D will be followed.

## Kincaid's Lupine

Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii*) occupies 51 sites throughout the Willamette Valley and one site in southern Washington, which implies a close association with native upland prairie sites. Its aromatic flowers are yellowish-cream colored, often showing shades of blue on the keel. The upper calyx (collective sepals) lip is short, yet unobscured by the reflexed banner when viewed from above. The leaflets tend to a deep green with an upper surface that is often glabrous. The plants are 4-8 decimeters (~16-32 inches) tall, with single to multiple unbranched flowering stems and basal leaves that remain after flowering (Kuykendall and Kaye 1993). Kincaid's lupine is a long-lived perennial species, with a maximum reported age of 25 years (M. Wilson, Oregon State University, in litt., 1993), and is pollinated by solitary bees and flies (P. Hammond, pers. comm., 1994). Seed set and seed production are low, with few (but variable) numbers of flowers producing fruit from year to year (Liston *et al*. 1994). Seeds are dispersed from fruits that open explosively upon drying.

The primary loss of habitat for *Lupinus sulphureus* ssp. *kincaidii* has resulted from the extensive alteration of native prairie in the Willamette Valley that has occurred over the last 140 years. Over 99 percent of the native prairie in the Willamette Valley, the only known habitat area of Kincaid's lupine, has been lost (E. Alverson, pers. comm., 1994). Habitat at 80 percent of the sites containing Kincaid's lupine (e.g., 68) is rapidly disappearing due to agriculture practices, development activities, forestry practices, grazing, roadside maintenance, and commercial Christmas tree farms. Because of these threats the Service proposed listing Kincaid's lupine as a threatened species in 1998 (USDI 1998c).

In order to avoid impacts to Kincaid's lupine, Partners program projects will follow the PDCs outlined in appendix D. For more detailed information on this species, see the Proposed Rule for Kincaid's lupine (USDI 1998c).

## Large-flowered Wooly Meadowfoam

A delicate annual in the meadowfoam, or false mermaid, family (Limnanthaceae), the large-flowered wooly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora*) grows 5 to 15 cm (2 to 6 in) tall, with 5 cm (2-in) leaves divided into 5 to 9 segments. The stems and leaves are sparsely covered with short, fuzzy hairs, while the flowers and, especially, the calyx are densely covered with wooly hairs. Each of the five yellowish to white petals is 5 to 10 mm (1/4 to 1/2 in) and has two rows of hairs near its base.

The large-flowered wooly meadowfoam occurs in and around vernal pools within an 83 square km (32 square mi) landform in southwestern Oregon (Jackson County) known as the Agate Desert; which is also one of the sites where Cook's lomation is found. Located on the floor of the Rogue River basin north of Medford, the Agate Desert is characterized by shallow, Agate-Winlow complex soils, a relative lack of trees, and sparse prairie vegetation (ONHP 1997). The Agate-Winlow soil landscape consists of a gentle mound-swale topography that develops pools of water in the swales during the fall and winter rainy season. These vernal pools vary in size from 1 to 30 meters (m) (3 to 100 feet) across, and attain a maximum depth of about 30 cm (12 in) (ONHP 1997). Plants native to these pools are adapted to grow, flower, and set seed during the relatively short time that water is available in the spring.

There are only 10 known occurrences of large-flowered wooly meadowfoam in the Agate Desert where mapped habitat for this species totals 198 acres (ONHP 1998). However, due to recent alteration and destruction of Agate Desert vernal pools (ONHP 1997), habitat currently occupied by large-flowered wooly meadowfoam is considerably less, at an estimated 116 acres (ONHP 1998). Vernal pool habitat, formerly widespread south of the Rogue River, is now almost completely eliminated (Brock 1987; ONHP 1997).

Five occurrences of *Limnanthes floccosa* ssp. *grandiflora* are located on other non-federal lands. Two occurrences are on State land, primarily the Ken Denman Wildlife Area, where much of the habitat has been altered and planted to grasses. Portions of three occurrences are on lands owned by the City of Medford, within an area designated as the Whetstone Industrial Park, while portions of two occurrences are located in State or county-maintained highway rights-of-way, or in powerline rights-of-way (ONHP 1998), where they are subject to herbicide spraying and other maintenance activities.

The continued existence of the large-flowered wooly meadowfoam is at risk, primarily by destruction of their specialized habitat by industrial and residential development, including road and powerline construction and maintenance. Agricultural conversion, certain grazing practices, off-road vehicle use, and competition with non-native plants also contribute to population declines. The Service designated the large-flowered wooly meadowfoam as a candidate species on December 15, 1980 (USDI 1980a).

## MacFarlane's Four-o'clock

The following information on MacFarlane's four-o'clock (*Mirabilis macfarlanei*) (Family: nyctaginaceae) is from the species recovery plan (USDI 1985a). MacFarlane's four-o'clock is an endangered perennial with freely branched stems (swollen at the nodes), so that the plant forms hemispherical clumps 6-12 decimeters in diameter. The leaves are opposite, somewhat succulent, green above and glaucescent (film covered) below. The lower leaves are orbicular or ovate-deltoid in shape and become progressively smaller toward the tip of the stem. Flowers bloom between May and early June with an inflorescence that is a 4-7 flowered cluster subtended by an involucre. The flowers are striking in their large size (up to 25 mm long and 25 mm wide) and rose-purple color. They are funnel-form in shape with a widely expanding limb. The flower is 5-merous, stamens 5, generally exerted. The root is a stout, deep-seated taproot.

MacFarlane's four-o'clock has been found in 25 sites: eleven sites on the banks of the Snake River in Hell's Canyon, Wallowa County, Oregon and Idaho County, Idaho; two sites above the Imnaha River, Wallowa County, Oregon: and 12 sites above the Salmon River in adjacent Idaho County, Idaho.

All of the populations of MacFarlane's four-o'clock known at this time grow as scattered plants on open, steep (50%) slopes of sandy soils, generally having west to southwest aspects. One colony has been found having an east aspect. Talus rock underlies the soil in which the plants are rooted. The soil type is unknown. The plant community is a transition between *Agropyron spicatum* - *Poa secunda* (bluebunch wheatgrass - Sandberg's bluegrass) and *Rhus glabra* - *Agropyron spicatum* (smooth sumac - bluebunch wheatgrass). The native *Poa secunda* of this community has been replaced by the exotic *Bromous tectorum* (cheatgrass).

The plant is vulnerable to trampling due to increased recreational use of a hiking trail (along the Snake River in OR); collection of plants; grazing pressure (cattle trampling resulting in soil erosion); inhibitory effects on seed germination, growth and development by exotic plants (cheatgrass); fungal disease (two species of fungi); ovary predation by a lepidopteran; and damage by spittle bugs. This species was listed as Threatened by the Service in 1979 (USDI 1979.)

Recovery actions for MacFarlane's four-o'clock include conducting censuses, securing each colony with habitat management plans, establishing new colonies at suitable sites, and establishing propagule banks.

To eliminate or reduce adverse project impacts to MacFarlane's four-o'clock, the PDCs listed in Appendix D will be followed.

## McDonald's Rock-cress

McDonald's rock-cress (*Arabis mcdonaldiana*) is a perennial member of the mustard family (Brassicaceae) and can be distinguished by its relatively large, conspicuous lavender to purplish flowers, flattened rosette, glabrous simple leaves, and seeds with wings on the distal end. McDonald's rock-cress is restricted to soils derived from ultramafic rocks, commonly referred to as serpentine. McDonald's rock-cress is commonly found in open areas around manzanita in open canopied mixed conifer forest with various mixes of ponderosa pine, Jeffrey pine, sugar pine and incense cedar. McDonald's rock-cress is known from Mendicino County, California, and, recently, from Josephine and Curry Counties, Oregon.

McDonald's rock-cress is a poor competitor for the scant resources of serpentine soils, and is restricted in distribution for this reason. The recovery plan for this species (USFWS 1990a) cites mining and road widening/maintenance as the two main threats to this specie's survival, which is why the Service listed this plant as endangered in 1978 (USDI 1978). At that time the Josephine County population was unknown. This population, however, is also threatened by a proposed nickel mine. While all the known populations of McDonald's rock-cress in Oregon are on federal land, it may occur on private land, as well (J. Kagan, pers. comm., 1998).

To prevent any adverse impact to McDonald's rock-cress, any projects in serpentine soils in Southwestern Oregon will be surveyed prior to implementation of Partner's activities, and the PDCs in Appendix D will be followed.

## Nelson's Checkermallow

Nelson's checkermallow (*Sidalcea nelsoniana*) in the mallow family (Malvaceae), is a perennial herb with pinkish-lavender to pinkish-purple flowers born in clusters at the end of 1 to 2.5 foot tall stems. The majority of sites for the species occur in the Willamette Valley of Oregon; the plant is also found at several sites in the Coast Range of Oregon and at one site in the Coast Range in Cowlitz County, 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 just west of the crest of the Coast Range.

Inflorescences of plants from the Willamette Valley are usually somewhat spike-like, usually elongate and somewhat open (Hitchcock 1957). Inflorescences of plants from the Coast Range

are shorter and not as open (K. Chambers, pers. comm.). Plants have either perfect flowers (male and female) or pistillate flowers (female). The plant can reproduce vegetatively, by rhizomes, and produces seeds that drop near the parent plant. Flowering can occur as early as mid-May and extend into September in the Willamette Valley. Fruits have been observed as early as mid-June and as late as mid-October. Coast Range populations generally flower later and produce seed earlier, probably because of the shorter growing season ($CH_2M$ Hill 1991).
Within the Willamette Valley, Nelson's checkermallow most frequently occurs in *Fraxinus* (ash) swales and meadows with wet depressions, or along streams. The species also grows in wetlands within remnant prairie grasslands. Some sites occur along roadsides at stream crossings where exotics such as 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.

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 control and prevention practices allow succession of introduced and native species, which may gradually replace habitat for Nelson's checkermallow (BLM 1985). Any remnant prairies in the Willamette Valley have been modified by livestock grazing, fire suppression, or agricultural land conversion. (Moir and Mika 1972). Stream channel alterations, such as straightening, splash dams, 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. The species is now known to occur in 48 patches within five relict population centers in Oregon, and at one site in Washington ($CH_2M$ Hill 1991). Four additional sites with occurrences recorded since 1985 apparently have been extirpated as a result of plowing, deposition of fill material or yard debris, or intense roadside vegetation management. Nelson's checkermallow was listed as threatened on February 12, 1993 (USDI 1993b).

In order to minimize damage to Nelson's checkermallow or its habitat, the PDCs listed in Appendix D will be followed.

## Rough Popcornflower

An annual herb in the Borage family (Boraginaceae), the rough popcornflower (*Plagiobothrys hirtus*) is an annual herb with a stout stem, erect or reclining, that grows 1 to 2 feet long. The leaves are linear, the lower paired and the upper alternate, 10 to 25 cm in length. The flowers are white with yellow centers, 5-petaled, radially symmetrical, up to 20 mm across, and are arranged in curled racemes typical of the borage family. The nutlets (seeds) are ovate, 2 mm long, with a prominent dorsal keel. It can be distinguished from other sympatric *Plagiobothrys* species by its distinctive, wide-spreading hairs, in contrast to the appressed hairs of the other species. The species is an annual, or creeping perennial with rooting stems, a unique trait for the genus.

The rough popcornflower has a narrow range historically, and currently occurs at only 4 known sites in Oregon's Umpqua Valley, near Sutherlin, in Douglas County. The sites are all located within 5 miles of one another and total under 10 acres in area. Fewer than 3,000 plants exist. The species occurs in moist, open areas on poorly drained silty clay soils in flat valley bottoms. Its habitat is maintained by the seasonal ponding of water.

The rough popcornflower is highly threatened by development, ditching, road building and maintenance, grazing, and competition with non-native weeds. One population actually occurs within the town of Sutherlin, on a vacant lot surrounded by residential areas. Another population occurs along the shoulder of Interstate 5, at the Sutherlin exit. The third population is transversed by a series of drainage ditches, with seasonal pool areas leveled with fill dirt, which has introduced non-native weeds to the site. The fourth site has a history of sheep grazing, and is presently grazed by cattle (Gamon and Kagan 1985). Listing of this species is urgently needed, although some recovery work is already in progress (Amsberry and Meinke 1997).

In order to minimize damage to the rough popcornflower or its habitat, the PDCs listed in Appendix D will be followed.

## Umpqua Mariposa Lily

The Umpqua mariposa lily *(Calochortus umpquaensis,* Family: Liliaceae) is a bulbous perennial, with a single, dark green basal leaf 8 to 12 inches long and a flowering stalk 8 to 20 inches high. This stalk bears one to five three-petaled flowers, which measure 1.5 to 3 inches in diameter. Flowers are white, with a deep purple spot near the base of the petal. Blooming occurs in June and July.

The Umpqua mariposa lily occurs in an area of less than 32,000 acres, in Douglas County, Oregon. Within this limited range, the species is restricted to serpentine soils, but does not seem restricted to a particular aspect or slope type. Fourteen populations are presently known extant.

Studies have shown that this lily is significantly affected by grazing, which removes the individual's single leaf. Feeding by deer, rabbits and insects alone can cause serious damage; additional grazing by cattle could readily lead to extirpation of populations (Fredricks *et al*. 1992). Like other members of its genus, this showy lily is also highly sought after in the horticultural trade. In order to minimize damage to the Umpqua mariposa lily or its habitat, the PDCs listed in Appendix D will be followed.

## Western Lily

The western lily (*Lilium occidentale*), a perennial in the lily family (Liliaceae), grows from a short unbranched, rhizomatous bulb, reaching a height of up to 1.8 meters (5 ft.). Leaves grow along the unbranched stem singly or in whorls and are long and pointed, roughly 1 cm wide and 10 cm long (0.5 in by 4 in). The nodding flowers are red, sometimes deep orange, with yellow to green centers in the shape of a star and spotted with purple. The six petals are 3 to 4 cm (1 to 1.5 in) long and curve strongly backwards.

**APPENDIX C: Description of Oregon's Sensitive Species**

The western lily has an extremely restricted distribution within 2 miles (3.2 kilometers) of the coast, from Hauler, Coos County, Oregon to Lolita, Humboldt County, California. This range encompasses approximately the southern one-third of the Oregon coast and the northern 100 miles (161 km) of the California coast. The plant is currently known from 7 widely separated regions along the coast, and occurs in 31 small, isolated, densely clumped populations. Of the 25 populations known in 1987 and 1988, 9 contained only 2 to 6 plants, 5 contained 10 to 50 plants, 6 contained 51 to 200 plants, 4 contained 201 to 600 plants, and 1 contained almost 1,000 plants (Schultz 1989). At some sites, particularly the sites with more than 200 plants, the majority of plants were non-flowering, which is probably an indication of stress (Schultz 1989). Since then, an estimated total of 1,000 to 2,000 flowering plants have been discovered at 4 sites near Crescent City, California, where none were previously known (Dave Imper, pers. comm., 1991). In addition, a population of about 125 flowering plants was discovered near Brookings, Oregon, in 1991 (Margie Willis, pers. comm., 1991), and a population of 13 flowering plants was discovered near Bandon, Oregon, in 1992.

The western lily grows at the edges of sphagnum bogs and in forest or thicket openings along the margins of ephemeral ponds and small channels. It also grows in coastal prairie and scrub near the ocean where fog is common. Historical records indicate that the western lily was once more common than it is today. After the ice age, rising sea levels flooded marine benches, creating much more extensive bogs and coastal scrub than exist today. That may account for the patchiness of the western lily's current distribution. It is known or assumed to be extirpated in at least nine historical sites, due to forest succession, cranberry farm development, livestock grazing, highway construction, and other development. These factors continue to threaten the lily, with development taking a primary role. Two known populations near Brookings, Oregon were partially or totally destroyed by unpermitted development-related wetland fill activity in 1991. The largest known population and three smaller populations near Crescent City, California are currently threatened by housing and recreation development. The western lily was listed as federally endangered on August 17, 1994 (USDI 1994a).

In order to minimize damage to the western lily or its habitat, the PDCs listed in Appendix D will be followed.

## Willamette Daisy

A member of the sunflower family (Asteraceae), this plant is a perennial herb, 6-24 inches tall. Basal leaves are 2 to 7 inches long and less than ½ inch wide, becoming gradually shorter along the stem. The flowering stems, which are taller than the vegetative stems, produce 2 to 5 flower heads in June and July. The flowers are daisy-like, with yellow centers and 25 to 50 pinkish to blue rays, often fading to white with age.

The Willamette daisy (*Erigeron decumbens* var. *decumbens*) is endemic to the state of Oregon, where it is known only from the Willamette Valley. Historically, this plant likely was widespread throughout the Valley. Presently, 18 sites are known, distributed over an area of some 1.7 million acres, between Grand Ronde and Goshen, Oregon. The plant is known to have been extirpated from an additional 19 historic locations (Clark *et al*. 1993).

Willamette daisy populations are known from both bottomland and upland prairie remnants. Prior to European settlement, these prairies were maintained by fire, which prevented the establishment of woody species. Prairie remnants are considered to be among the rarest habitats in western Oregon and are threatened by fragmentation, agriculture and urban growth. Most sites are small and privately owned. Only four sites are in secure ownership (Clark *et al*. 1993). In order to avoid impacts, restoration activities will incorporate the PDCs listed in Appendix D.

## FISH

### Borax Lake Chub

The borax lake chub (*Gila boraxobius*) is endemic to the 640 acres of Borax Lake, and has been found in lower Borax Lake and their associated wetlands in Harney County, in south-central Oregon. This small (up to 93 mm, 3.6 in) chub is restricted to the geothermally heated Borax Lake system which reaches temperatures, typically, of between 35 and 40°C (95 to 104°F) at the inflow. The lake system also has a water chemistry that makes it an unusual habitat within the surrounding desert landscape. Water diversions for agricultural purposes have, in the past, been a danger to this species, but the 1993 purchase of the lake by The Nature Conservancy has put an end to that threat. The Borax Lake Chub remains listed as endangered, however, due to potential geothermal energy exploration on BLM lands within two miles of the lake. Heavy recreational use is also considered a threat to the species.

Population counts conducted in 1995 and 1997 estimated that there were 34,634 and 10,631 individuals, respectively, which represents a 69 percent fluctuation (Dan Salzer, pers. comm., 1998). Borax Lake Chub reproduce year-round, although primarily in the spring (Williams 1995). Insects comprise the chub's diet in the spring and summer while allochthonous material is the primary diet item in the fall and winter (USDI 1995b). While Borax lake chub are adapted to the warm water of Borax Lake, temperature fluctuations impact where the fish can be found within the lake (Williams *et al.* 1989).

No Partners program projects will be initiated within the sub-basin that drains into Borax Lake which involve the use of pesticides or other chemicals, or which involve the diversion of water, without further consultation.

### Bull Trout

The bull trout (*Salvelinus confluentus*) was first described by Girard in 1856 from a specimen collected on the lower Columbia River. Cavender (1978) presented morphometric, meristic, osteological, and distributional evidence to document the separation between Dolly Varden (*Salvelinus malma*) and bull trout, and resurrected the species name *confluentus*, as first proposed by Suckley in 1858. Based on this work, taxonomists have recognized bull trout as a separate species from the coastal Dolly Varden since 1978 (Bond 1992).

Juvenile bull trout average approximately 50 to 70 mm (2 to 3 in) in length at age 1, 100 to 120 mm (4 to 5 in) at age 2, and 150 to 170 mm (6 to 7 in) at age 3 (Pratt 1992). Juveniles have a slender body form and exhibit the small scalation typical of charr. The back and upper sides are typically olive-green to brown with a white to dusky underside. The dorsal surface and sides are marked with faint pink spots. They lack the worm-like vermiculations and reddish fins commonly seen on brook trout (*Salvelinus fontinalis*). Spawning bull trout, especially males, turn bright red on the ventral surface with a dark olive-brown back and black markings on the head and jaw. The spots become a more vivid orange-red and the pectoral, pelvic, and anal fins are red-black with a white leading edge. The males develop a pronounced hook on the lower jaw. Bull trout have an obvious "notch" on the end of the nose above the tip of the lower jaw.

Bull trout populations are known to exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous. Resident bull trout spend their entire life cycle in the same (or nearby) streams in which they were hatched. Fluvial and adfluvial populations spawn in tributary streams where the young rear from one to four years before migrating to either a lake (adfluvial) or a river (fluvial) where they grow to maturity (Fraley and Shepard 1989). Anadromous fish spawn in tributary streams, with major growth and maturation occurring in salt water.

The historic range of the bull trout spanned seven states (Alaska, Montana, Idaho, Washington, Oregon, Nevada, and California) and two Canadian Provinces (British Columbia and Alberta) along the Rocky Mountain and Cascade Mountain ranges (Cavender 1978). In the United States, bull trout occur in rivers and tributaries throughout the Columbia Basin in Montana, Idaho, Washington, Oregon, and Nevada, as well as the Klamath Basin in Oregon, and several cross-boundary drainages in extreme southeast Alaska. In California, bull trout were historically found in only the McCloud River, which represented the southernmost extension of the species' range. Bull trout numbers steadily declined after completion of McCloud and Shasta Dams (Rode 1990). The last confirmed report of a bull trout in the McCloud River was in 1975, and the original population is now considered to be extirpated (Rode 1990).

Bull trout distribution has been reduced by an estimated 40 to 60 percent since pre-settlement times, due primarily to local extirpations, habitat degradation, and isolating factors. The remaining distribution of bull trout is highly fragmented. Resident bull trout presently exist as isolated remnant populations in the headwaters of rivers that once supported larger, more fecund migratory forms. These remnant populations have a low likelihood of persistence (Reiman and McIntyre 1993). Many populations and life history forms of bull trout have been extirpated entirely.

Highly migratory, fluvial populations have been eliminated from the largest, most productive river systems across the range. Stream habitat alterations restricting or eliminating bull trout include obstructions to migration, degradation of water quality, especially increasing temperatures and increased amounts of fines, alteration of natural stream flow patterns, and structural modification of stream habitat (such as channelization or removal of cover).

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 (Goetz 1989). Presently, most bull trout populations are confined to headwater areas of tributaries to the Columbia, Snake, and Klamath rivers (Ratliff and Howell 1992). Major tributary basins containing bull trout populations include the Willamette, Hood, Deschutes, John Day, and Umatilla (Columbia River tributaries), and the Owyhee/Malheur, Burnt/Powder, and Grande Ronde/Imnaha Basins (Snake River tributaries). Of these eight major basins, large fluvial migratory bull trout are potentially stable in only one, the Grande Ronde, and virtually eliminated from the remaining 7, including the majority of the mainstem Columbia River. The only known increasing population of bull trout is an adfluvial migrant population located in Lake Billy Chinook, and spawning and rearing in the Metolius River and tributaries. In recognition of the precarious status of Oregon bull trout populations, harvest of bull trout is prohibited in all state waters with the exception of Lake Billy Chinook and Lake Sintustus in the Deschutes River Basin.

Columbia and Klamath River basin bull trout have been isolated from one another for over 10,000 years. Leary *et al*. (1993) demonstrated substantial genetic separation between bull trout in the Klamath and Columbia River basins; these two basin populations would constitute "distinct population segments," potentially listable under the Endangered Species Act.

Bull trout spawn in the fall, primarily in September or October when water temperatures drop below 9°C (48°F). Typically, spawning occurs in gravel, in runs or tails of spring-fed pools. Adults hold in areas of deep pools and cover and migrate at night (Pratt 1992). After spawning, adfluvial adults return to the lower river and lake. In Flathead Lake, Montana, an average of 57 percent of the adult bull trout spawned in a given year (Fraley and Shepard 1989).

Bull trout eggs are known to require very cold incubation temperatures for normal embryonic development (McPhail and Murray 1979). In natural conditions, hatching usually takes 100 to 145 days and newly-hatched fry, known as alevins, require 65 to 90 days to absorb their yolk sacs (Pratt 1992). Consequently, fry do not emerge from the gravel and begin feeding for 200 or more days after eggs are deposited (Fraley and Shepard 1989), usually in about mid-April.

Fraley and Shepard (1989) reported that juvenile bull trout were rarely observed in streams with summer maximum temperatures exceeding 15°C (59°F). Fry, and perhaps juveniles, grow faster in cool water (Pratt 1992). Juvenile bull trout are closely associated with the substrate, frequently living on or within the streambed cobble (Pratt 1992). Along the stream bottom, juvenile bull trout use small pockets of slow water near high velocity, food-bearing water. Adult bull trout, like the young, are strongly associated with the bottom, preferring deep pools in cold water rivers, as well as lakes and reservoirs (Thomas 1992).

Juvenile adfluvial fish typically spend one to three years in natal streams before migrating in spring, summer, or fall to a large lake. After traveling downstream to a larger system from their natal streams, subadult bull trout (age 3 to 6) grow rapidly but do not reach sexual maturity for several years. Growth of resident fish is much slower, with smaller adult sizes and older age at maturity.

Juvenile bull trout feed primarily on aquatic insects (Pratt 1992). Subadult bull trout rapidly convert to eating fish and, as the evolution of the head and skull suggest, adults are opportunistic and largely nondiscriminating fish predators. Historically, native sculpins (*Cottus* spp.), suckers (*Catostomus* spp.), and mountain whitefish (*Prosopium williamsoni*) were probably the dominant prey across most of the bull trout range. Today, throughout most of the bull trout's remaining range, introduced species, particularly kokanee (*Oncorhynchus nerka*) and yellow perch (*Perca flavescens*), are often key food items (Pratt 1992).

Bull trout are habitat specialists, especially with regard to preferred conditions for reproduction. While a small fraction of available stream habitat within a drainage or subbasin may be used for spawning and rearing, a much more extensive area may be utilized as foraging habitat, or seasonally as migration corridors to other waters. Structural diversity is a prime component of good bull trout rearing streams (Pratt 1992). Several authors have observed highest juvenile densities in streams with diverse cobble substrate and low percentage of fine sediments (Shepard *et al.* 1984, Pratt 1992).

Persistence of migratory life history forms and maintenance or re-establishment of stream migration corridors is crucial to the viability of bull trout populations (Reiman and McIntyre 1993). Migratory bull trout facilitate the interchange of genetic material between populations, ensuring sufficient variability within populations. Migratory forms also provide a mechanism for reestablishing local populations that have been extirpated. Migratory forms are more fecund and larger than smaller non-native brook trout, potentially reducing the risks associated with hybridization (Reiman and McIntyre 1993). The greater fecundity of these larger fish enhances the ability of a population to persist in the presence of introduced fishes. On June 13, 1997, the Service proposed the Columbia Basin population of the bull trout as threatened and the Klamath population as endangered (USDI 1997a).

No permanent adverse effects to bull trout habitat are anticipated in association with Partners program projects. Any river restoration projects in the range of the species could result in beneficial effects to this species. Partners program projects that involve in-channel work could result in direct take of individual bull trout. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions associated with Partners program projects, if made at an inappropriate time of year, could interfere with the bull trout's migration patterns. In order to minimize project impacts to bull trout, the PDCs listed in Appendix D will be followed.

## Chinook Salmon

Chinook salmon (*Oncorhynchus tshawytscha*), are listed as a threatened species in the Snake River basin (USDC 1992), and are proposed as threatened in the Upper Willamette River, the Lower Columbia River, and along the southern Oregon coast; chinook in the Deschutes River are proposed to be added to the threatened Snake River Evolutionarily Significant Unit (ESU) (USDC 1998a). The information that follows was taken from Beauchamp *et al.* (1983) except as noted. Chinook are anadromous salmonids, typically rearing in large streams, and migrating to the ocean where they live for an average of 3 to 4 years before returning to their natal streams to spawn before dying. Adult chinook can reach up to 22.7 kg (50 .1 lb) in weight, although some larger chinook have been recorded (Emmett *et al.* 1991). The chinook's coloration when in the ocean and prior to changing to spawning colors is a silvery-blue on the dorsal surface with silvery sides (Groot and Margolis 1991). The chinook has somewhat large, irregular spots on the back and upper sides, as well as the dorsal and adipose fins, and the entire caudal fin. The adult chinook is also distinguishable from coho due to its black gums, the coho has pale gums. Prior to spawning, the chinook turns a yellowish green on back and sides, with a pale grey to pink ventral surface (Groot and Margolis 1991).

After spending most of its adult life in the ocean, the chinook returns to its natal streams. The timing on the return to the natal streams and subsequent spawning varies dependent which of the three chinook runs is involved. The spring chinook returns to freshwater beginning in February, and spawn from August to November. The summer chinook enters freshwater during the late spring to mid-summer, and spawn in the fall. The fall chinook returns to its natal streams in fall and spawns in the fall or winter. Juvenile fry emerge from the gravel during the winter or early spring. Juveniles remain in freshwater from 1 to 18 months before migrating to the ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Chinook prefer stream water temperatures of 4 to 14.4° C (39.2 to 57.2°F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to chinook habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to chinook, the PDCs listed in Appendix D will be followed.

## Chum Salmon

Chum salmon (*Oncorhynchus keta*), is proposed as a threatened species in the Columbia River basin, which includes chum that spawn in Oregon's tributaries to the lower Columbia River (USDC 1998b). The information that follows was taken from Pauley *et al.* (1988), except as noted. Chum are anadromous salmonids, rearing in rivers of varying sizes, typically within 200 km (124 mi) of the sea, and migrating to the ocean where they live for 2 to 4 years (typically) before returning to their natal streams to spawn before dying. Adult chum average 4.0 to 7.0 kg (8.8 to 15.4 lb) in weight. The chum's coloration when in the ocean and prior to changing to spawning colors is a silvery-blue to -green on the dorsal surface with silvery sides. The chum lacks large black spots and is also distinguishable by its white tips on both pelvic and anal fins. Prior to spawning, the chum's coloration changes to reddish sides with a series of dark bars while some also have grey blotches.

After spending a majority of its life in the ocean, chum begin migrating upstream in summer and late fall (there are both summer and fall runs of chum). Spawning occurs within 6 weeks. In the spring, juvenile fry emerge from the gravel, and typically begin their migration downstream shortly after spawning. Young chum salmon spend some time in estuaries to grow and possibly to acclimate to saltwater prior to entering the open ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Chum prefer stream water temperatures of 4.4 to 15.6°C (39.9 to 60.1° F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to chum habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to chum, the PDCs listed in Appendix D will be followed.

## Coho Salmon

Coho salmon (*Oncorhynchus kisutch*), are listed as a threatened species in southern Oregon coastal streams (south of Cape Blanco), and are considered a candidate for listing in the remaining Oregon coastal streams (north of Cape Blanco) (USDC 1997a). The information that follows was taken from Laufle *et al.* (1986), except as noted. Coho are anadromous fish that rear in small, and occasionally large, streams, and migrate to the ocean where they live for 2 years before returning to their natal streams to spawn. Adult coho reach 3.6 to 4.5 kg (7.9 to 9.9 lb) in weight. The coho's coloration when in the ocean and prior to changing to spawning colors is a silvery-blue to -green on the dorsal surface with silvery sides. The coho's small black spots are restricted to the back and upper sides, dorsal fin base, and upper lobe of the caudal fin. The adult coho is also distinguishable from chinook salmon based on its pale gums, as the chinook has black gums. Prior to spawning, the male's back gets darker in color, the sides become dulled with a bright red stripe, and the ventral surface is grey to black. The spawning female has a dull green back with dull red sides (Groot and Margolis 1991).

After spending 2 years in the ocean, coho return to coastal waters from the open ocean beginning in July. They return to their natal streams between August and February, where spawning occurs from late September to March. Juvenile coho emerge from the gravel between March and July, and spend 1 to 2 years in freshwater before migrating to the ocean from April to August.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Coho prefer stream water temperatures of between 4.4 and 15.6° C (39.9 to 60.1° F), depending on life stage, and spawning gravel size of 1.3 to 10.2 cm (.51 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to coho salmon habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to coho, the PDCs listed in Appendix D will be followed.

## Foskett Speckled Dace

The Foskett speckled dace (*Rhinichthys osculus* ssp.) is a threatened species found in south central Oregon. The information for this section is contained in the Draft Recovery Plan of the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin (U.S. Fish and Wildlife Service 1997). There are two known populations of the Foskett speckled dace which inhabit isolated spring habitats in Foskett and Dace Springs in the Coleman Subbasin of the Warner Valley. This species is in decline due to modifications of their native habitat. These areas are currently stable, but extremely restricted. Any alterations to the springs or surrounding activities that indirectly modify the springs containing these two species could lead to the extinction of these species. Foskett and Dace Springs occur on public land and are managed by the Lakeview BLM. This habitat is currently fenced from cattle use and is in stable condition.

The Foskett speckled dace was listed as threatened in 1985 (USDI 1985b). Despite the undescribed status it can be distinguished from other speckled dace by external characteristics, such as: much reduced lateral line, about 15 scales with pores; about 65 lateral line scales; a large eye; the dorsal fin is positioned well behind the pelvic fin but before the beginning of the anal fin; and barbels are present on most individuals (C. Bond, pers. comm., 1990).

Both Foskett and Dace springs are extremely small and shallow with limited habitat for fish. Foskett Spring has the only known native population of Foskett speckled dace and originates in a pool about 5 meters (16.6 ft) across, then flows toward Coleman Lake in a narrow, shallow channel [approximately 5 cm (2 in) deep and 5 cm (2 in) wide]. The source pool has a loose sandy bottom and is choked with macrophytes. The outflow channel eventually turns into a marsh, and finally dries up. The Foskett speckled dace population was estimated in 1997 at 27,000 individuals in Foskett Spring (most in an ephemeral lower pool), and 19 dace in the nearby outplanted population in Dace Spring (J. Dambacher, pers. comm., 1998).

Nothing is known about the biology/ecology of the Foskett speckled dace. The only habitat information available regards plant species found around the springs which include rushes, sedges, monkey flowers (*Mimulus* ssp.), Kentucky bluegrass (*Poa pretensis*), thistle and saltgrass (*Distichlis spicata*). Foskett Spring is a cool-water spring with temperatures recorded at a constant 18°C (64.4°F) over a 2 year period (A. Munhall, pers. comm., 1997). No information is available on growth rates, age of reproduction or behavioral patterns.

Springs and wet meadow areas have relatively high amounts of soil moisture and can support higher levels of plant growth that extend longer into the season than drier sites. This can lead to a disproportionate amount of use by livestock, especially late in the grazing season. The impacts by livestock generally reduce the integrity and complexity of these spring areas in much the same way riparian areas are degraded. Impacts range from reduction of the riparian vegetation surrounding spring areas by trampling and grazing to increased sedimentation from trampling and decreasing aquatic vegetation from the smothering effects of silt. Some springs have also been tapped or partially diverted to watering troughs.

While it is unlikely that there will be any Partners program projects in the vicinity of this species, especially considering that it only occurs on public lands, no projects will entail any actions that take place within the spring pool and no pesticides will be used in the vicinity of Foskett or Dace Springs.

## Hutton Tui Chub

The Hutton tui chub (*Gila bicolor* ssp.) is only found in Hutton spring in the Alkali Subbasin of the Chewaucan Basin in south-central Oregon. A second reported spring was not located in 1996 and therefore its existence is questionable. Bills (1977) performed an extensive examination of morphometric and meristic characters and found the Hutton tui chub to be distinguishable from other tui chub in adjacent basins by morphology of the head. These characters are: head has a convex outline, is longer (from tip of snout to rear edge of the gill cover), deeper, and the distance between the eyes is greater than other tui chub subspecies. The Hutton tui chub was listed as threatened in 1985 due to declines in the species habitat (USDI 1985).

Hutton Spring has been diked and has a pool approximately 12 meters (40 feet) wide, 4.5 meters

(15 feet) deep, is surrounded by rushes, and, in 1977, contained estimated 300 Hutton tui chub (Bills 1977). There is very little information regarding the ecology of the Hutton tui chub. Bills (1977) examined gut content and found the Hutton tui chub to be omnivorous with a majority of food eaten being filamentous algae. It appears that dense aquatic algae is needed for spawning and rearing of young (J. Williams, pers. comm., 1995). No information is available on growth rates, age of reproduction or behavioral patterns. Hutton Spring is privately owned and the habitat is in good condition primarily due to conscientious, long-term land stewardship by the landowner. This habitat is currently fenced from cattle use and is in stable condition. In order to preserve the Hutton Tui Chub population, no Partners program projects will impact the pool in Hutton Spring or any of the water within the currently fenced area. In addition, no pesticides will be used in the vicinity of Hutton Spring.

## Lahontan Cutthroat Trout

Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) (LCT) is one subspecies of the wide-ranging cutthroat trout that includes at least 14 recognized forms in the western United States. The spotting pattern on LCT helps distinguish the LCT from other subspecies of cutthroat trout (Behnke 1992). The LCT often exhibit spots on the top and sides of the head, extending to the tip of the snout (other interior species typically lack the spots on the head and ventral region) (USDI 1994). The coloration is generally dull, but reddish tones may appear on the sides and cheeks; the orange cutthroat slash is typically present to some degree, but yellow slashes also occur (USDI 1994). The Lahontan cutthroat trout is an obligatory stream spawner. Spawning occurs from April through July over gravel substrate in riffle areas. The eggs hatch in 4 to 6 weeks, and fry emerge 13 to 23 days later (USDI 1994).

Cutthroat trout have the most extensive range of any inland trout species of western North America (Behnke 1992), and occur in anadromous, non-anadromous, fluvial, and lacustrine populations. Many of the basins in which cutthroat trout occur contain remnants of much more extensive bodies of water which were present during the wetter period of the late Pleistocene epoch (Smith 1978).

Lahontan cutthroat trout historically occurred in most cold waters of the Lahontan Basin of Nevada and California, including the Humboldt, Truckee, Carson, Walker, and Summit Lake/Quinn River drainages. Large alkaline lakes, small mountain streams and lakes, small tributary streams, and major rivers were inhabited, resulting in the current highly variable subspecies. The fish occurred in Tahoe, Pyramid, Summit, Donner, Walker, and Independence Lakes, but has disappeared from Lake Tahoe, Pyramid, Donner and Walker lakes (Behnke 1992). The Pyramid lake population was extirpated primarily due to blockage of spawning tributaries (Behnke 1992). The subspecies has been extirpated from most of the western portion of its range in the Truckee, Carson, and Walker river basins, and from much of its historic range in the Humboldt basin. Only remnant populations remain in a few streams in the Truckee, Carson, and Walker basins out of an estimated 1,020 miles of historic habitat (Gerstung 1986). Coffin (1988) estimated that only 85 stream populations existed in the Humboldt Basin in a total of 270 miles of habitat compared with an estimated historic occurrence in 2,210 stream miles.

The LCT inhabiting Oregon were originally classified as Willow Whitehorse cutthroat trout. Genetic and taxonomic investigations led to its re-classification as LCT in 1991 (Williams 1991). Willow-Whitehorse cutthroat were afforded protection and threatened status as LCT on November 4, 1991. The LCT occurs in the following Oregon streams: Willow Creek, Whitehorse Creek, Little Whitehorse Creek, Doolitle Creek, Fifteen Mile Creek (from the Coyote Lake Basin) and Indian, Sage, and Line Canyon Creeks (tributaries of McDermitt Creek in the Quinn River (NV) basin).

Sources and mechanisms of stream colonization outside of the Lahontan basin by LCT are uncertain, but human transport is suspected. Resident stream populations have been used to stock other Willow-Whitehorse area streams during the seventies and early eighties. These transplanted populations are considered threatened unless they are determined to be "experimental populations" released outside of the native range of the species for conservation purposes (USDI 1997b).

The severe decline in range and numbers of LCT is attributed to a number of factors, including hybridization and competition with introduced trout species; loss of spawning habitat due to pollution from logging, mining, and urbanization; blockage of streams due to dams; channelization; de-watering due to irrigation and urban demands; and watershed degradation due to overgrazing of domestic livestock (Gerstung 1986; Coffin 1988; Wydoski 1978). Declining LCT populations in the Whitehorse and Trout Creek Mountains are a result of decades of season-long intensive livestock grazing, recreational over-fishing, and more recently drought conditions from 1985 to 1994.

Oregon Department of Fish and Wildlife surveys indicated that LCT populations were reduced from 1985 to 1989 (USDI 1997b). Declining numbers of LCT prompted ODFW to close area streams to fishing (by special order) in 1989. This closure remains in effect. Fish surveys of area streams were conducted again in October of 1994. Although methods vary between the conducted surveys (1985, 1989 and 1994), fish numbers have increased in general from approximately 8,000 fish in the mid 1980s to approximately 40,000 fish in 1994. However, in many areas stream conditions remain less than favorable for the cutthroat; of the 70 miles surveyed less than 20 miles supported adequate densities of fish (USDI 1997b).

No permanent adverse effects to LCT habitat are anticipated in association with Partners program projects. Any river restoration projects conducted in the range of the species could have a beneficial effect to this species. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. In order to minimize disturbance to LCT, the PDCs listed in Appendix D will be followed.

## Lost River and Shortnose Suckers

The Lost River sucker (*Deltistes luxatus*) is a large sucker that may reach over 0.9 m (3 ft). It is characterized by a long, slender head with a subterminal mouth and long, rounded snout. The coloring is dark on the back and sides, fading to white or yellow on the belly. The only species in the genus *Deltistes*, the Lost River sucker is native to Upper Klamath Lake and its tributaries. This sucker also historically inhabited the Lost River watershed, Tule Lake, Lower Klamath Lake, and Sheepy Lake (Moyle 1976), but is not considered native to the Klamath River, although it is now found there, at least downstream to Copco Reservoir (Beak 1987).

The shortnose sucker (*Chasmistes brevirostris*) historically occurred in Upper Klamath Lake and its tributaries (Miller and Smith 1981). Its historic range likely included Lake of the Woods, Oregon, and probably the Lost River system (Scoppettone and Vinyard 1991). The current distribution of the shortnose sucker includes Upper Klamath Lake and its tributaries, Klamath River downstream to Iron Gate Reservoir, Clear Lake Reservoir and its tributaries, Gerber Reservoir and its tributaries, the Lost River, and Tule Lake. Gerber Reservoir represents the only habitat with a shortnose sucker population that does not also have a Lost River sucker population.

Both species are primarily lake residents that spawn in associated rivers, streams, or springs. After hatching, larval suckers migrate out of spawning substrates, which are usually gravels or cobbles, and drift downstream into lakes. Vegetated river and lake shoreline habitats are known to be important during larval and juvenile rearing (Klamath Tribe 1991; Markle and Simon 1993). The Lost River and shortnose suckers are omnivorous bottom feeders whose diets include detritus, zooplankton, algae and aquatic insects (Buettner and Scoppettone 1990). Sexual maturity for Lost River suckers sampled in Upper Klamath Lake occurs between the ages of 6 to 14 years with most maturing at age 9. Most shortnose suckers reach sexual maturity at age 6 or 7 (Buettner and Scoppettone 1990).

The Upper Klamath River Basin above Iron Gate Dam (Basin) encompasses a drainage area of approximately 2,120,400 hectares (5,301,000 acres) in Oregon and California (USFWS 1992). The Basin once had over 350,000 acres of wetlands (USFWS 1989a), extensive riparian corridors, and functional floodplains. Early records from the Basin indicate that the Lost River and shortnose suckers were common and abundant. Gilbert (1898) noted that the Lost River sucker was "the most important food-fish of the Klamath Lake region." Several commercial operations processed "enormous amounts" of suckers into oil, dried fish, canned fish, and other products (Andreasen 1975, Howe 1968). Currently, less than 75,000 acres of wetlands remain in the Basin (USFWS 1992).

The historical range of the Lost River and shortnose suckers has been fragmented by construction of dams, instream diversion structures, irrigation canals, and the general development of the U.S. Bureau of Reclamation's Klamath Project and related agricultural processes. Because habitat fragmentation limits or prevents genetic interchange among populations, extinction could result as genetic diversity decreases and populations become more susceptible to environmental change. The combined effects of damming of rivers, instream flow diversions, draining of marshes, dredging of Upper Klamath lake, and other water manipulations has threatened both species with extinction (USDI 1988b). Additionally, water quality degradation in the Upper Klamath Lake watershed has led to large-scale fish kills related to algal bloom cycles in the lake (Kann and Smith 1993). Introduced exotic fishes may reduce recruitment through competition with, or predation upon, suckers (USFWS 1993, Dunsmoor 1993).

No permanent adverse effects to Lost River or shortnose sucker habitat are anticipated in association with Partners program projects. Any river restoration projects conducted within the range of the species could result in long-term beneficial effects to these species. Partners program projects that involve in-channel work could result in direct take of individual suckers. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions associated with Partners program projects, if made at an inappropriate time of year, could interfere with the species' migration patterns. In order to minimize disturbance to Lost River and shortnose suckers, the PDCs listed in Appendix D will be followed.

## Oregon Chub

The Oregon chub (*Oregonichthys crameri*) is a small minnow endemic to the Willamette River Basin in western Oregon. The chub was listed by the U.S. Fish and Wildlife Service as endangered in 1993. Critical habitat has not been designated for Oregon chub. For a complete discussion of the ecology and life history of this species, see the final rule listing the chub as endangered (USDI 1993c). The information below is extracted from that document. A recovery plan for the Oregon Chub is presently being developed.

Oregon chub and its sibling Umpqua chub have an olive colored back grading to silver on the sides and white on the belly. Scales are relatively large with fewer than 40 occurring along the lateral line; scales near the back are outlined with dark pigment. The main distinguishing characteristics between Oregon and Umpqua chub are: the greater length of the caudal peduncle in the Oregon chub; the mostly scaled breast on Oregon chub versus three fourths to fully naked breast of Umpqua chub; and the Oregon chub's more terminal mouth position, versus Umpqua chub's subterminal mouth. Several size classes of Oregon chub have been collected. Young of the year are approximately 7 to 32 mm (0.27 to 1.26 in), presumed 1+ year chub are approximately 33 to 46 mm (1.3 to 1.81 in), presumed 2+ year chub are approximately 47-64 mm (1.85 to 2.52 in), and presumed 3+ year fish are >65 mm (2.56 in). The largest Oregon chub was collected from the North Santiam River and measured 89 mm (3.5 in) in length.

Oregon chub are endemic to the Willamette River drainage of western Oregon. Typically they occupy off-channel habitats such as beaver ponds, oxbows, side channels, backwater sloughs, low gradient tributaries, and flooded marshes. This species was formerly distributed throughout the Willamette River Valley as far downstream as Oregon City and as far upstream as Oakridge. Historical records 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 Portland to Eugene.

The current distribution of Oregon chub is limited to 19 naturally occurring populations and three recently reintroduced populations. The naturally occurring populations are found in the North Santiam River (4 populations), Mary's River (1 population), Muddy Creek in Linn County (1 population), Middle Fork Willamette River (11 populations), and Coast Fork Willamette River (1 population). Only four of these populations have more than 1000 fish, and 12 populations contain fewer than 50 individuals. The Oregon chub was petitioned for federal listing in 1990, and subsequently listed in 1993. Subsequent to listing, three populations of Oregon chub have been introduced into habitats in the Middle Fork Willamette River drainage at Wicopee Pond, East Ferrin Pond, and Fall Creek Spillway Pond.

Oregon chub habitats usually have little or no water flow, silty and organic substrate, and considerable aquatic vegetation as cover for hiding and spawning (Markle *et al.* 1991; Scheerer and Jones 1997). The average depth of Oregon chub habitats is typically less than 2 m and the summer temperatures typically exceed 16$^{o}$ C (60.8$^{o}$ F). Adult Oregon chub seek dense vegetation for cover and frequently travel in beaver channels or along the margins of macrophyte beds. In the early spring, fish are most active in the warmer, shallow areas of the ponds. Larval chub congregate in shallow areas near the shore (Pearsons 1989, Scheerer 1997). Juvenile Oregon chub venture farther from shore into deeper water (Pearsons 1989). In the winter months, Oregon chub are found buried in detritus or concealed in the limited aquatic vegetation (Pearsons 1989; P. Scheerer, pers. comm.). Fish of similar size classes school and feed together.

Oregon chub spawn from April through September. Before and after spawning season, chub are social and non-aggressive. Spawning behavior, as described by Pearsons (1989), begins with the male establishing a territory in or near dense aquatic vegetation and aggressively excluding other males. When an adult female enters the territory the courting begins. The male rubs his head in the ventral region of the female between the pectoral and anal fins and directs her into the aquatic vegetation by slight changes in the angle and pressure of the head on the lateral undersides of the female. Twirling of both fish, arranged head to head, follows, and eggs and sperm are released. Spawning activity has only been observed at temperatures exceeding 16$^{o}$ C (60.8$^{o}$ F). Males >35 mm have been observed exhibiting spawning behavior. Female egg masses have been found to contain 147 to 671 eggs (Pearsons 1989).

Oregon chub feed throughout the day, mostly on water column fauna, and stop feeding after dusk (Pearsons 1989). The diet for Oregon chub adults collected in a May sample consisted primarily of copepods, cladocerans, and chironomid larvae (Markle *et al.* 1991). The diet of juvenile chub consisted of rotifers, copepods, and cladocerans. (Pearsons 1989).

In the last 80 years, backwater and off-channel habitats typically occupied by the Oregon chub have disappeared rapidly because of changes in seasonal flows resulting from the construction of dams throughout the basin, channelization of the Willamette River and its tributaries, removal of snags for river navigation, and agricultural practices. As a result, available Oregon chub habitat was reduced, existing Oregon chub populations were isolated, and recolonization of habitat and mixing between populations was reduced. In addition, a variety of non-native aquatic species were introduced to the Willamette Valley over the same period. The establishment and expansion of these non-native species, in particular, largemouth bass (*Micropterus salmoides*), smallmouth bass *(Micropterus dolomicu*), crappie (*Pomoxis* sp.), bluegill (*Lepomis macrochirus*), western mosquitofish (*Gambusia affinis*) and bullfrog (*Rana catesbiana*), has contributed to the decline of the Oregon chub and limits the species' ability to expand beyond its current range.
Many of the known extant populations of Oregon chub occur near rail, highway, and power transmission corridors and within public park and campground facilities. These populations are threatened by chemical spills from overturned truck or rail tankers; runoff or accidental spills of brush control chemicals; overflow from chemical toilets in campgrounds; siltation of shallow habitats from logging and construction activities; and changes in water level or flow conditions from construction, diversions, or natural desiccation.

No permanent adverse effects to Oregon chub habitat are anticipated in association with Partners program projects. Any river restoration projects conducted within the range of the species could have a beneficial effect to this species. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. In order to minimize disturbance to Oregon chub, the PDCs listed in Appendix D will be followed.

**Sea-run Cutthroat Trout**

Sea-run cutthroat trout (*Oncorhynchus clarki clarki*), are listed as an endangered species in the Umpqua River basin (USDC 1996), and are considered candidates for listing elsewhere throughout their range (USDC 1997b). The information that follows was taken from Pauley *et al*. (1989a), except as noted. Sea-run cutthroat are anadromous salmonids, spawning and rearing in small tributaries of small or large streams, and migrating to the near-coastal ocean where they spend less than one year before returning to their natal streams to spawn. Sea-run cutthroat, like rainbow trout, are unlike other salmonids in that they do not die after spawning, but can repeat the migration to and from the ocean several times to spawn. Adult sea-run cutthroat trout reach up to 2.7 kg (5.95 lb) in weight. When in the ocean and prior to changing to spawning colors, the cutthroat is silvery in coloration with small black spots are on the back, head, and sides to below the lateral line, as well as on the anal and caudal fins. The sea-run cutthroat's spawning coloration is darker; the males gain an amber hue with pinkish-orange sides (Trotter 1987). The primary distinguishing characteristic in sea-run cutthroat is the orange to red streak along the lower jaw, which is faint in the ocean fish, and brightens as the fish gets closer to spawning (Trotter 1987).

After spending one growing season in the ocean, sea-run cutthroat return to their natal streams from July to March (timing varies with geographic location; within-stream returns occur within in a fairly close time-frame). Spawning occurs in late winter and spring. Juveniles migrate down-river from March to June, although this species may migrate several times within the river before migrating to the ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Cutthroat trout prefer stream water temperatures of 9 to 12°C (48.2 to 53.6°F), depending on life stage, and a spawning gravel size of 0.6 to 10.2 cm (0.24 to 4.02 in) in diameter (Emmett *et al.* 1991).

No permanent adverse effects to cutthroat trout habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to cutthroat trout, the PDCs listed in Appendix D will be followed.

**Sockeye Salmon**

The sockeye salmon (*Oncorhynchus nerka*), is listed as an endangered species in the Snake River basin (USDC 1991). The information that follows was taken from Pauley *et al.* (1989b), except as noted. Sockeye are anadromous salmonids, rearing in lakes or the portions of streams that flow into or out of lakes, and migrating to the ocean where they live for 1 to 4 years (typically 2) before returning to their natal lakes/streams to spawn before dying. Adult sockeye average 1.58 to 3.16 kg (3.48 to 6.97 lb) in weight (Groot and Margolis 1991). Their coloration when in the ocean and prior to changing to spawning colors is a green-blue dorsal surface with silvery sides. The spotting pattern is often a distinguishing characteristic between species. The sockeye's fine black speckling on the back is free of larger spots, and there is no spotting on its dorsal or caudal fins. Prior to spawning, the body of the sockeye body turns a bright red, and the head of the male turns light green.

After spending 1 to 4 years in the ocean (typically 2), sockeye return to their natal streams between June and September (Groot and Margolis 1991). Spawning occurs from August to January. Juvenile fry emerge from the gravel from April to May and spend 1 to 2 years in the rearing lakes, before migrate to the ocean in the spring.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Sockeye prefer stream water temperatures of 4 to 15.6°C (39.2 to 60.1°F), depending on life stage (Emmett *et al.* 1991), and a spawning gravel size of 1.3 to 10.2 cm (0.51 to 4.02 in) in diameter (Bjornn and Reiser 1991).

No permanent adverse effects to sockeye salmon habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to sockeye, the PDCs listed in Appendix D will be followed.

## Steelhead Trout

Steelhead trout *(Oncorhynchus mykiss*), are listed as a threatened species in the Snake River basin (USDC 1997c) and the Lower Columbia River (USDC 1998c), are proposed for listing in the Upper Willamette River and the Middle Columbia River (USDC 1998d), and are considered candidate species in the Klamath Mountains Province and Oregon coastal streams (USDC 1998c). The information that follows was taken from Pauley *et al.* (1986), except as noted. Steelhead are an anadromous species, typically rearing in large streams, and migrating to the ocean where they live for 2 to 3 (and occasionally 4) years before returning to their natal streams to spawn. Steelhead are unlike other salmonids in that they may return to their natal streams several times to spawn before they die. Adult steelhead reach up to 19.5 kg (43 lb) in weight. Their coloration when in the ocean and prior to changing to spawning colors is a silvery-blue on the dorsal surface with silvery sides. The steelhead has black spots on the back and the dorsal and caudal fins, and a complete lateral line, with a slight anterior curve. Prior to spawning, the steelhead gets considerably darker in color, and the male has a pink to red band on the sides. Steelhead are distinguished from cutthroat trout by the absence of a red or orange dash under the lower jaw.

After spending 2 to 3 years in the ocean, steelhead return to their natal streams. There are two runs of steelhead: a winter and a summer run. Winter steelhead return to their natal stream in the late fall or winter and spawn by May. Summer steelhead migrate to their native stream during spring and summer, and spawn the following spring. Fry emerge from the gravel four to eight weeks later and spend 1 to 4 years in freshwater before migrating to the ocean.

Habitat conditions important to the survival and success of salmon include cool water temperatures, low turbidity, high levels of dissolved oxygen, gravel size, and stream-side vegetation and submerged cover for protection from predation and disturbance as well as providing shade. Stream water temperatures of 8 to 21°C (46.4 to 69.8°F) appear best for steelhead, depending on life stage, and they prefer a spawning gravel size of less than 0.85 cm (0.33 in) in diameter, with rubble for rearing (Emmett *et al.* 1991).

No permanent adverse effects to steelhead trout habitat are anticipated in association with Partners program projects. Partners program projects that involve in-channel work could result in direct take of individual fish. Further, temporary increases in turbidity associated with Partners program projects aimed at improving habitat for salmonids and other native species could interfere with the species' foraging or spawning behavior. In order to minimize impacts to steelhead trout, the PDCs listed in Appendix D will be followed.

## Warner Sucker

The Warner sucker (*Catostomus warnerensis*) is a threatened species occurring in water bodies within the Warner valley of south central Oregon. This species is in decline due to modifications of their native habitat. The information in the following sections is from the Draft recovery plan for the threatened and rare native fishes of the Warner basin and Alkali subbasin (USFWS 1997c).

The Warner sucker is a slender-bodied fish that grows to a maximum recorded fork length of 456 mm (17.9 in). The dorsal two-thirds of the head and body are blanketed with dark pigment, which borders creamy white lower sides and belly. During the spawning season, males have a brilliant red lateral band along the midline of the body; female coloration is lighter. Sexes can be distinguished by the anal fin shape (Coombs *et al.* 1979); the male's is broad and rounded distally, while the female's is narrower in appearance and nearly pointed or angular. The Warner sucker was federally listed as threatened in September 1985 and is also listed by the state of Nevada.

There is essentially one metapopulation of the Warner sucker which is endemic to the streams and lakes geographically delineated by the Warner Basin. The Warner Basin extends from southeast Oregon into extreme northern Nevada and California. The probable historic range of the Warner sucker includes the main Warner Lakes (Pelican, Crump, and Hart), and other accessible standing or flowing water in the Warner Valley, including the low to moderate gradient reaches of the tributaries which drain into the Valley. These tributaries include Deep Creek, the Honey Creek drainage, Snyder Creek and the Twentymile Creek drainage, including Greaser Reservoir (White *et al.* 1990). In Twelvemile Creek, a tributary to Twentymile Creek, the historic range of the sucker extended through Nevada and back into Oregon, but probably not as high as the California reach of the stream.

The Warner sucker currently inhabits the lakes and low gradient stream reaches of the Warner Valley, and is represented by a lake morph and a stream morph. Stream fish prefer long pools with undercut banks, containing high macrophytic coverage of substrates (≥70%) and root wads or large boulders, with a maximum depth of 1.5 meters (5 ft), a 2°C (35.6°F) differential between the surface and the pool bottom, and overhanging vegetation (often *Salix* sp.). Lake fish prefer the deepest available habitat where food is plentiful. A variety of studies have shown that when adequate water is present, Warner suckers may inhabit all the lakes, sloughs, and potholes in the Warner Valley. The documented range of the sucker extended as far north into the ephemeral Flagstaff Lake during high water in the early 1980's, and again in the 1990's (Allen *et al.* 1996).

Warner sucker larvae have terminal mouths and short digestive tracts, enabling them to feed selectively in midwater or on the surface. Invertebrates, particularly planktonic crustaceans, make up most of their diet. As the suckers grow, they develop subterminal mouths, longer digestive tracts, and gradually become generalized benthic feeders on diatoms, filamentous algae, and detritus. Adult stream morph suckers forage nocturnally over a wide variety of substrates such as boulders, gravel, and silt. Adult lake morph suckers are thought to have a similar diet, but feed over predominantly muddy substrates (Tait and Mulkey 1993a,b).

Sexual maturity occurs at an age of 3 to 4 years (Coombs *et al.* 1979). Spawning usually occurs in April and May in streams, although variations in water temperature and stream flows may result in either earlier or later spawning. Temperature and flow cues appear to trigger spawning, with most spawning taking place at 14-20°C (57-68°F) when stream flows are relatively high. The Warner sucker spawns in sand or gravel beds in slow pools (White *et al.* 1990, 1991; Kennedy and North 1993). In years when access to stream spawning areas is limited by low flow or by physical in-stream blockages (such as beaver dams or diversion structures), suckers may attempt to spawn on gravel beds along the lake shorelines.

Larvae are found in shallow backwater pools or on stream margins where there is no current, often among or near macrophytes. Young of the year are often found over deep, still water from midwater to the surface, but also move into faster flowing areas near the heads of pools (Coombs *et al.* 1979). Juveniles (1 to 2 years old) are usually found at the bottom of deep pools or in other habitats that are relatively cool and permanent such as near springs.

The major threats to the continued existence of the Warner Sucker are human induced stream channel and watershed degradation, irrigation diversion practices and predation and competition from introduced fishes. Cattle grazing is ubiquitous throughout the interior basins of Oregon, and has had profound impacts on the streams in the Warner Valley (White *et al.* 1991). Not only do cattle trample streamside vegetation, destroy undercut banks and increase erosion in spawning streams, but their cumulative impacts often result in the dropping of water tables. This can cause disruptions in the flood process, nutrient inflow, peak and dry season flows and their velocities, and has resulted in stream down cutting in many areas within the range of the Warner Sucker.

Water diversion structures (which first appeared in the Warner Valley in the 1930's) can block upstream migration to spawning grounds and divert water and fish of all ages into fields and adjacent uplands where they are destined to perish. Diversion screening has been attempted by ODFW, but no screens have remained in place due to maintenance problems (USFWS 1997c).

Over a series of drought years, reduced flows can cause drops in lake levels and sometimes, especially in conjunction with lake pumping for irrigation, cause complete dry-ups, as was the case with Hart Lake in 1992.

The introduction of exotic piscivorus fishes disrupted this balance and the native ichthyofauna has suffered. In the early 1970s, ODFW stocked white crappie (*Pomoxis annularis*), black crappie (*P. nigromaculatus)*, and largemouth bass (*Micropterus salmoides*), in Crump and Hart Lakes. Prior to this, brown bullhead (*Ameiurus nebulosus*) and non-native rainbow trout were introduced into the Warner Valley. The adults of all five species feed on small fishes to varying degrees (Wydoski and Whitney 1979), while the larvae of the crappie and bullhead compete directly with young suckers for food.

No permanent adverse effects to Warner sucker habitat are anticipated in association with Partners program projects. Any restoration projects conducted within the range of the species could result in long-term beneficial effects to these species. Partners program projects that involve work in lakes or streams inhabited by the Warner sucker could result in direct take of individual suckers. Further, temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. Any temporary water diversions associated with Partners program projects, if made at an inappropriate time of year, could interfere with the species' migration patterns. In order to minimize disturbance to Warner suckers, the PDCs listed in Appendix D will be followed.

## AMPHIBIANS

### Spotted Frogs

Recent genetic work shows that the taxon formally known as the West Coast population of the spotted frog is actually distinct to a point of being recognized as a full species (Green *et al*. 1996). Green *et al*. (1997) names the two species of spotted frogs that occur in the western States as the Oregon spotted frog (*Rana pretiosa*) and the Columbia spotted frog (*Rana luteiventris*). The Columbia spotted frog is found from extreme southwestern Yukon, through the Alaska panhandle and most of British Columbia, to Washington east of the Cascades, Idaho, western Montana, eastern Oregon, and northwestern Wyoming. Disjunct populations of the Columbia spotted frog occur in southeastern Oregon, southwestern Idaho, the Bighorn Mountains of Wyoming, the Mary's, Reese, and Owyhee River systems in Nevada, the Wasatch Mountains, and the western desert of Utah (Green *et al*. 1997). Based on this information, the West Coast population of the spotted frog should now be known as the Oregon spotted frog (*Rana pretiosa*) with a consequent change in listing priority number.

#### 1. Columbia Spotted Frog

The Great Basin population of the Columbia spotted frog (*Rana luteiventris*) is a candidate for

Endangered Species Act protection. This candidate species occurs in Oregon in the Owyhee, Wallawa, and Blue Mountains. The following species information is from the candidate assessment form (USDI 1997c). The Columbia spotted frog is closely associated with surface waters; it is dependent on wetlands for over-wintering, breeding, and foraging habitats. Habitat in the Great Basin is seasonally xeric. Spotted frogs commonly use areas such as spring heads and deep undercuts with overhanging vegetation. Adults move to breeding areas in the spring, which may be hundreds of meters away from over-wintering sites. Breeding typically takes place in pooled water with floating/emergent vegetation. This may occur as soon as snow or ice melts from water surface, and may be completed within 2 days at higher elevations. Successful egg production, development, and metamorphosis of spotted frogs depend on hydration, adequate water depth, overhanging vegetation, appropriate pH and temperature, and the absence or low density of non-native fish and bullfrogs.

Threats to the existence of the spotted frog include:

1) Livestock degradation of habitat: Mismanagement of livestock grazing may result in the removal of cover vegetation, degradation of water quality, breakdown of bank overhangs, rechanneling of water and dessication of meadows and ponds. A 1994 spotted frog survey in southeastern Oregon found spotted frogs only in a stream protected by cattle exclosure. Other reports indicate that responsible grazing practices may, in some cases, maintain suitable spotted frog habitat by controlling some aquatic plants (Bull and Hayes, pers. com, 1998).

2) Loss or fragmentation of habitat by spring development, wetland loss, road construction, and a reduction in beaver populations.

3) Degraded water quality as a result of seepage through from mine spoils.

4) Predation by nonnative species: Both bullfrogs and non-native salmonid and bass species occur in the Great Basin and are suspected predators of the spotted frog. The bullfrog may also compete for breeding sites, or interrupt spotted frog courtship (Hayes, pers. comm., 1998).

Any Partners program projects that take place in Columbia spotted frog habitat are expected to benefit the species in the long term, although short term negative impacts (e.g., sedimentation) may occur. In order to minimize impacts to the Columbia spotted frog, the PDCs listed in Appendix D will be followed.

<u>2. Oregon Spotted Frog</u>

Historically, the Oregon spotted frog (*Rana pretiosa*) was recorded from 8 localities in western Washington, 44 localities in Oregon, 3 localities in California, and 1 site in British Columbia. Extensive surveys have recently been completed, and the species is currently documented from 3 sites in Washington, and 19 sites in Oregon. The species has not been found for 15 years at the British Columbia site, and no longer is extant in California. Based on historical sites, the Oregon spotted frog has disappeared from approximately 76 percent of its range (25 sites). This figure may be conservative due to the lack of historic collections at low elevation sites; the species has been estimated to be extirpated from 90 percent of its range based on geographic analysis. It is estimated that over 95 percent of the habitat that is suitable for the Oregon spotted frog has been surveyed across its range (Hayes 1997).

The Oregon spotted frog historically ranged from extreme southwestern British Columbia, Canada, south through the eastern side of the Puget/Willamette Valley trough and the Columbia River gorge, to the central Cascade mountains of Oregon, south into the Klamath Basin and northeastern California. The species is associated with non-woody wetland plant communities, along the marshy edges of ponds, lakes, and slow-moving streams. Breeding occurs February through March at lower elevations and late May to early June at higher elevations. Males are not territorial and may gather in large groups of 25 or more individuals at specific locations. Females deposit their egg masses at the same locations in successive years. Tadpoles metamorphose during their first summer.

The Oregon spotted frog faces threats to its warm water marsh habitat from development, changes in hydrology, and water quality and overgrazing. Although moderate livestock grazing in some instances benefits the spotted frog by maintaining openings in the vegetation, overgrazing can adversely affect the habitat causing severe hydrologic modification. In addition, preliminary results from studies being conducted at two sites in Oregon show a significant improvement in the vegetation in areas where cattle are excluded.

Adverse affects from hydrologic changes are a significant threat to the spotted frog. Modification of river hydrology from the series of dams in the Willamette Valley and the Puget Trough has significantly reduced the amount of shallow overflow wetland habitat historically used by the spotted frog. In the Cascades, reservoirs have inundated large marsh complexes and fragmented remaining marshes, thereby reducing the survival of the Oregon spotted frog in these areas. Range-wide, over 50 percent of the extant Oregon spotted frog sites face threats from changes in hydrology.

Development threatens the spotted frog at several sites. For example, in Washington, the Dempsey Creek site near Olympia is privately owned by landowners who have recently expressed interest in subdividing or selling their land for development. The Nature Conservancy has purchased approximately 200 acres of the 1,200 acre Trout Lake site. The Department of Natural Resources has started the acquisition process to protect additional acres at this site, however, the remaining land at this site is vulnerable to subdivision. In Oregon, the landowner at the LaPine Creek site has expressed a desire to develop the property.

At Paulina Marsh, an historic site in Oregon, only 1 frog was found in 1991, and frogs have not been found there since. The loss of this site is probably due to a number of factors, including drought, habitat degradation from livestock, and the presence of brook trout.

Predation by exotic species such as warm water fishes and bullfrogs (*Rana catesbeiana*) adversely affect the Oregon spotted frog. The spotted frog is unique among the native ranids of the Pacific Northwest in that it requires warm water habitat, which is also habitat for a number of introduced fish. During recent surveys in Oregon, at least one exotic predator occupied 17 of 19 sites where spotted frogs were found (Hayes 1997). Brook trout was the most frequently recorded exotic aquatic predator, occurring at 16 of the sites. These introduced fish prey on the tadpoles of native amphibians. The Oregon spotted frog did not evolve with these fish and do not have mechanisms to deter their predation. Evidence that exotic fish adversely affect the Oregon spotted frog comes from 1) demographics data that show sites that contain a disproportionate ratio of older spotted frogs to juvenile frogs (i.e., poor recruitment) also have significant numbers of brook trout; and 2) results of studies on other native amphibians that show lower densities of larvae or egg masses in areas containing high densities of fish (Tyler *et al*. 1996).

The invasion of such exotic plants as reed canary grass may eliminate areas of suitable breeding habitat for the Oregon spotted frog by creating such dense areas of vegetation that the frogs cannot gain access for breeding. A study currently underway in Washington is investigating this possibility.

Drought causes seasonal loss of habitat and degradation of essential shoreline vegetation and is considered a threat to the species. During extended droughts, spotted frogs are more vulnerable to predation as a result of reduced cover. Further, reduced water levels confine the frogs to smaller areas where they are more vulnerable to predators such as introduced fish.

The majority of the Oregon spotted frog populations are small, which makes them vulnerable to stochastic events such as drought and disease. Only 5 of 21 populations are considered large (greater than 1,000 individuals). Six populations contain fewer than 100 individuals. One site (Jack Creek, Klamath Co.) contains a relatively large number of larvae and juveniles, but very few adult frogs. There appears to be a lack of either adult survivorship or a lack of recruitment after the juvenile stage. Poor recruitment could lead to the loss of this site. Two of the five large sites face imminent threats from either brook trout predation or habitat degradation.

No permanent adverse effects to spotted frog habitat are anticipated in association with Partners program projects. Any aquatic restoration projects conducted within the range of the species could result in beneficial effects to this species. Partners program projects that involve in-water activities could result in direct take of individual spotted frogs. Temporary increases in turbidity associated with Partners program projects could interfere with the species' foraging or spawning behavior. In order to minimize disturbance to spotted frogs, the PDCs listed in Appendix D will be followed.

## INVERTEBRATES

## Fender's Blue Butterfly

Fender's blue butterfly (*Icaricia icarioides fenderi*), a candidate for Federal listing, was first described as *Plebejus maricopa fenderi*, from specimens collected in Yamhill County, Oregon. The genus *Plebejus* has since been split, with some of its members, including the Fender's blue butterfly, assigned to the genus *Icaricia.* Males of this subspecies are silvery-blue on the dorsal wing surface and gray on the ventral wing surface. The upper wing surface of female butterflies is a brown ground color, with a wing underside similar in appearance to that of the male. The ventral hindwing often has a series of small, black spots near the margin of the wing.

Only a limited number of collections were made between the time of the subspecies' discovery and Macy's last observation on 23 May, 1937 in Benton County, Oregon (Hammond and Wilson 1992). Searches were made, but a lack of information on the butterfly's host plant prevented researchers form focusing their efforts. Finally, in 1989, the Fender's blue butterfly was rediscovered by Dr. Paul Hammond at McDonald Forest, Benton County, Oregon on Kincaid's lupine, an uncommon species.

Prior to the rediscovery of this species in 1989, the taxonomy of the Fender's blue butterfly was unclear due to the limited number of specimens available. The confusion arises from the similarity in appearance between the Fender's blue butterfly and the Pardalis blue butterfly (*Icaricia icarioides pardalis*), an inhabitant of the central California Coast Range near San Francisco. Recent comparison of specimens (Hammond and Wilson 1993) indicates significant morphological differentiation between populations of Fender's blue butterflies and Pardalis blue butterflies, confirming the status of these two taxa as distinct subspecies.

The historic distribution of the Fender's blue butterfly is unknown due to the limited information initially collected on this species. Recent surveys, however, indicate that the Fender's blue butterfly is confined to the Willamette Valley and currently occupies 21 sites in Yamhill, Polk, Benton and Lane counties (Hammond and Wilson 1992). One population at Willow Creek (Lane Co.) is found in wet, tufted hair grass (*Deschampsia- caespitosa*) type prairie, while the remaining sites are found on drier upland prairies characterized by Fescue grasses (*Festuca* spp.). Sites occupied by the Fender's blue butterfly are located almost exclusively on the valley's western side, within 26 km (16.15 mi) of the Willamette River.

This butterfly's life cycle appears to parallel that described for other subspecies of *Icaricia icarioides* (Hammond and Wilson 1993). Adult butterflies lay their eggs on host plants during May and June. Newly hatched larvae feed for a short time, reaching their second instar in the early summer, at which point they enter an extended diapause. Diapausing larvae remain at or near the base of the host plant through fall and winter and become active again the following March or April. Once diapause is broken, the larvae feed and grow through three to four additional instars, metamorphosing into adult butterflies in April and May. This life cycle allows for the completion of only one generation per year.

Behavioral observations of Fender's blue butterfly larvae indicate an extremely cautious nature, with individuals noted to drop from their feeding position on lupine leaves to the base of the plant at the slightest sign of disturbance (C. Schultz, University of Washington, pers. comm., 1994). Though many Lycaenids are tended by ants during their larval stage, observations of Fender's blue butterfly larvae in the field have failed to document such an a mutualistic association.

The preference of the Fender's blue butterfly for Kincaid's lupine has been supported through extensive searches of other neighboring lupine species throughout the butterfly's range. Of the many lupine species examined, secondary use of only two additional lupine species has been documented--*L. laxiflorus* (spurred lupine) and *L. albicaulis* (sickle-keeled lupine). Feeding on these two lupines has been noted at seven of 21 sites that support Fender's blue butterflies. At each site, however, *L. sulphureus* ssp. *kincaidii* is present nearby and is the predominant lupine species in all but one instance (Hammond and Wilson 1992 ).

The Fender's blue butterfly is limited in range to upland prairie remnants in western Oregon. Current estimates indicate that fewer than 400 ha. (1,000 acres) of native upland prairie remain in the Willamette Valley, only one-tenth of 1 percent of the original upland prairie once available to the Fender's blue butterfly. The immediate threat of habitat loss has been well documented. Habitat in western Polk County is rapidly disappearing due to housing and tree farm development (Hammond 1996). Between 1990 and 1992, three occurrences of both the Fender's blue butterfly and Kincaid's lupine were lost to the expansion of Christmas tree farming operations (Hammond 1996). Conversion of these three sites destroyed approximately 3 hectares (7 acres) of private and roadside habitat that comprised the nucleus of two Fender's blue butterfly populations. The two roadside occurrences of the butterfly that remain nearby are no longer considered viable due to the loss of the source butterfly populations and host plants. Urban development, agriculture, and tree farm cultivation have removed habitat from several additional populations since 1992, causing the butterflies to be extirpated or reduced to very low numbers. Housing development is also planned for the Dallas site in Polk County (Hammond 1996).

Fender's blue butterfly populations are additionally threatened by virtue of their small size. Over half of the sites occupied by these butterflies are parcels of 3 hectares (7.4 acres) or less. These occurrences, predominantly roadsides and fence line/boundary sites, face an immediate threat of destruction through development, agriculture, roadside maintenance and herbicide application. Of the 21 sites, only three are considered secure, and two of these are facing management problems. Even without habitat destruction, such extremely small population fragments would be subject to the adverse effects of low genetic variability, as well as extirpation due to stochastic events.

Effects to Fender's blue butterflies associated with Partners program projects would most likely result from adverse modification of the species' habitat. In order to minimize impacts to these butterflies and their habitat, the PDCs listed in Appendix D will be followed.

## Oregon Silverspot Butterfly

The Oregon silverspot butterfly (*Spyeria zerene hippolyta*) is a darkly marked coastal subspecies of the Zerene fritillary, a widespread species in montane western North America.  The historical range of the subspecies extends from the Long Beach Peninsula, Pacific County, Washington, south to Del Norte County, California.  Within its range, the butterfly is known to have been extirpated from at least 11 colonies (two in Washington, eight in Oregon, and one in California).  The Oregon silverspot butterfly was listed as a threatened species with Critical Habitat by the Service in 1980. For a complete discussion of the ecology and life history of this subspecies, see that final rule (USDI 1980). The information below is extracted from that document.

Historically, the Oregon silverspot butterfly was distributed along the Washington and Oregon coasts from Westport in Grays Harbor County south to about Heceta Head in Lane County.  In addition, there is a disjunct cluster of populations north of Crescent City in Del Norte County, California.  At least 20 separate localities were known for the butterfly in the past.  The butterfly and its coastal grassland habitat were probably much more common in the past.

At present, the subspecies is currently well-established at only five sites.  They include one in Del Norte County, two in Lane County (Rock Creek-Big Creek and Bray Point), and two in Tillamook County (Cascade Head and Mt. Hebo).  A sixth site in Clatsop County (Clatsop Plains) is still extant.  In addition, surveys in 1990 confirmed continued presence of a population on the Long Beach Peninsula.  A new site was tentatively established on Fairview Mountain in Lane County, Oregon.

The current distribution of the Oregon silverspot butterfly includes three distinct (but in some cases co-occurring) types of grassland habitats -- montane grasslands, marine terrace and coastal headland "salt spray" meadows, and stabilized dunes.  The latter two ecosystem types are strongly influenced by proximity to the ocean and are subject to mild temperatures, high rainfall, and persistent fog.  In contrast, the montane sites have colder temperatures, significant snow accumulations, less coastal fog, and no salt spray.

Adult emergence starts in July and extends into September.  Many males appear several weeks before most females emerge, as is typical of *Spyeria* butterflies.  Mating usually takes place in relatively sheltered areas.  Adults will often move long distances for nectar or to escape windy and foggy conditions. The Oregon silverspot butterfly differs from related taxa in physiology and slow larval development rates.  These differences appear to be specific adaptations to a harsh, coastal environment characterized by fog and cold wind throughout much of the year.  A slow caterpillar development rate synchronizes the adult flight season with best coastal weather conditions.

Caterpillars of the Oregon silverspot butterfly feed primarily on western blue violets (*Viola* *adunca*), but are known to feed on a few other species of the genus *Viola* as well. Nectar plants most frequently used by the Oregon silverspot adults are members of the aster (Composite) family, including goldenrod (*Solidago canadensis*), dune goldenrod (*Solidago spathulata*), California aster (*Aster chilensis*), pearly everlasting (*Anaphalis margaritacea*), and yarrow (*Achillea millefolium*).

Historically, fire is thought to be the dominant factor that maintained Oregon's coastal grassland communities and their endemic species. Other disturbances such as landslides, small mammal activities, wind throw, and herbivory by invertebrates, small mammals and large native ungulate grazers are thought to have played a secondary role in opening early successional habitat conditions. Severe fires in 1845 and 1910 converted substantial portions of Mt. Hebo from forest to grassland. Since that time fire frequencies on the Oregon coast have been greatly reduced and the extent of coastal grasslands has declined dramatically.

Effects to Oregon silverspot butterflies associated with Partners program projects would most likely result from adverse modification of the species' habitat. In order to minimize disturbance to these butterflies and their habitat, the PDCs listed in Appendix D will be followed.

## Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp (*Branchinecta lynchi*) (fairy shrimp) was found for the first time in vernal pool wetlands in the Rogue Valley near Medford and White City, Oregon, in February of 1998 (USFWS 1998b). The fairy shrimp (Family: Brachinectidae) was previously known from numerous sites in California, with the nearest site 80 miles south near Mt. Shasta, California, and was listed as threatened in 1994 (USDI 1994c).

This species of fairy shrimp is restricted to vernal pool wetlands which are shallow depressions that ephemerally retain water in the winter and spring, often into early summer. Vernal pools typically form in flat plains where water percolation is restricted by a clay or hardpan layer so that rainfall is retained for several months of the year (USDI 1994c). These types of plains and their unique hydrology are threatened by development pressures from urban, transportation, agricultural and utility projects. In the Rogue Valley, the vernal pool ecosystems are threatened by urban development, cattle grazing and municipal waste discharge (D. Borgias, pers. comm., 1997).

This fairy shrimp ranges in size from 10.9 to 25.0 mm (0.4 to 1.0 inches), and requires clear or semi-clear water with low total dissolved solids, conductivity, alkalinity, and chloride. Fairy shrimp feed on algae and plankton which is scraped from vegetation within vernal pools, and lay thick-shelled eggs which withstand heat, cold, and dessication (USFWS 1998b). Partner's program projects in vernal pools within and south of the Rogue Valley will survey for the vernal pool fairy shrimp prior to conducting activities. To avoid impacts to the fairy shrimp, Partners program projects in or adjacent to vernal pool habitat within and south of the Rogue Valley will follow the PDCs in Appendix D.

# BIRDS

## Aleutian Canada Goose

The Aleutian Canada goose (*Branta canadensis leucopareia* ) is one of eleven generally recognized sub-species of Canada geese. It is the second smallest species in the Pacific Flyway. The adults are easily distinguished by a white ring around the neck. Other characteristics include: an abrupt forehead, cheek patches generally separated by black feathering on the ventral side of the head, and a narrow border of dark features along the bottom of the neck ring. In 1967, Aleutian Canada geese were listed as endangered (USDI 1967). Fewer than 800 birds remained. Their decline was greatly attributed to the farming of Arctic foxes on all but one of the Aleutian Islands.

The loss of migration and wintering habitat to urban development also contributed to the decline of the Aleutian Canada goose. Chemical pollutants, human disturbance, disease, subsistence hunting by natives on the nesting area, and commercial and sport hunting on the winter grounds contributed further to the reduction of an already endangered bird.

Primarily due to successful control of Arctic fox predation, the status of the Aleutian Canada goose began to improve. The count in the winter of 1986/1987 showed a significant increase in population, from 790 geese in 1975 to 5,000 that winter. In 1990, an estimated 6,000 geese existed. The species was reclassified from endangered to threatened in 1991. The count in the spring of 1996 indicated that there are now more than 19,000 Aleutian Canada geese.

It is now known that the geese winter in and use pastures and grain fields along the coasts of Oregon and northern California and in California's Central Valley. Prior to the northward spring migration, almost the entire population stages near Lake Earl in Crescent City. They arrive in early February and head north in April. Thousands of birds heading north along the southern coast of Oregon stop to graze in the New River pastures on the Coos/Curry county line. At night, the geese roost on the coastal rocks near Bandon. It is presumed that the geese migrate between the Aleutian Islands and their wintering grounds by flying non-stop over the Pacific Ocean, a distance of nearly 2,000 miles.

A unique population of Aleutian Canada geese breeds in the Semidi Islands, southwest of Kodiak Island, and winter only at Nestucca Bay, near Pacific City, Oregon. This population was slowly increasing and reached a peak of 144 birds. In the last few years, it has begun to decline with only 97 birds remaining. Mr. Roy W. Lowe, a wildlife biologist with the Service in Oregon, is conducting research in the Semidi Islands to see if squirrels are preying on goslings and eggs.

No adverse effects to habitat of wintering Aleutian Canada geese are anticipated as a result of Partners program projects. Any marsh restoration projects conducted within the range of the species could be particularly beneficial to these geese. Disturbance to Aleutian Canada geese could occur from project activities that produce noise above ambient levels. Such disturbance could interfere with resting and foraging behavior, if it caused the birds to flush frequently from their feeding and loafing areas. To minimize disturbance to Aleutian Canada geese the PDCs listed in Appendix D will be followed.

## American Peregrine Falcon

The American peregrine falcon is listed as endangered in the United States. The recovery plan was developed by The Pacific Coast American Peregrine Falcon Recovery Team (USFWS 1982).

Peregrine falcons nest on cliffs situated near lacustrine, marine or riparian habitat. They often have a diverse avian prey base associated with riparian habitat (J.E. Pagel, pers. comm., 1996). Peregrine falcons are particularly sensitive to disturbance near the nest cliff during the breeding season, which extends from the winter solstice through the end of August (site specific nesting chronologies vary due to elevation, aspect of cliff, and individual behavioral variations).

Productivity at all peregrine nest sites in Oregon has been hampered by eggshell thinning induced by chronic levels of organochlorines. Due to eggshell thinning, protection of sites from disturbance is important to reduce potential for nest failure caused by human activities.

Silvicultural activities will not be allowed to occur within ¼ mile of any known peregrine nest site; we anticipate no effect to nesting peregrines resulting from habitat modification. Disturbance to peregrines could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to peregrine falcons the PDCs listed in Appendix D will be followed.

## Brown Pelican

A ponderous dark water bird, the brown pelican (*Pelecanus occidentalis )* can reach a bill-to-tail length of 127 cm (50 in) and may have a wing span of near 2 meters (6.5 ft). Adults have much white about the head and neck. Immatures have dark heads and whitish underparts. The species ranges along the southern Atlantic, Pacific, and Gulf coasts of the United States, including the entire coast of Oregon, south to northern Brazil and Chile. Small numbers of immature brown pelicans regularly wander inland in summer, especially in the Southwest. Brown pelicans are listed as endangered (USDI 1970).

Brown pelicans occupy salt bays, beaches, and ocean, generally preferring shallow waters immediately along the coast, but sometimes seen well out to sea. The species nests on islands, which may be either bare and rocky or covered with mangroves or other trees. Strays may appear on freshwater lakes inland.

The diet consists almost entirely of fish. Types of fish known to be important in some areas include menhaden, smelt, anchovies. Some crustaceans may also be taken. The specie's feeding behavior is spectacular, diving from as high as 18.3 m (60 ft) above water, plunging into water headfirst and coming to surface with fish in bill. Typically, pelicans then tilt the bill down to drain water out of the pouch, then toss the head back to swallow. Brown pelicans will become tame, sometimes approaching fishermen for handouts.

Brown pelicans produce one brood per year. Breeding first occurs at age 3 years or older. Brown pelicans nest in colonies, on ground or cliffs, or on low trees such as mangroves. The nest, built by the female with material gathered by male, may be a simple scrape in the soil, a heap of debris with a depression at the top, or a large stick nest in a tree. Brown pelicans lay 2 to 4 eggs. Both sexes incubate; hatching occurs in 28 to 30 days. Both parents feed the young. Young may leave ground nests after about 5 weeks and gather in groups, where parents returning from foraging apparently can apparently recognize their own offspring. Young may remain in tree nests longer (perhaps up to 9 weeks) before clambering about in the branches. Age at first flight varies, reportedly 9 to 12 weeks or more. Adults continue to feed the young for some time after they leave the nesting colony.

Brown pelicans declined drastically in mid-20th century, as pesticides caused eggshell thinning and failure of breeding. After banning of DDT, the species made a strong recovery; it is now common and increasing on southeast and west coasts.

As stated in Appendix D for the brown pelican, coastal habitats will not be adversely impacted by restoration activities under any of the Partners program project categories, and only native, non-invasive plant species will be used to revegetate disturbed coastal project sites. Therefore, no effect to brown pelicans from habitat modification is anticipated, in association with the Partners program.

Disturbance to brown pelicans in their foraging or loafing areas could occur from project activities that produce noise above ambient levels, or otherwise flush the birds, thus interfering with loafing or foraging behavior. To minimize disturbance to brown pelicans, the PDCs listed in Appendix D will be followed.

## Marbled Murrelet

The marbled murrelet (*Brachyramphus marmoratus*) is a small diving seabird in the family Alcidae. Breeding adults have sooty brown upper plumage with dark bars and light, mottled brown underparts. In winter, adult plumage is brownish-gray above, with a white throat and nape, and white scapulars (shoulder patches). Male and female plumage is identical.

The following information has been extracted from the Marbled Murrelet Recovery Plan

(USFWS 1997d). Marbled murrelets have a life history strategy unique among seabirds. Although they feed on fish and invertebrates primarily in nearshore marine waters, they nest inland as far as 52 miles inland from the marine environment, on large limbs of mature conifers. While they are not colonial nesters, these birds are frequently observed in groups of three or more. Detailed accounts of the taxonomy, ecology, and reproductive characteristics of the murrelet are found in the final rule designating the species as threatened (USDI 1992), the final rule designating critical habitat for the species (USDI 1996), and the Service's biological opinion for Alternative 9 of the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (FSEIS) (USFWS 1994).

The Forest Service has published the *Ecology and Conservation of the Marbled Murrelet* (Ralph *et al*. 1995), a peer-reviewed, comprehensive summary of the status of the species. This document makes several key points regarding the status of the murrelet. Population trends are clearly downward. Ralph *et al*. (1995) and the Marbled Murrelet Recovery Team believe that possible reasons for the decline include the species' dependence for nesting on older forests that are now scarce and heavily fragmented, its low reproductive rate, and adult mortality due to predation, capture in gill nets, and encounters with oil spills. The amount and distribution of the remaining suitable [nesting] habitat is considered to be the most important determinant of the long-term population trend; further loss may severely hamper the stabilization and recovery of the species.

Most population estimates for murrelets have been conducted using at-sea surveys. Population estimates for the murrelet in Oregon vary substantially. Ralph *et al*. (1995) summarized some of the reasons for variability in population estimates among researchers, including differences in methodology, assumptions, spatial coverage, and survey and model errors. Nevertheless, both Ralph *et al*. (1995) and the Marbled Murrelet Recovery Team have concluded that the listed population appears to be in a long-term downward trend.

Murrelets have approximately 979 known occupied sites within Washington, Oregon, and California (S. Holzman, pers. comm. 1996). The total number of acres of suitable habitat in these three states is unknown. Currently, suitable habitat for the murrelet is estimated at 2,561,500 acres on Federal lands in the listed range of this species (Ralph *et al*.1995).

The entire Coast Range Province supports approximately 400,000 acres of suitable murrelet habitat (based on suitable spotted owl habitat). Approximately 591 known murrelet sites occur within this province, of which roughly 418 (71 percent) are on Federal land (S. Holzman, pers. comm. 1995).

The FEMAT (USDA *et al*. 1993) identified two zones of murrelet habitat based on observed use and expected occupancy. In Oregon, Zone 1 extends 0-35 miles inland from the marine environment. The majority of murrelet occupied sites and sightings occur in this zone. Zone 2 encompasses areas inland from the eastern boundary of Zone 1 and is typified by relatively low numbers of murrelet sightings, which is partially a function of fewer inventories (USDA *et al*. 1993). The U. S. Forest Service and the Bureau of Land Management have surveyed to protocol 4.2 percent of the suitable murrelet habitat throughout Zones 1 and 2.

No silvicultural activities associated with the Partners program will occur in marbled murrelet suitable or critical habitat. Therefore, we anticipate no effect to marbled murrelets from habitat modification. Disturbance to marbled murrelets could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to murrelets the PDCs listed in Appendix D will be followed.

## Northern Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened in Oregon. Its present status is a result of destruction of habitat, illegal harassment and disturbance, shooting, electrocution, poisoning, a declining food base, and environmental contaminants. Currently the primary threats to bald eagles are habitat degradation and environmental contaminants. Statewide goals set by the Pacific Bald Eagle Recovery Plan (USFWS 1986) have been met.

In Oregon and Washington, bald eagles typically nest in multi-layered, coniferous stands with old-growth trees located within one mile of lacustrine, large riverine or marine habitat. Availability of suitable trees for nesting and perching is necessary to maintain bald eagle site fidelity and populations. Perch trees are also needed by eagles for hunting and resting. These trees typically provide and unobstructed view of the surrounding area and are in proximity to feeding areas.

Oregon and Washington support approximately 25 percent of the wintering bald eagles in the conterminous United States. Wintering sites are typically in the vicinity of concentrated food sources such as anadromous fish runs, high concentrations of waterfowl or mammalian carrion. Winter roost sites provide protection from inclement weather conditions and are characterized by more favorable microclimate conditions.

Silvicultural activities will not be allowed to occur within ½ mile of any known eagle nest site. Therefore, we anticipate no effect to nesting bald eagles from habitat modification.

Disturbance to eagles could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to bald eagles the PDCs listed in Appendix D will be followed.

## Northern Spotted Owl

The northern spotted owl (*Strix occidentalis caurina*) (spotted owl) breeds in forest communities of the Pacific Northwest. The spotted owl is distinguished by round to elliptical white spots on its chocolate brown body feathers, white bars on the tail, and dark eyes surrounded by tawny facial disks. This subspecies ranges from southern British Columbia, south to Marin County, California.

Most northern spotted owl nest sites observed on public land have been located in old-growth or mature forests (Forsman *et al*. 1984). Spotted owls do not build their own nests; they depend upon suitable naturally occurring nest sites available in older-aged forests, such as broken-top trees and cavities. Less frequently, they will also nest in abandoned squirrel or raptor nests or on platforms formed by mistletoe brooms or debris accumulations. Spotted owls may forage and roost in younger age forest communities. A detailed account of the taxonomy, ecology and reproductive characteristics of the spotted owl is found in the Fish and Wildlife Service Status Reviews (USFWS 1987, 1990b); the 1989 Status Review Supplement (USFWS 1989b); the ISC Report (Thomas *et al*. 1990); and the final rule designating the spotted owl as a threatened species (USDI 1990).

There are approximately 5,600 pairs of spotted owls and resident singles (activity centers) and 8.1 million acres of "suitable" habitat (older age forests) currently estimated across the range of the species (S. Holzman, pers. comm., 1996). Recent demographic studies suggest that the meta-population is declining (Burnham *et al*. 1994, Lande 1988); however, the Service anticipates that implementation of the Forest Plan will provide for long-term conservation of the species.

No silvicultural activities associated with the Partners program will occur in spotted owl suitable or critical habitat. Therefore, we anticipate no effect to spotted owls from habitat modification. Disturbance to spotted owls could occur from project activities that produce noise above ambient levels. Such disturbance could be particularly harmful during the nesting season, if it caused incubating adults to flush from the nest, allowing the eggs to cool. To minimize the impacts of disturbance to spotted owls the PDCs listed in Appendix D will be followed.

## Western Snowy Plover--Pacific Coast Population

The western snowy plover (*Charadrius alexandrinus nivosus*), one of twelve subspecies of the snowy plover, is a small, pale colored shorebird with dark patches on either side of the upper breast. For a complete discussion of the ecology and life history of this subspecies, see the final rule listing the coastal population of the western snowy plover as a threatened species (USDI 1993d). The information below is extracted from that document.

Western snowy plovers in the Pacific Coast population breed in loose colonies primarily on coastal beaches from southern Washington to southern Baja California, Mexico. Preferred coastal habitats for nesting include sand spits, dune-backed beaches, unvegetated beach strands, open areas around estuaries, and beaches at river mouths. Other less common nesting habitats include salt pans, coastal dredged spoil disposal sites, dry salt ponds, and salt pond levees and islands.

Based on the most recent surveys, a total of 28 snowy plover breeding sites currently occur on the Pacific Coast. Six of these sites occur in Oregon, with 3 sites (Bayocean Spit, North Spit Coos Bay and spoils, and Bandon State Park-Floras Lake) supporting 81 percent of the total coastal nesting population. From 43 to 81 plovers wintered on the Oregon coast between 1982-1990 (ODFW1996). The majority of birds, however, winter south of Bodega Bay, California.

Historic records indicate that nesting western snowy plovers were once more widely distributed in coastal California, Oregon, and Washington than they are currently. In Oregon, snowy plovers historically nested at 29 locations on the coast (C. Bruce, pers. comm., 1991). In 1990, only 6 nesting colonies remained, representing a 79 percent decline in active breeding sites.

In addition to loss of nesting sites, the coastal plover breeding population itself has declined significantly. Breeding season surveys along the Oregon coast from 1981 to 1992 show that the number of adult snowy plovers has declined at an average annual rate of about 7 percent (ODFW 1996). The number of adults and young declined from a high of 142 adults in 1978 to a low of 30 adults in 1992, but have since rebounded to 72 in 1995 (ODFW 1996). A number of habitat enhancement projects and conservation measures have been implemented to increase chick survival and minimize human disturbance. In 1996, plover numbers had increased to an estimated 132-137 adults in Oregon (Estelle *et al*. 1997).

The breeding season of the coastal population of the western snowy plover extends from mid-March through mid-September. Nest initiation and egg laying occurs from mid-March through mid-July (Wilson 1980, Warriner *et al*. 1986). The usual clutch size is three eggs. Incubation averages 27 days (Warriner *et al*. 1986). Both sexes incubate the eggs.

Plover chicks are precocial, leaving the nest within hours after hatching to search for food. Fledging (reaching flying age) requires an average of 31 days (Warriner *et al*. 1986). Broods rarely remain in the nesting territory until fledging (Warriner *et al*. 1986).

Page *et al*. (1977) estimated that snowy plovers must fledge 0.8 young per nest to maintain a stable population. Reproductive success falls far short of this threshold at many nesting sites (Page 1990). Fledging success was 34 percent in Oregon in 1996 (Estelle *et al*. 1997).

To avoid or minimize the impacts of Partners program projects on western snowy plover habitat or the potential for disturbance that could cause birds to flush, the PDCs listed in Appendix D will be followed.

## MAMMALS

## Columbian White-Tailed Deer

Accompanying the demise of the riverine woodland habitat along the Columbia River has been the decline of the Columbian white-tailed deer (*Odocoileus virginianus leucurus*). This deer is medium-sized, with a coat that is tawny in the summer and bluish-gray in winter. Bucks weigh around 182 kg (400 lb), whereas does do not usually get over 113 kg (250 lb). The Columbian white-tailed has between one and two fawns every season; the young deer exhibiting a reddish-tan coat with small white speckles.

Historically, the Columbian white-tailed deer, one of 38 subspecies of white-tailed deer in the Americas, ranged from the southern end of Puget Sound to the Willamette Valley of Oregon and throughout the river valleys west of the Cascade Mountains. Following European settlement, conversion of land to agriculture forced the deer into small vestiges of habitat where they are found today. Logging, vehicular fatalities, poaching, and flooding events also have contributed to the decline of these deer which is listed as endangered (USDI 1967). Today, only two populations exist, one near Roseburg, Oregon, and another on a few small islands and in isolated areas of the lower Columbia River, near Cathlamet, Washington.

Efforts to save the Columbian white-tailed deer from extinction began in 1972, when the Service established the 4,800-acre Julia Butler Hansen Refuge for the Columbian White-Tailed Deer near Cathlamet, Washington. Total numbers of the deer in the lower Columbia River population have increased in recent years. However, the flood of 1996 dealt these deer a setback, possibly eliminating up to half of this population (USFWS 1996). Based on aerial surveys, biologists estimated a post-flood population of 60 deer on the Refuge mainland unit and 100 deer on 2,000-acre Tenasillahe Island in the Columbia River. Before the onset of winter and the February 1996 flooding, deer populations were estimated at 115 to 120 on the mainland and more than 200 on the Tenasillahe Island. Fortunately, flooding of the Julia Butler Hansen Refuge does not appear to have had a major effect on vegetation in the area. Bottomland pastures on the refuge regularly flood during winter, and the woody shrubs on which the deer browse were not killed by the flood.

A separate population of Columbian white-tailed deer, estimated at 5,000 animals, is found along the Umpqua River in Douglas County, Oregon, near Roseburg.

No Partners program projects will result in adverse habitat modification impacts to Columbian white-tailed deer. Therefore, no effects to this species from adverse habitat modification are anticipated in association with the Partners program. Any marsh restoration projects conducted within the range of the species could be particularly beneficial to this deer. Disturbance or take of Columbian white-tailed deer could result in association with Partners program projects. For all current and future projects funded or partially funded by the Partners program in western Oregon, the PDCs listed in Appendix D will be followed.

## North American Lynx

The North American Lynx (*Lynx canadensis*) (lynx) is associated with boreal forests in the higher elevations (4000 ft or greater) of the Cascade Mountain Range, historically as far south as Klamath County and through Eastern Oregon (USDA 1994; Oregon Natural Heritage Program, in litt. 1988). Lynx habitat is typically composed of young, dense forests for foraging, and late-successional forests (with down logs) for denning and cover. Intermediate stage forests are used for travel and possibly foraging. The main prey item is the snowshoe hare, although the lynx is somewhat opportunistic and does eat other small mammals and birds (USDA 1994). As a forest-dependent species, alterations to lynx habitat pose the greatest threat to its survival. Of greatest concern is (1) the heavy thinning of dense young forest stands, which adversely affects prey populations, and (2) the removal of late-successional forests, which removes cover and denning opportunities (WDW 1993). The lynx was considered extirpated from Oregon (WDW 1993), although there have been several sightings in eastern Oregon since 1991 (C. Lee, pers. comm.). The lynx has always been rare in Oregon historically, and is considered a candidate species. The lynx is a short-tailed cat, larger than the bobcat with relatively long legs. The coat is reddish to gray-brown in the summer and a mix of gray-brown with buff or pale brown fur on the back and grayish- or buff-white on the underside, legs, and feet in the winter (USDA 1994).

Any Partners program projects that take place in lynx habitat are expected to either not impact or benefit the species. No short term negative impacts are expected. In order to avoid impacts to the lynx, the PDCs listed in Appendix D will be followed.

# APPENDIX D: Project Design Criteria

## PROJECT DESIGN CRITERIA

To ensure that Partners Program projects incorporate the latest information on location and management of rare species, and to provide a means for Partners Program biologists to update other biologists and staff annually on the status of Partners projects, follow the consultation procedure outlined on page 14 of the attached Assessment.

The following project design criteria (PDC) will be followed, by species, for project implementation:

### PLANTS

**Applegate's Milk-Vetch (Klamath County)**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is from June to early August.

**Bradshaw's Lomatium (Willamette Valley)**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is during April to mid-May.

**Cook's Lomatium (Jackson and Josephine County vernal pool habitat)**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is in mid-March through April and varies depending on spring moisture patterns.

**<u>Gentner's Fritillary (Jackson and Josephine Counties)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is from April through June.

**<u>Howell's Spectacular Thelypody (moist meadows in Union, Baker, or Malheur counties)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is from June through July.

**<u>Kincaid's Lupine (remnant native prairie in Yamhill, Polk, Benton, Lane and Douglas Counties)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is from May through July.

**<u>Large-flowered Wooly Meadowfoam (vernal pools of Jackson County)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location._The optimal survey period for this species is mid-March through April and varies depending on spring moisture patterns.

**<u>MacFarlane's four o'clock (steep, sandy slopes in Wallowa County)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is from May through June.

**<u>McDonald's Rock-cress (Serpentine soils in southern Josephine and Curry counties)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is mid-March through May (S. Vrilakas, pers. comm).

**<u>Nelson's Checkermallow (Willamette Valley and the Coast Range)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is in June and July.

**<u>Rough Popcornflower (Douglas County)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is in mid-June to early July.

**<u>Umpqua Mariposa Lily (Douglas County)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse

impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is during June and July.

**<u>Western Lily (Coos and Curry Counties)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is in late June - July.

**<u>Willamette Daisy (Willamette Valley)</u>**

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and activities would result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered/threatened species botanist, will be conducted to determine the presence or absence of the species at each project location. The optimal survey period for this species is from mid-June to early July.

## FISH

For <u>all</u> fish species (refer to Appendix C), the following PDCs will be followed. Any additional PDCs specific for an individual species are listed under the species name.

1. Projects will adhere to the current ODFW timing restrictions for instream construction activities (by stream reach); in reaches where this conflicts with the needs for resident listed fish, ODFW will be contacted for a waiver to the timing restrictions.
2. Projects will comply with ODFW and NMFS guidelines for instream construction activities. Close coordination with NMFS and/or ODFW at a project specific level will insure compliance with the intent of the Oregon Plan for Salmon and Watersheds.
3. The implementation of BMPs listed in Appendix E of the BA will eliminate or reduce adverse impacts to the fish and their habitat and will maintain appropriate water quality to promote the survival of all life stages.
4. Surveys will be conducted for Lost River, Shortnose and Warner Suckers and for

Oregon Chub within the range of these prospective species prior to initiating activity.

## AMPHIBIANS

### Columbia Spotted Frog

1. Projects will adhere to the established ODFW timing restrictions for instream construction activities (i.e., by stream reach).
2. The implementation of BMPs listed in Appendix E of this assessment will eliminate or reduce adverse impacts to the spotted frog and will maintain appropriate water quality to promote the survival of all life stages.
3. Spotted frog surveys will be conducted at each project site where a known population occurs within 2 kilometers upstream or downstream from the project site. Surveys will be conducted three times at 2 to 3 week intervals starting one week after snow and/or ice melt.
4. Modifications to the project will be made, as necessary, to eliminate or reduce adverse impacts if survey results indicate the presence of the species at or near the project site.

### Oregon Spotted Frog

1. Projects will adhere to the established ODFW timing restrictions for instream construction activities (i.e., by stream reach).
2. The implementation of BMPs listed in Appendix E of this assessment will eliminate or reduce adverse impacts to the spotted frog and will maintain appropriate water quality to promote the survival of all life stages.
3. A spotted frog survey will be conducted at each project site where a known population occurs within 2 kilometers upstream or downstream from the project site. Surveys will be conducted three times at 2 to 3 week intervals starting one week after snow and/or ice melt.
4. Modifications to the project will be made, as necessary, to eliminate or reduce adverse impacts if survey results indicate the presence of the species at or near the project site.

## INVERTEBRATES

### <u>Fender's Blue Butterfly (Benton, Polk, Yamhill and Lane Counties)</u>

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and result in long-term benefits to this species. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species.
2. A botanical survey, if required by the Service's endangered species biologist, will be conducted to determine the presence or absence of Kincaid's lupine at each project location. The optimal survey period is May to June.
3. Surveys for Fender's Blue will be conducted during May to June on any proposed project site that supports Kincaid's lupine.

### <u>Oregon Silverspot Butterfly (Clatsop, Tillamook and Lane Counties)</u>

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and result in long-term benefits to this plant. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species
2. A botanical survey, if required by the Service's endangered species biologist, will be conducted to determine the presence or absence of western blue violet at each project location. The optimal survey period is April to May.
3. Surveys for Oregon silverspot will be conducted during late July to early September on any proposed project site that supports western blue violet.
4. For all coastal project sites, only native, noninvasive plant species will be used to revegetate disturbed areas.

### <u>Vernal Pool Fairy Shrimp (Jackson County)</u>

1. Restoration activities will only occur in habitats containing this species when adverse impacts are minimized or eliminated and result in long-term benefits to this species. Any Partners Program projects conducted within or near the species habitat area will be designed in a manner that will potentially benefit the species.
2. All projects in or adjacent to vernal pools will avoid disrupting the impermeable, sub-surface soil layer, movement of soils that could result in depositing soils in pools, or the use of any herbicides or pesticides.
3. Care will be taken to avoid travelling through the wetted portions of vernal pools

## BIRDS

### Aleutian Canada Goose

Where project sites are located within ¼ mile of active resting and foraging sites in the coastal areas of Tillamook, Coos and Curry Counties, work activities producing noise above ambient levels will not occur during the birds' normal wintering and migration period, from October 1 to April 30.

### American Peregrine Falcon

For projects within a ¼ mile non-line-of-site or ½ mile line-of-site of a known peregrine nest, no noise-producing work activities (i.e., above local ambient conditions) will occur from January 1 - August 15.

### Brown Pelican

Work activities producing noise above ambient levels will not be allowed to occur within ¼ mile of known pelican roosting/resting areas along the coast.

### Marbled Murrelet

1. For projects located in within a ¼ mile of suitable occupied or unsurveyed habitat, (a) no work will occur at the project location from April 1 - August 5, and (b) work activities between August 6 - September 15 will begin no earlier than two hours after sunrise and conclude no later than two hours before sunset.
2. If projects are following in-stream work windows and the above condition would not allow the project to take place, the seasonal restriction for murrelets will be waived, but the daily restriction will remain in place for the entire nesting season (April 1-September 15). Also, the activity will be scheduled as late in the murrelet nesting season as possible.

### Northern Bald Eagle

1. For any project located within a ¼ mile or within sight and within ½ mile of a known eagle nest, no noise-producing work activities (i.e., above local ambient conditions) will occur at the project site from January 1 - September 1.
2. Work activities producing noise above local ambient conditions will not be allowed to occur within ¼ mile of occupied roost sites or key foraging areas during periods of bald eagle use.

## Northern Spotted Owl

1. For projects located in or within a ¼ mile of an occupied spotted owl site or activity center, or suitable unsurveyed habitat, noise-producing work activities (i.e., above local ambient conditions) will be suspended at the project location during the nesting season (March 1 - June 30.)
2. If projects are following in-stream work windows and the above condition would not allow the project to take place, the seasonal restriction for spotted owls will be waived. However, the activity will be scheduled as late in the owl nesting season as possible.

## Western Snowy Plover--Pacific Coast Population

1. To ensure that impacts to incubating plovers and their nests are avoided, work in or adjacent to known current nesting habitat, as identified by the Oregon Department of Wildlife, the Oregon Natural Heritage Program, or the US Fish and Wildlife Service, will not occur during the nesting season (March 15 - September 30). Work in or adjacent to potential or historical nesting habitat will occur during the nesting season only if a survey, consisting of at least three visits within the week prior to initiation of work, determines that plovers are not using the site or adjacent areas. Plover habitat is typified by open coastal beaches, dunes, dry mud flats, sand spits at river outlets, or open sand bars along river estuaries. For the purposes of this condition, "work" includes personnel and equipment access routes.
2. To ensure that impacts to brooding plovers and their chicks are avoided: For projects proposed within two miles of known current nesting areas and linked to such nesting areas by contiguous plover habitat, and that are planned to be implemented during the chick rearing period of the nesting season (April 10 - September 30), a site specific plan will be developed to ensure that any plover broods entering the project site are not harmed or disturbed. Such plans will likely specify regular communication with the nest area monitors regarding the status of nests and brood movement, and will invoke temporal restrictions if it appears that broods are moving into or adjacent to the project area. Plans would have to be approved by Service plover specialists before work is conducted. For the purposes of this condition, "work" includes personnel and equipment access route.
3. Appropriate efforts will be made not to attract potential avian or mammalian predators to the project location (e.g., the elimination of human-introduced food sources by removal of such food or use of covered and maintained garbage facilities and the proper disposal of organic waste materials generated by restoration activities).
4. Plans for planting near nest sites would be coordinated with plover specialists (e.g., from Oregon Department of Wildlife, the Oregon Natural Heritage Program, or the Service). Such plantings would only be for the restoration of native beach and dune plant communities, and avoid the planting of non-native vegetation or over-dense native vegetation near nest sites that could serve as predator cover.

## MAMMALS

### Columbian White-Tailed Deer

1. a pre-construction meeting will be conducted to inform contractors about construction guidelines in Columbia white-tailed deer habitat.
   a. Care will be taken during times of limited visibility (e.g., sunset through sunrise) when driving in or near occupied Columbian white-tailed deer habitat. If deer are spotted, vehicle speed will be reduced to account for the actions of the visible deer as well as the likelihood that other deer are nearby.
   b. Harrassment of adults or juveniles (such as chasing by dogs, shooting at, or automobile interaction) is to be avoided near project locations.

### North American Lynx

1. The assistance of local and Service biologists knowledgeable about the life-history needs of the lynx, will be solicited to insure that project design and specifications meet standards favorable to the species.
2. If tree thinning is prescribed in potential lynx habitat as a means to mimic a desirable seral stage, prescriptions will be designed in a manner that will minimize the affect to potential prey populations.

## APPENDIX E:  Best Management Practices

Best Management Practices (BMPs) are designed to reduce adverse impacts to fish, wildlife, and plant species and their critical habitats.  Appropriate BMPs must be executed by all project coordinators.  BMPs are listed by main project categories, but in practice overlaps do exist among the categories.  Individual BMPs are subject to becoming more stringent or additional BMPs instituted if restoration activities are changed.

**General BMPs for all Project Categories:**

1. Follow all terms and conditions in regulatory permits and other official project authorizations to eliminate or reduce adverse impacts to any endangered, threatened, or sensitive species or their critical habitats.

2. Complete restoration activities at individual project sites in a timely manner.  This will reduce disturbance and/or displacement of fish and wildlife species in the immediate project area.

3. Significant modifications to an approved work plan must be reviewed and approved by appropriate agency personnel and the landowner(s) before the work can be carried out or continued.

4. Unobstructed fish passage must be provided at all times during any restoration activity.

5. Use existing roadways or travel paths for access to project sites.

6. Avoid the use of heavy equipment and techniques that will result in excessive soil disturbances or compaction of soils, especially on steep or unstable slopes.

7. Vehicles and machinery must cross streams at right angles to the main channel whenever possible.

8. Excavation or transport equipment/machinery should be limited in capacity, but sufficiently sized to complete required restoration activities.

9. Streams, riparian zones, and wetlands must not be used as staging or refueling areas. Equipment must be stored, serviced, and fueled away from aquatic habitats or other sensitive areas.

10. Native vegetation must be planted on disturbed sites.  Native vegetation should be salvaged from areas where ground disturbances will be occurring on projects.  Salvaged vegetation should then be replanted after the completion of project activities.  The use of nonnative vegetation will be strictly limited and will apply to situations where native vegetation (i.e., grasses) is not commercially available.  All nonnative vegetation must be a close subspecies or variety to native species or reproductively altered (i.e., sterilized) to avoid future

ecological complications with native species. Vegetative planting techniques must not cause major disturbances to soils and slopes. Hand planting is the preferred technique for all plantings. Plantings must occur during the optimal seasonal growth period for the respective plant species involved. Vegetation growth should also be enhanced by bank sloping/grading, seedbed and site preparations, mulching, or fertilizing.

11. Boulder and rock materials used for restoration projects must come from non-streambed and non-wetland sources. Conifer and hardwood timber stands must not be specifically harvested to supply woody materials for any restoration activity, unless the harvest is part of an approved silvicultural operation. Boulder, rock, and woody materials must be collected during appropriate seasonal periods to reduce soil and slope disturbances.

12. A written contingency plan must be developed for all project sites where hazardous materials (e.g., pesticides, herbicides, petroleum products) will be used or stored. Appropriate materials/supplies (e.g., shovel, disposal containers, absorbent materials, first aid supplies, clean water) must be available on site to cleanup any small scale accidental hazardous spill; this action will protect the environment, project workers, and the public from direct contact with hazardous materials. Hazardous spills must be reported to the **Oregon Emergency Response System at 1-800-452-0311 (24 hrs)**. Emergency response, removal, transport, and disposal of hazardous materials must be done in accordance with the U.S. Environmental Protection Agency and Oregon Department of Environmental Quality laws and regulations.

13. The evaluation of herbicide, pesticide, and fertilizer use must include the accuracy of applications, effects on target and non-target species, and the potential impacts to aquatic and terrestrial ecosystems. Treatments for the control or removal of invasive plants in riparian/wetland areas must be limited to hand or wick applications by qualified personnel. Apply chemicals during calm, dry weather and maintain unsprayed buffer areas near aquatic habitats and other sensitive areas. Chemical applications must be avoided where seasonal precipitation or excess irrigation water is likely to wash residual toxic substances into waterways. Consider persistence, soil/water mobility, toxicity, and plant uptake when selecting appropriate chemicals. All chemicals should be handled in strict accordance to label specifications. Proper personal protection (e.g., gloves, masks, clothing) must be used by all applicators. Obtain a copy of the material safety data sheet (MSDS) from the chemical manufacturer for detailed information on each chemical to be used. Refer to appropriate federal and state regulations concerning the use of chemicals. Contact your local state forester, state extension service agent, or Soil and Water Conservation District for information or assistance on chemical selection and use. Contact the **Oregon Poison Control Center at 1-800-452-7165 (24 hrs)** for assistance in responding to emergency chemical exposures. Chemicals must only be considered when other treatments would be ineffective or cannot be applied.

14. Sedimentation and erosion controls must be implemented on all project sites where the

implementation of restoration activities will result in soil and/or slope disturbances. Soil and slope stabilization control structures/techniques must be bio-engineered to the extent possible. Structures/techniques must be placed and/or anchored appropriately to prevent adverse impacts to down slope habitats. Revegetate disturbed areas with native vegetation as soon as possible. Control structures/techniques may include, but are not limited to, silt fences, hay bale structures, seeding by hand and hydro-seeding, jutte mats, and coconut logs. Contact the local state forester, state extension service agent, or Soil and Water Conservation District for information or assistance on control structures/techniques. **NOTE: This requirement refers to all sediment and erosion control measures addressed in the following project categories**.

15. Staging and stockpile areas must be located on or immediately beside the project area whenever possible. Sediment and erosion controls must be implemented around all stockpiled material and disturbed project sites to prevent the introduction of pollutants into water sources. This will reduce the disturbance and displacement potentials to fish and wildlife species in the surrounding areas.

16. Excess excavated materials removed during the completion of a restoration activity must be disposed of properly and/or stabilized to eliminate future environmental problems. Salvage of boulders, rock, and fill material is encouraged for use on nearby roads or other projects. Vegetation not salvaged will be removed to a county approved disposal site or chipped and composted off site to prevent spread of noxious weeds. If specific uses are not available for project spoils, they will be placed in upland areas, and contoured, with the assistance of an environmental engineer, to blend into the surrounding landscape. Under no circumstances will disposal sites be located in riparian, wetland, or floodplain areas unless used for dike construction. Dike construction would take place only to 1) restore historic hydrology when modifications on adjacent ownerships prevent re-contouring or use of other methods to restore the historic physical condition, or 2) prevent flooding of adjacent landowners' properties not involved in the project. Sedimentation and erosion controls must be implemented to prevent adverse impacts to down slope habitats. Disposal sites should be revegetated with native vegetation as soon as possible.

17. Project coordinators must ensure that all waste resulting from the completion of a project is removed and disposed of properly before work crews vacate the project site.

18. Structures containing concrete or wood preservatives must be cured or dried before they are placed in streams, riparian zones, or wetlands. Wet concrete or runoff from cleaning tools that have wet concrete slurry or lye dust must never enter aquatic habitats. Runoff control measures must be employed, such as hay bales and silt fences, until the risk of aquatic contamination has ended.

19. Monitoring is required during project implementation and for at least one year following

project completion to ensure that restoration activities implemented at individual project sites are functioning as intended and do not create unintended consequences to fish, wildlife, and plant species and their critical habitats or adversely impact human health and safety. Corrective actions, as appropriate, must be taken for potential or actual problems.

## Instream Habitat Restoration BMPs:

1. Instream restoration activities must occur during appropriate times as determined by the Oregon Department of Fish and Wildlife (ODFW) as cited in the most recent "Oregon Guidelines for Timing of In-water Work to Protect Fish and Wildlife Resources" and comply with ODFW and National Marine Fisheries Service (NMFS) guidelines for placement of large wood in streams, stream-road crossings, fish passage improvements (ODFW 1995 and 1997; NMFS 1995a, 1995b, and1996), and the draft "Oregon Aquatic Habitat Restoration and Enhancement Guide" for instream restoration activities (NMFS 1998). Close coordination with NMFS and/or ODFW at a project specific level will insure compliance with the intent of the Oregon Plan for Salmon and Watersheds. Instream activities must not conflict with other timing restrictions imposed under the Endangered Species Act. If conflicts exist between ODFW work windows and critical times for listed resident fish, ODFW will be contacted for a waiver to instream work window.

2. Large woody debris and boulders used for instream structures need to be appropriately sized, anchored, and/or placed to eliminate or reduce the movement of these materials during high flow events. Size standards must be determined by hydrologists, biologists, or other qualified professionals and should be based on individual stream reaches and their associated seasonal discharge rates. Durable wood and rock materials should be used for instream structures. Refer to NMFS and ODFW Guidelines as cited in Instream BMP #1.

3. Installed instream or streambank structures altering hydrologic flow regimes must not impact adjacent or down stream properties or manmade structures. Refer to NMFS and ODFW Guidelines as cited in Instream BMP #1.

4. Temporary coffer dams built as a part of a project must use materials from non-streambed and non-wetland sources that are free of fines. Upon project completion, coffer dams must be feathered out in the streambed.

5. Adequate fish screening must be installed and maintained to eliminate or reduce fish emigration into water distribution systems as required by the Oregon Water Resources Department screening law and the NMFS and ODFW guidelines. All off-channel livestock watering systems must adhere to this requirement.

6. Heavy equipment must have limited access to the streambeds and streambanks. Instream

construction activities must be minimized to reduce sedimentation rates, channel instability, and aquatic habitat impacts. In areas where Port-Orford Cedar (POC) occurs, heavy machinery should not operate on dirt roads when pooled water is present, and it must be pressure-washed of all mud before leaving the area of operation to prevent transmission of the laminated root rot, *Phytophthera lateralis*.

7. Soil and/or slope disturbances along stream channels should be eliminated or reduced wherever possible. Undisturbed vegetated buffer zones must be retained along stream channels to reduce sedimentation rates, channel instability, and aquatic habitat impacts.

**Riparian/Wetland and Upland/Forest Restoration BMPs:**

1. Bank stabilizing vegetation removed or altered because of restoration activities must be replanted with native vegetation and protected from further disturbance until new growth is well established. Native shrubs and trees should also be included in the reclamation of disturbed sites. Waste organic materials (e.g., discarded lumber, woody vegetation) must not be used to stabilize soils and slopes in disturbed areas. Metal refuse or debris (e.g., petroleum containers, car bodies) must not be used for streambank protection; this violates both state and federal regulations. Also, broken asphalt and tires must not be used due to potential seepage of petroleum and other toxic chemicals. Concrete is not recommended for bank stabilization projects. Do not use instream materials (e.g., stream debris and gravels) to replace or restore eroded streambanks. **Stabilization projects should employ bioengineering methods to the greatest extent possible.**

2. Sedimentation and erosion controls must be implemented on site at all times during wetland restoration or creation activities to maintain the water quality of adjacent water sources.

3. Restoration activities that require prescribed burning of slash material or invasive vegetation must be planned and managed to maximize the benefits and reduce the detrimental effects of burns. Slash control and disposal must also be completed in a way that reduces the occurrence of debris from entering stream channels. Reduce the potential for very hot burns to conserve litter layers and eliminate or reduce the development of hydrophobic soil conditions. Develop plans for rapid site revegetation. Always consider nonburning alternatives whenever possible. Fire suppression equipment must always be located at the immediate project site during prescribed burnings. Project coordinators should follow Oregon Department of Forestry - Forest Practice Administrative Rules concerning the disposal of slash and treatment of waste materials.

4. Slash materials should be gathered by hand or with light machinery to reduce soil disturbances and compaction of soils. Avoid accumulating or spreading slash in upland draws, depressions, intermittent streams, and springs. Slash control and disposal activities should be conducted in a way that reduces the occurrence of debris in streams. These practices will eliminate or reduce debris torrents, avalanches, flows, and slides.

5. Use the appropriate timber yarding system during silvicultural operations to eliminate or reduce soil disturbances and compaction of soils.

6. Retain or develop snags on project sites for cavity dependent wildlife species whenever possible.

7. Abandoned and decommissioned roadways must be revegetated. Till compacted road surfaces to promote vegetation establishment and growth. Ensure that drainage patterns on these roadways will not result in increased sedimentation rates or erosion to down slope habitats. Drainage improvements should be constructed and stabilized before the rainy season. Install water energy dissipators (e.g., water bars and rolling dips) along roadways and on all cross drain outfalls. Do not sidecast excavated road materials, and avoid accumulating or spreading these materials in upland draws, depressions, intermittent streams, and springs. Road entrances closed by tanking or ditching must have the excavated/disturbed areas stabilized as soon as possible.

8. Purchase seedlings from reputable suppliers or growers. Hardwood and conifer seedlings should be stored, handled, and planted properly. 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. Reduce seedling competition by clearing grasses, forbs, and woody shrubs from around each seedling for a minimum distance of three feet. Employ the proper methods to protect seedlings from animal, insect, and environmental damages. Periodically examine planted seedlings for damages and diseases. Contact your local state forester or extension service agent for additional information or assistance.

9. Retain the appropriate amount of down and decaying woody debris to provide for wildlife habitats and nutrient recycling. Project coordinators should be aware of potential wildfire hazards in project areas because of retained woody debris.

10. Fall trees away from streams, riparian zones, and wetlands whenever possible. Tree falling on steep slopes should not be done or done in an appropriate manner to avoid damage to surrounding vegetation and soils. Employ the proper yarding technique on project sites to eliminate or reduce soil disturbances and compaction of soils. Refer to the Oregon Department of Forestry - Forest Practice Administrative Rules (ODF 199X) concerning falling and yarding regulations.

11. Fence designs (e.g., wire type and wire spacing) and installations should not restrict the movement of any wildlife species; limit the use of woven wire fences whenever possible. The quality and durability of fencing materials must meet or exceed the intended management objectives. Fences must not be constructed in areas where natural barriers restrict livestock movements. Refer to the Bureau of Land Management fencing handbook (BLM 1989) for additional information.

12. Livestock crossings and off-channel livestock watering facilities must not be located in areas where compaction and/or damage may occur to sensitive soils, slopes, or vegetation due to congregating livestock. Livestock fords across streams must be appropriately rocked to stabilize soils/slopes and prevent erosion. Do not use crushed rock to stabilize fords. Fords should be placed on bedrock or stable substrates whenever possible.

13. Silvicultural activities (e.g., herbicide treatment, thinning, and harvesting) should be limited or restricted on steep slopes and highly erodible soils to prevent accelerated soil erosion and increased sedimentation rates.

14. Fill material used on project sites must be from nonstreambed and nonwetland sources that are free of fines. Deposition of materials must not violate state or federal regulations, standards, or guidelines as set forth by local Soil and Water Conservation Districts, Oregon Division of State Lands, U.S. Army Corps of Engineers, or other regulatory agencies.

**Fish Passage Improvement BMPs:**

1. The dimensions, slopes, jump heights, water depths, and seasonal flows in fishways must be adequate to pass the intended fish species and life stages at critical migration periods. Provide fish resting areas, as necessary, within the fishways, and maintain appropriate entrance flows to attract fish. Restrict fish access to inappropriate areas to prevent fish morbidity and mortality.

2. Culverts and bridges, whether for livestock or vehicle access, must be sized to pass at least a normal seasonal high flow and designed to provide unobstructed fish passage at all times. Bridge abutments must be designed and installed in a way that does not alter stream flows or channel stability. Do not backfill culverts or bridge abutments with vegetation, debris, or mud. Abutments should be properly protected (e.g., rock armored) to prevent future scouring actions and erosion hazards. All culvert passage projects must be consistent with the NMFS "Culvert Passage Guidelines" and ODFW "Guidelines and Criteria for Stream-Road Crossings." Bridge designs and installations must conform to all federal and state standards.

3. Installed culverts should be aligned to stream flows and positioned at or below stream grades. Culvert inlets and outfalls should be properly protected (e.g., rock armored) to prevent future scouring actions and erosion hazards. Use appropriate culvert lengths and install culverts at proper slopes (less than 1% slope gradient) to aid fish passage. Install baffles inside culverts, as a last resort necessity, to reduce flow velocities. Open-bottom and arch culverts are the preferred culvert types to be used if existing culverts are to be replaced. A single large culvert is preferred over using several smaller culverts at individual stream crossings.

4. Develop maintenance schedules for culvert and bridge installations to ensure they remain in proper functioning condition. Install trash/debris racks, as necessary, to prevent blockage or damage to these structures. These racks must be installed and maintained in such as manner

that fish are easily able to pass through them at any time.

5. Appropriate sediment and erosion controls must be implemented as they apply to specific fish passage structures. Revegetate bare soils with native vegetation as soon as possible to prevent sedimentation and erosion hazards.

6. All fish screening projects must be consistent with the Oregon Water Resources Department screening law, NMFS "Juvenile Fish Screen Criteria," and all intake screening projects must be consistent with NMFS "Pump Intake Screen Guidelines."

7. Fish passage structural designs (i.e., culverts and fishways) must be submitted to the NMFS, through the U.S. Fish and Wildlife Service, to obtain design approvals prior to the installation of the structures.

# APPENDIX F:  Levels of Incidental Take

| Restoration Activity [1] | Project Category | Fish | Invertebrate | Bird | Mammal |
|---|---|---|---|---|---|
| | | | | | |
| 1. Installation of wood and/or boulder instream structures (heavy machinery or helicopter) | Instream | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Marbled murrelet, Northern spotted owl | No Take |
| 2. Installation of instream structures to reestablish natural hydrologic regimes in riparian/wetland habitats | Instream, Riparian/Wetland | Take: all salmonids, Oregon chub, Lost River Sucker, Shortnose sucker, Warner sucker | Take: Vernal pool fairy shrimp | Take: Marbled murrelet, Northern spotted owl | No Take |
| 3. Hydrologic modifications to stream side channels | Instream, Riparian/Wetland | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Aleutian Canada goose, Northern spotted owl, Marbled murrelet | No Take |
| 4. Development of off-channel refuge areas | Instream, Riparian/Wetland | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Aleutian Canada goose, Northern spotted owl, Marbled murrelet | No Take |
| 5. Reshaping ditched/straightened stream channels, abandoning and/or plugging straightened stream segments, and/or relocation of streams to historic channels | Instream, Riparian/Wetland | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Aleutian Canada goose, Northern spotted owl, Marbled murrelet | No Take |
| 6. Installation of bioengineered streambank stabilization structures and the implementation of sedimentation and erosion reduction techniques | Instream, Riparian/Wetland Fish Passage | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | Take: Vernal pool fairy shrimp | Take: Northern spotted owl, Marbled murrelet | No Take |
| 7. Installation of bioengineered soil and slope stabilization structures and the implementation of sedimentation and erosion reduction techniques | Upland | No Take | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 8. Restoration, and/or enhancement, and/or management of natural wetlands and their restored functions | Riparian/Wetland | No Take | Take: Vernal pool fairy shrimp | Take: Aleutian Canada goose, Northern spotted owl, Marbled murrelet | No Take |
| 9. Creation and/or management of wetlands | | | | Take: Aleutian Canada goose, | |

1 -  Refer to Appendix A for a detailed description of restoration activities.

## APPENDIX F:  Levels of Incidental Take

| Restoration Activity [1] | Project Category | Fish | Invertebrate | Bird | Mammal |
|---|---|---|---|---|---|
| | | | | | |
| and their restored functions | Riparian/Wetland | No Take | No Take | Northern spotted owl, Marbled murrelet | No Take |
| 10. Installation or development of wildlife foraging, breeding, nesting, roosting, and basking structures | Instream, Riparian/Wetland Fish Passage Upland | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | No Take | No Take |
| 11 a&b. Installation of: streambank and/or cross-pasture livestock exclusion fencing, and/or off-channel livestock watering facilities | Riparian/Wetland | No Take | No Take | No Take | No Take |
| 11 c. Installation of livestock stream crossings | Instream Riparian/Wetland | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | No Take | No Take |
| 12. Installation of livestock exclusion fencing and/or livestock watering facilities | Upland | No Take | Take: Fenders blue butterfly, Oregon silverspot butterfly | No Take | No Take |
| 13. Closure, abandonment, or decommissioning of roads | Riparian/Wetland Upland | No Take | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 14. Drainage improvements on roads for sedimentation and erosion control | Riparian/Wetland Upland | No Take | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 15. Planting of native vegetation | Riparian/Wetland Fish Passage Upland | No Take | No Take | No Take | No Take |
| 16. Silviculture treatments | Riparian/Wetland Upland | No Take | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 17. Controlled disturbances/management practices | Riparian/Wetland Upland | No Take | Take: Fenders blue butterfly, Oregon silverspot butterfly, Vernal pool fairy shrimp | Take: Northern spotted owl, Marbled murrelet | No Take |

1 - Refer to Appendix A for a detailed description of restoration activities.

## APPENDIX F:  Levels of Incidental Take

| Restoration Activity [1] | Project Category | Fish | Invertebrate | Bird | Mammal |
|---|---|---|---|---|---|
| | | | | | |
| 18. Control or removal of invasive plant species | Riparian/Wetland Upland | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | Take: Vernal pool fairy shrimp | Take: Northern spotted owl, Marbled murrelet | No Take |
| 19. Installation or modification of fishways | Fish Passage | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 20. Reengineering of irrigation diversion structures | Fish Passage | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 21. Removal or lowering of culverts or log jams, and/or removal of tidegates | Fish Passage | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 22. External and/or internal modifications to culverts | Fish Passage | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 23. Realignment of culverts to stream flows | Fish Passage | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 24. Replacement of undersized culverts with appropriately sized culverts | Fish Passage | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take | Take: Northern spotted owl, Marbled murrelet | No Take |
| 25. Replacement of culverts with bridges<br><br>26. Fish collection and rearing | Fish Passage<br><br>Instream | Take: all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker<br><br>Take:  all salmonids, Oregon chub, Lost River sucker, Shortnose sucker, Warner sucker | No Take<br><br>No Take | Take: Northern spotted owl, Marbled murrelet<br><br>No Take | No Take<br><br>No Take |

1 -  Refer to Appendix A for a detailed description of restoration activities.

# APPENDIX G: NMFS Matrix for Baseline Conditions and Effects of Proposed Actions

## Checklist for Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators

Project Name and Location: USFWS Partners for Fish and Wildlife Instream Restoration Projects, across Oregon

| PATHWAYS: INDICATORS | ENVIRONMENTAL BASELINE | | | EFFECTS OF THE ACTION(S) | | |
|---|---|---|---|---|---|---|
| | Properly Functioning[1] | At Risk[1] | Not Properly Functioning[1] | Restore[2] | Maintain[3] | Degrade[4] |
| Water Quality: Temperature | X | X | X | X (long-term) | X | |
| Sediment | X | X | X | long-term | | short-term |
| Chem. Contaminants/Nutrients | X | X | X | | X | |
| Habitat Access: Physical Barriers | X | X | X | | X | |
| Habitat Elements: Substrate | X | X | X | X | X | |
| Large Woody Debris | X | X | X | X | X | |
| Pool Frequency | X | X | X | X | X | |
| Pool Quality | X | X | X | long-term | short-term | |
| Off-channel Habitat | X | X | X | X | X | |
| Refugia | X | X | X | X | X | |
| Channel Condition/Dynamics: Width/Depth Ratio | X | X | X | X | X | |
| Streambank Condition | X | X | X | | X | |
| Floodplain Connectivity | X | X | X | | X | |
| Flow/Hydrology: Peak/Base Flows | X | X | X | | X | |
| Drainage Network Increase | X | X | X | | X | |
| Watershed Conditions: Road Density and Location | X | X | X | | X | |
| Disturbance History | X | X | X | | X | |
| Riparian Reserves | X | X | X | | X | |

1 These three categories of function ("properly functioning," "at risk," and "not properly functioning") are defined for each indicator in the "Matrix of Pathways and Indicators" (Table 1 on p. 10).

2 For the purposes of this checklist, "restore" means to change the function of an "at risk" indicator to "properly functioning," or to change the function of a "not properly functioning" indicator to "at risk" or "properly functioning" (i.e., it does not apply to "properly functioning" indicators).

3 For the purposes of this checklist, "maintain" means that the function of an indicator does not change (i.e., it applies to all indicators regardless of functional level).

4 For the purposes of this checklist, "degrade" means to change the function of an indicator for the worse (i.e., it applies to all indicators regardless of functional level). In some cases, a "not properly functioning" indicator may be further worsened, and this should be noted.

## Checklist for Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators

Project Name and Location: USFWS Partners for Fish and Wildlife Riparian/Wetland Restoration Projects, across Oregon

| PATHWAYS: INDICATORS | ENVIRONMENTAL BASELINE | | | EFFECTS OF THE ACTION(S) | | |
|---|---|---|---|---|---|---|
| | Properly Functioning[1] | At Risk[1] | Not Properly Functioning[1] | Restore[2] | Maintain[3] | Degrade[4] |
| Water Quality: Temperature | X | X | X | long-term | short-term | |
| Sediment | X | X | X | long- term | | short- term |
| Chem. Contaminants/Nutrients | X | X | X | X | X | |
| Habitat Access: Physical Barriers | X | X | X | | X | |
| Habitat Elements: Substrate | X | X | X | | X | |
| Large Woody Debris | X | X | X | long-term | short-term | |
| Pool Frequency | X | X | X | long-term | short-term | |
| Pool Quality | X | X | X | long-term | short-term | |
| Off-channel Habitat | X | X | X | | X | |
| Refugia | X | X | X | | X | |
| Channel Condition/Dynamics: Width/Depth Ratio | X | X | X | long-term | short-term | |
| Streambank Condition | X | X | X | long-term | short-term | |
| Floodplain Connectivity | X | X | X | X | X | |
| Flow/Hydrology: Peak/Base Flows | X | X | X | X | X | |
| Drainage Network Increase | X | X | X | | X | |
| Watershed Conditions: Road Density and Location | X | X | X | | X | |
| Disturbance History | X | X | X | | X | |
| Riparian Reserves | X | X | X | X | X | |

1 These three categories of function ("properly functioning," "at risk," and "not properly functioning") are defined for each indicator in the "Matrix of Pathways and Indicators" (Table 1 on p. 10).

2 For the purposes of this checklist, "restore" means to change the function of an "at risk" indicator to "properly functioning," or to change the function of a "not properly functioning" indicator to "at risk" or "properly functioning" (i.e., it does not apply to "properly functioning" indicators).

3 For the purposes of this checklist, "maintain" means that the function of an indicator does not change (i.e., it applies to all indicators regardless of functional level).

4 For the purposes of this checklist, "degrade" means to change the function of an indicator for the worse (i.e., it applies to all indicators

regardless of functional level). In some cases, a "not properly functioning" indicator may be further worsened, and this should be noted.

**Checklist for Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators**

Project Name and Location: USFWS Partners for Fish and Wildlife Fish Passage Restoration Projects, across Oregon

| PATHWAYS: | ENVIRONMENTAL BASELINE | | | EFFECTS OF THE ACTION(S) | | |
|---|---|---|---|---|---|---|
| INDICATORS | Properly Functioning[1] | At Risk[1] | Not Properly Functioning[1] | Restore[2] | Maintain[3] | Degrade[4] |
| Water Quality: Temperature | X | X | X | | X | |
| Sediment | X | X | X | | long-term | short-term |
| Chem. Contaminants/Nutrients | X | X | X | | X | |
| Habitat Access: Physical Barriers | | X | X | X | | |
| Habitat Elements: Substrate | X | X | X | | X | |
| Large Woody Debris | X | X | X | | X | |
| Pool Frequency | X | X | X | | X | |
| Pool Quality | X | X | X | | X | |
| Off-channel Habitat | X | X | X | | X | |
| Refugia | X | X | X | | X | |
| Channel Conditions/Dynamics Width/Depth Ratio | X | X | X | | X | |
| Streambank Condition | X | X | X | | X | |
| Floodplain Connectivity | X | X | X | | X | |
| Flow/Hydrology: Peak/Base Flows | X | X | X | | X | |
| Drainage Network Increase | X | X | X | | X | |
| Watershed Conditions: Road Density and Location | X | X | X | | X | |
| Disturbance History | X | X | X | | X | |
| Riparian Reserves | X | X | X | | X | |

1 These three categories of function ("properly functioning," "at risk," and "not properly functioning") are defined for each indicator in the "Matrix of Pathways and Indicators" (Table 1 on p. 10).

2 For the purposes of this checklist, "restore" means to change the function of an "at risk" indicator to "properly functioning," or to change the function of a "not properly functioning" indicator to "at risk" or "properly functioning" (i.e., it does not apply to "properly functioning" indicators).

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noted.

**Checklist for Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators**

Project Name and Location: USFWS Partners for Fish and Wildlife Upland Restoration Projects, across Oregon

| PATHWAYS: INDICATORS | ENVIRONMENTAL BASELINE | | | EFFECTS OF THE ACTION(S) | | |
|---|---|---|---|---|---|---|
| | Properly Functioning[1] | At Risk[1] | Not Properly Functioning[1] | Restore[2] | Maintain[3] | Degrade[4] |
| Water Quality: Temperature | X | X | X | X | X | |
| Sediment | X | X | X | X | X | |
| Chem. Contaminants/Nutrients | X | X | X | X | X | |
| Habitat Access: Physical Barriers | X | X | X | | X | |
| Habitat Elements: Substrate | X | X | X | | X | |
| Large Woody Debris | X | X | X | long-term | short-term | |
| Pool Frequency | X | X | X | | X | |
| Pool Quality | X | X | X | | X | |
| Off-channel Habitat | X | X | X | | X | |
| Refugia | X | X | X | | X | |
| Channel Condition/Dynamics: Width/Depth Ratio | X | X | X | | X | |
| Streambank Condition | X | X | X | | X | |
| Floodplain Connectivity | X | X | X | | | |
| Flow/Hydrology: Peak/Base Flows | X | X | X | long-term | short-term | |
| Drainage Network Increase | X | X | X | | X | |
| Watershed Conditions: Road Density and Location | X | X | X | X | X | |
| Disturbance History | X | X | X | X | X | |
| Riparian Reserves | X | X | X | | X | |

1 These three categories of function ("properly functioning," "at risk," and "not properly functioning") are defined for each indicator in the "Matrix of Pathways and Indicators" (Table 1 on p. 10).

2 For the purposes of this checklist, "restore" means to change the function of an "at risk" indicator to "properly functioning," or to change the function of a "not properly functioning" indicator to "at risk" or "properly functioning" (i.e., it does not apply to "properly functioning" indicators).

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4 For the purposes of this checklist, "degrade" means to change the function of an indicator for the worse (i.e., it applies to all indicators

regardless of functional level). In some cases, a "not properly functioning" indicator may be further worsened, and this should be noted.

## FIGURE 1. DICHOTOMOUS KEY FOR MAKING ESA DETERMINATION OF EFFECTS

1. Are there any proposed/listed anadromous salmonids and/or proposed/designated critical habitat in the watershed or downstream from the watershed?

   NO.........................................................................................................No effect

   YES...............................................................................................May affect, go to 2

2. Does the proposed action(s) have the potential to hinder attainment of relevant properly functioning indicators (from table 2)?

   YES.................................................................................... Likely to adversely affect

   NO..............................................................................................................Go to 3

3. Does the proposed action(s) have the potential to result in "take"[1] of proposed/listed anadromous salmonids or destruction/adverse modification of proposed/designated critical habitat?

   A. There is a negligible (extremely low) probability of take of proposed/listed anadromous salmonids or destruction/adverse modification of habitat ..............................................................................Not likely to adversely affect

   B. There is more than a negligible probability of take of proposed/listed anadromous salmonids or destruction/adverse modification of habitat. ......... Likely to adversely affect

1 "Take" - The ESA (Section 3) defines take as "to harass, harm, pursue, hunt, shoot, wound, trap, capture, collect or attempt to engage in any such conduct." The USFWS (USFWS, 1994) further defines "harm" as "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering," and "harass" 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."

# APPENDIX H: Suggested Parameters for Project Eligibility

In order to determine if a project falls within the scope and intent of this amended EA, parameters are outlined for each project type. The parameters are framed as questions, and where applicable, quantities are provided that suggest upper and/or lower limits for the action. If a project approaches the upper limit for *all* parameters that may indicate the need for further analysis. While these parameters are effective sideboards for determining whether a project is covered under this EA, they are guidelines only. Professional judgment should be applied to make the final determination.

**For all projects, the following should be asked:**

(1) What are the impacts to adjacent, upstream, and/or downstream landowners?
(2) Does the action area fall within multiple jurisdictions (landowners, agencies, private groups, etc.)?
(3) What is the level of public controversy and interest?

## Riparian Projects

Fencing for livestock management

- How many miles of fencing? More than 40 to 50 miles may signal the need for further analysis.
- What is the quality of the riparian area being protected?
- What species and/or habitat types does the riparian area provide? Are any of the species/habitats listed?

Alternative watering sources for livestock

- What is the size of the watering source to be constructed?
- What is the size of the riparian area protected?
- What is the quality of the riparian area protected?
- Does the landowner have the proper water right?

Non-native plant removal/control

- How are non-native plants to be removed (hand/chemical/other)? No quantities are suggested for hand or mechanical methods, but further analysis may be required for chemical treatments, particularly those with potential connectivity to waterways.
- How invasive is the non-native plant and what is its priority for removal (high, medium, low)?
- Over how many acres will removal actions take place?

Native plant establishment/diversification

- How will the native plants be established or diversified (hand-planted, machine-planted, allowed to reestablish on their own)?
- How many acres of establishment/diversification are involved?
- How many years of follow-up (weeding, watering) are required to ensure success?

Erosion control

- What methods of erosion control are to be implemented (straw bales, silt fences, settling ponds, etc)? Further analysis may be required for projects that generate high levels of sediment.
- What will be done with captured (i.e., project-generated) sediment?
- What species will benefit and is the species listed?
- What size of an area will be protected from erosion?
- Are temporary and/or permanent plantings or structures involved?

Wildlife habitat improvements

- What species and habitats are targeted and are they listed?
- How many acres of habitat improvements are expected?
- What actions will be taken to improve habitat (thinning, planting, creating/restoring wetlands, prevent grazing, etc.)?

## Wetland Projects

Fencing

- How many miles of fencing? Installation of more than 40 to 50 miles of fencing may signal the need for further analysis.
- What type of habitat does the fencing protect? Is the habitat designated as critical?
- What species benefit? Are the species listed?

Wetland restoration and enhancement

- How many acres are to be restored or enhanced? More than 500 acres may signal the need for further analysis.
- What species/habitats benefit and are they listed?
- What functions does the restored wetland provide (connectivity, rearing, water quality, etc.)?
- How does the wetland affect water quality?

Wildlife habitat improvements

- How many acres will be improved?
- What species of wildlife will benefit and is the species listed?
- What type of ground-disturbing actions are needed?

## Instream Projects

Habitat complexity and diversity improvements

- How many miles of improvement? More than one mile of in-channel modification and two miles of downstream effects may signal the need for further analysis.
- What species/habitats benefit and are they listed?

Hydrologic regime improvements

- How many miles of stream will be improved? More than one mile of in-channel modification and two miles of downstream effects may signal the need for further analysis.
- What species will benefit and is the species listed?

Large woody debris and boulder supplementation

- How many miles of stream are to be supplemented? More than one mile of in-channel modification and two miles of downstream effects may signal the need for further analysis.
- Approximately how many logs/boulders will be added to system?
- What species will benefit? Is the species listed?
- What will be the backwater or flood effect from wood addition?
- What transport methods will be used and what are the effects of transporting wood to the project site?

Fish passage improvements, modifications, and creations

- What is the size of the structure?
- What are the benefits of removal/modification/creation?
- What are the impacts to other resources?
- What species will benefit and is the species listed?
- What size is the fish screen and how many are to be installed?
- Any monitoring/maintenance required?
- Does the landowner have the proper water right?

Collection and rearing of fish

- How many fish will be captured and reared? Further analysis is required for release of reared fish back into the Upper Klamath Lake ecosystem.
- At what life stage will capture occur?
- Will the action benefit and further the understanding of a listed species?

Spawning Habitat Improvements

- How large is the improved spawning area?
- What species is targeted and is the species listed?
- How will habitat be improved (addition of gravels, improving temperature or water quality, etc.)?
- How great is the possible incidental mortality to target/non-target organisms?

Non-native fish removal

- What method is to be used and what species is targeted?
- What is the number of fish estimated for removal?
- What about incidental removal of native fish?
- What is the size of the area? What is the benefit expected?
- How long does the effect/mechanism remain within the stream system (e.g., chemical removal)?

## Road Projects (within riparian corridors)

Road abandonment (road is no longer maintained), decommissioning (road closure through gates, berms, or other physical means), and obliteration (road is scarified and replanted)

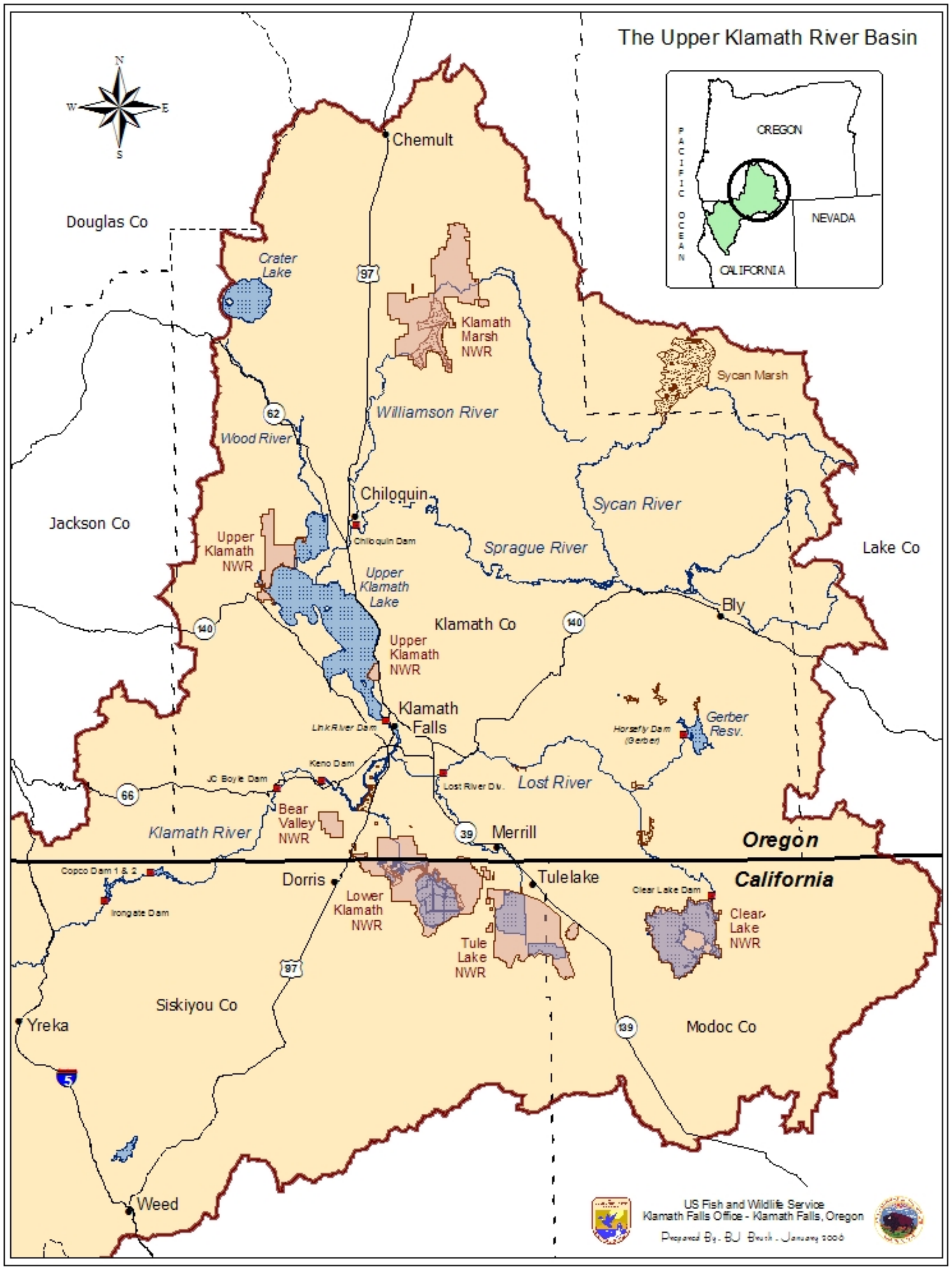
- How many miles of road will be altered? More than 10 miles may signal the need for further analysis.
- Will the road be replanted?
- Is monitoring required?
- What species are targeted to benefit and is the species listed?

Road drainage improvements and storm-proofing

- How many culverts/structures are involved?
- How many miles of road will benefit?

Culvert/stream crossing upgrades

- How many structures are involved?
- What species/habitats will benefit and are they listed?
- Is the culvert currently a barrier to non-native fish invasion?
- How much fill/removal or grade control will be required?
- How great are the associated upstream and downstream effects (short- or long-term)?



The Upper Klamath River Basin
OREGON
NEVADA
CALIFORNIA
PACIFIC OCEAN
Chemult
Douglas Co
Crater Lake
97
Klamath Marsh NWR
Sycan Marsh
62
Williamson River
Wood River
Chiloquin
Chiloquin Dam
Jackson Co
Upper Klamath NWR
Upper Klamath Lake
Sycan River
Sprague River
Lake Co
Bly
140
Klamath Co
Upper Klamath NWR
Klamath Falls
Link River Dam
Horsefly Dam (Gerber)
Gerber Resv.
Keno Dam
JC Boyle Dam
Lost River Div.
Lost River
66
Bear Valley NWR
Klamath River
39
Merrill
Oregon
California
Copco Dam 1 & 2
Irongate Dam
Dorris
Tulelake
Lower Klamath NWR
Clear Lake Dam
Clear Lake NWR
Tule Lake NWR
Siskiyou Co
Yreka
139
Modoc Co
5
Weed
US Fish and Wildlife Service
Klamath Falls Office - Klamath Falls, Oregon


Appendix J

# NEPA GLOSSARY

**Affected Environment:** A description of the existing environment to be affected by the proposed action (40 CFR 1502.15).

**Alternative:** A reasonable way to fix the identified problem or satisfy the stated need (40 CFR 1502.4).

**Categorical Exclusion (CX):** A category of actions that do not individually or cumulatively have a significant effect on the human environment and have been found to have no such effect in procedures adopted by a Federal agency pursuant to NEPA (40 CFR 1508.4).

**Council on Environmental Quality (CEQ):** Established under Title II of NEPA to develop Federal agency-wide policy and regulations for implementing the procedural provisions of NEPA, resolve interagency disagreements concerning proposed major Federal actions, and to ensure that Federal agency programs and procedures are in compliance with NEPA.

**Cumulative Effect:** The incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

**Environmental Consequences:** Environmental effects of project alternatives, including the proposed action, any adverse environmental effects which cannot be avoided, the relationship between short-term uses of the human environment, and any irreversible or irretrievable commitments of resources which would be involved if the proposal should be implemented (40 CFR 1502.16).

**Environmental Action Statement (EAS):** A Service-required document prepared to improve the Service's administrative record for categorically excluded actions that may be controversial, emergency actions under CEQ's NEPA regulations (40 CFR 1506.1 1), decisions based on EAs to prepare an EIS, and any decision where improved documentation of the administrative record is desirable, and to facilitate internal program review and final approval when a FONSI is to be signed at the FWS-WO and FWS-RO level (550 FW ' ).

**Environmental Impact Statement (EIS):** A detailed written statement required by section 102(2)(C) of NEPA, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR 1508.1 1).

**Environmental Assessment (EA):** A concise public document, prepared in compliance with NEPA, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact (40 CFR 1508.9).

**Finding of No Significant Impact (FONSI):** A document prepared in compliance with NEPA, supported by an environmental assessment, that analyzes whether a Federal action will have no significant effect on the human environment and for which an environmental impact statement, therefore, will not be prepared (40 CFR 1508.13).

**Human Environment:** Includes the natural and physical environment and the relationship of people with the environment (40 CFR 1508.14).

**Impact (Effect):** A direct result of an action which occurs at the same time and place; or an indirect result of an action which occurs later in time or in a different place and is reasonably foreseeable; or the cumulative results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions (40 CFR 1508.8).

**Lead Agency:** The agency or agencies responsible for preparing the environmental impact statement (40 CFR 1508.16).

**Major Federal Action:** Actions with effects that may be major and which are potentially subject to Federal control and responsibility (40 CFR 1508.18).

**Mitigation:** Planning actions taken to avoid an impact altogether to minimize the degree or magnitude of the impact, reduce the impact over time, rectify the impact, or compensate for the impact (40 CFR 1508.20).

**National Environmental Policy Act of 1969 (NEPA):** Requires all agencies, including the Service, to examine the environmental impacts of their actions, incorporate environmental information, and utilize public participation in the planning and implementation of all actions. Federal agencies must integrate NEPA with other planning requirements and prepare appropriate NEPA documents to facilitate better environmental decision making. NEPA requires Federal agencies to review and comment on Federal agency environmental plans/documents when the agency has jurisdiction by law or special expertise with respect to any environmental impacts involved (42 U.S.C. 4321-4327) (40 CFR 1500-1508).

**Notice of Intent (NOI):** A notice that an environmental impact statement will be prepared and considered (40 CFR 1508.22).

**No Action Alternative:** The alternative where current conditions and trends are projected into the future without another proposed action [40 CFR 1502.14(d)].

**Proposed Action**:  A plan that contains sufficient details about the intended actions to be taken, or that will result, to allow alternatives to be developed and its environmental impacts analyzed (40 CFR 1508.23).

**Record of Decision (ROD):**  A concise public record of decision prepared by the Federal agency pursuant to NEPA that contains a statement of the decision, identification of all alternatives considered, identification of the environmentally preferable alternative, a statement as to whether all practical means to avoid or minimize environmental harm from the alternative selected have been adopted (and if not, why they were not), and a summary of monitoring and enforcement where applicable for any mitigation (40 CFR 1505.2).

**Relationship of Short-Term Uses and Long-Term Productivity:**  The balance or trade-off between short-term uses and long-term productivity need to be defined in relation to the proposed activity in question.  Each resource, of necessity, has to be provided with its own definitions of short-term and long-term (40 CFR 1502.16).

**Scope:**  The range of actions, alternatives, and impacts to be considered in an environmental impact statement (40 CFR 1508.25).

**Scoping:**  An early and open process for determining the extent and variety of issues to be addressed and for identifying the significant issues related to a proposed action (40 CFR 1501.7).

**Significant:**  Use in NEPA requires consideration of both context and intensity (40 CFR 1508.27):

> *Context* is the significance of an action that must be analyzed in its current and proposed short- and long-term effects on the whole of a given resource (e.g., affected region), while *intensity* refers to the severity of the effect.

**Tiering:**  The coverage of general matters in broader environmental impact statements with subsequent narrower statements of environmental analysis, incorporating by reference the general discussions and concentrating on specific issues (40 CFR 1508.28).

**Unavoidable Adverse Effects:**  Effects that can not be avoided due to constraints in alternatives.  These effects do not have to be avoided by the planning agency, but they must be disclosed, discussed, and mitigated, if possible [40 CFR 1500.2(e)].

# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AD-ES | Assistant Director - Ecological Services |
| BLM | Bureau of Land Management |
| BR | Bureau of Reclamation |
| CEQ | Council on Environmental Quality |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act of 1980 |
| CG | U.S. Coast Guard |
| Corps | U.S. Army Corps of Engineers |
| CX | Categorical Exclusion |
| DHC | Division of Habitat Conservation |
| Director | Director, U.S. Fish and Wildlife Service |
| D-J | Dingell-Johnson Act (Federal Aid in Sport Fish Restoration Act) |
| DOI or Department | Department of Interior |
| DOT | Department of Transportation |
| EA | Environmental Assessment |
| EC | Environmental Coordination |
| ED | Environmental Document |
| EIS | Environmental Impact Statement |
| EO | Executive Order |
| EPA | Environmental Protection Agency |
| ER | Environmental Review |
| ES | Ecological Services |
| ESA | Endangered Species Act |
| FAA | Federal Aviation Administration |
| FERC | Federal Energy Regulatory Commission |
| FHWA | Federal Highway Administration |
| FONSI | Finding of No Significant Impact |
| FWCA | Fish and Wildlife Coordination Act |
| ES Transmittal | ES Environmental Review Distribution Transmittal |
| MOA | Memorandum of Agreement |
| MOU | Memorandum of Understanding |
| MMPA | Marine Mammal Protection Act |
| NEPA | National Environmental Policy Act |
| NEPA Regulations | CEQ Regulations for Implementing the Procedural Provisions of NEPA |
| NOA | Notice of Availability |
| NOI | Notice of Intent |
| NPS | National Park Service |
| OEA | Office of Environmental Affairs (DOI) |
| P-R | Pittman-Robertson Act (Federal Aid in Wildlife Restoration Act) |
| PNRS | Preliminary Natural Resources Survey |
| REC | Regional Environmental Coordinator (Service) |

| | |
|---|---|
| REO | Regional Environmental Officer (DOI) |
| Secretary | Secretary of the Interior |
| Service | U.S. Fish and Wildlife Service |
| SOW | Scope of Work |
| WO | Washington Office |