1.0 Introduction

The purpose of this document is to address the requirements of the Federal Endangered Species Act (Federal ESA), the Oregon State Endangered Species Act (SESA), the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Migratory Bird Treaty Act (MBTA), the Fish and Wildlife Coordination Act (F&WCA), and the Marine Mammal Protection Act (MMPA) as they relate to the repair and replacement of 430 highway bridges funded by the Oregon Transportation Investment Act (OTIA) III: Statewide Bridge Delivery Program (Bridge Program) (Appendix A-1). The Oregon Department of Transportation (ODOT) will administer the Bridge Program with Federal Highway Administration (FHWA) funds and United States Army Corps of Engineers (Corps) permits. FHWA will serve as the lead Federal agency, although both agencies (FHWA and Corps) constitute a Federal nexus for the Program.

The main body of this document is structured as a Biological Assessment (BA) that addresses the proposed action in compliance with Section 7(c) of the Federal ESA, as amended, and the SESA (for fish and wildlife species). This BA provides a discussion of evaluation methods; of the proposed action, including minimization and avoidance measures developed for the Program; of statewide environmental baseline conditions; of species-specific effects analyses; and of cumulative effects. Subsequent chapters rely on the information and analyses provided in the BA to address the MSA (Section 7) and the MMPA (Section 8). Mandatory and recommended measures to avoid and minimize effects to species and habitats protected by the MBTA and F&WCA are included in Section 3.

The purpose of this BA is to identify and assess the effects of the Bridge Program on 73 threatened, endangered, proposed, and selected sensitive (TEPS) species and their designated or proposed critical habitat (Table 1.0-1). Section 7 of the Federal ESA assures that, through consultation with the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NOAA Fisheries), Federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species, or result in the destruction or adverse modification of designated or proposed critical habitat.

Table 1.0-1. List of TEPS species included in this consultation.

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat
Terrestrial Mammals				
Canada lynx	*Lynx canadensis*	Threatened	Threatened	
Columbian white-tailed deer (Columbia River DPS)	*Odocoileus virginianus leucurus*	Endangered		
Kit fox	*Vulpes macrotis*		Threatened	

Table 1.0-1. (continued).

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat
Wolverine	*Gulo gulo*		Threatened	
Washington ground squirrel	*Spermophilus washingtoni*		Endangered	
Marine Mammals				
Steller sea lion (Eastern population)	*Eumetopias jubatus*	Threatened		
Sei whale	*Balaenoptera borealis*	Endangered		
Blue whale	*Balaenoptera musculus*	Endangered		
Finback whale	*Balaenoptera physalus*	Endangered		
Right whale	*Eubalaena jubatus*	Endangered		
Humpback whale	*Megaptera novaeangliae*	Endangered		
Sperm whale	*Physeter macrocephalus*	Endangered		
Birds				
Marbled murrelet	*Brachyramphus marmoratus marmoratus*	Threatened	Threatened	Designated
Western snowy plover (Pacific Coast population)	*Charadrius alexandrinus nivosus*	Threatened		Designated
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened	
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Threatened	Designated
Western snowy plover (Interior population)	*Charadrius alexandrinus nivosus*		Threatened	
Peregrine falcon	*Falco peregrinus anatum*		Endangered	
Short-tailed albatross	*Phoebastria albatrus*	Endangered		
Brown pelican	*Pelecanus occidentalis californicus*	Endangered		

Table 1.0-1. (continued).

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat
Reptiles and Amphibians				
Loggerhead sea turtle	*Caretta caretta*	Threatened		
Green sea turtle	*Chelonia mydas*	Threatened		
Leatherback sea turtle	*Dermochelys coriacea*	Endangered		Designated
Olive (Pacific) Ridley sea turtle	*Lepidochelys olivacea*	Threatened		
Resident Fish				
Foskett speckled dace	*Rhinichthys osculus*	Threatened		
Shortnose sucker	*Chasmistes brevirostris*	Endangered	Endangered	Proposed
Lost River sucker	*Deltistes luxatus*	Endangered	Endangered	Proposed
Warner sucker	*Catostomus warnerensis*	Threatened		Designated
Oregon chub	*Oregonichthys crameri*	Endangered		
Hutton tui chub	*Gila bicolor*	Threatened		
Borax Lake chub	*Gila boraxobius*	Endangered		Designated
Lahontan cutthroat trout	*Oncorhychus clarki henshawi*	Threatened		
Bull trout	*Salvelinus confluentus*	Threatened		Proposed
Cutthroat trout (SW Washington/Columbia River DPS)	*Oncorhychus clarki clarki*	Species of Concern		
Pacific lamprey	*Lampetra tridentata*	Petitioned	Sensitive	
River lamprey	*Lampetra ayresi*	Petitioned	Sensitive	
Western brook lamprey	*Lampetra richardsoni*	Petitioned	Sensitive	
Anadromous Fish				
Chum salmon (Columbia River ESU)	*Oncorhynchus keta*	Threatened		
Coho salmon (Southern Oregon/Northern California Coasts ESU)	*Oncorhynchus kisutch*	Threatened		Designated

Table 1.0-1. (continued).

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat
Coho salmon (Oregon Coast ESU)	*Oncorhynchus kisutch*	Threatened		
Coho salmon (Lower Columbia River ESU)	*Oncorhynchus kisutch*		Endangered	
Steelhead (Upper Columbia River ESU)	*Oncorhynchus mykiss*	Endangered		
Steelhead (Lower Columbia River ESU)	*Oncorhynchus mykiss*	Threatened		
Steelhead (Middle Columbia River ESU)	*Oncorhynchus mykiss*	Threatened		
Steelhead (Snake River Basin ESU)	*Oncorhynchus mykiss*	Threatened		
Steelhead (Upper Willamette River ESU)	*Oncorhynchus mykiss*	Threatened		
Sockeye salmon (Snake River ESU)	*Oncorhynchus nerka*	Endangered		Designated
Chinook salmon (Snake River Spring/Summer-run ESU)	*Oncorhynchus tschawytscha*	Threatened		Designated
Chinook salmon (Snake River Fall-run ESU)	*Oncorhynchus tschawytscha*	Threatened		Designated
Chinook salmon (Upper Willamette ESU)	*Oncorhynchus tschawytscha*	Threatened		
Chinook salmon (Upper Columbia River Spring-run ESU)	*Oncorhynchus tschawytscha*	Endangered		
Chinook salmon (Lower Columbia River ESU)	*Oncorhynchus tschawytscha*	Threatened		
Invertebrates				
Vernal pool fairy shrimp	*Branchinecta lynchi*	Threatened		Designated
Fender's blue butterfly	*Icaricia icariodes fenderi*	Endangered		
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	Threatened		Designated

Table 1.0-1. (continued).

Common Name	Scientific Name	Federal Status	State Status	Critical Habitat
		Plants		
McDonald’s rock-cress	*Arabis mcdonaldiana*	Endangered		
Applegate’s milk-vetch	*Astragalus applegatei*	Endangered	Endangered	
Golden paintbrush	*Castilleja levisecta*	Threatened	Endangered	
Willamette daisy	*Erigeron decumbens var. decumbens*	Endangered	Endangered	
Gentner’s fritillary	*Fritillaria gentneri*	Endangered	Endangered	
Water howellia	*Howellia aquatilis*	Threatened		
Western lily	*Lilium occidentale*	Endangered	Endangered	
Large-flowered wooly meadowfoam	*Limnanthes floccosa ssp. grandiflora*	Endangered	Endangered	
Bradshaw’s Lomatium	*Lomatium bradshawii*	Endangered	Endangered	
Cook’s Lomatium	*Lomatium cookii*	Endangered	Endangered	
Kincaid’s lupine	*Lupinus sulphureus ssp. kincaidii*	Threatened	Threatened	
MacFarlane’s four-o’clock	*Mirabilis macfarlanei*	Threatened	Endangered	
Rough popcornflower	*Plagiobothrys hirtus*	Endangered	Endangered	
Nelson’s checker-mallow	*Sidalcea nelsoniana*	Threatened	Threatened	
Spalding’s catchfly	*Silene spaldingii*	Threatened	Endangered	
Malheur wire-lettuce	*Stephanomeria malheurensis*	Endangered	Endangered	Designated
Howell’s spectacular thelypody	*Thelypodium howellii ssp. spectabilis*	Threatened	Endangered	
Marsh sandwort	*Arenaria paludicola*	Endangered		

1.1 Background

In 2001, the Oregon State Legislature passed the original OTIA, which that provided $500 million to improve pavement conditions, increase lane capacity, and improve bridges throughout the State. Many of the projects funded by this legislation are currently in progress. In 2003, the State Legislature passed the third Oregon Transportation Investment Act (OTIA III) as House Bill 2041, which provides $1.3 billion for the repair and replacement of bridges on State highways. From this legislation, ODOT has developed the OTIA III Bridge Program, an aggressive program of 430 bridge repair and replacement projects throughout the State that will be completed over the next 10 years (ODOT 2003a).

Many of the bridge repair or replacement projects funded by OTIA III were constructed during the 1950s and 1960s building boom associated with the creation of I-5 and I-84. Due to their age and the heavy traffic volumes they now carry, many of the more vital bridges are nearing the end of their expected 50-year life span, and are in need of replacement or extensive repair. To identify bridge replacement and repair needs for the State, ODOT prepared an Economic and Bridge Options Report (EBOR) in August 2003 (ODOT 2003a). This report summarized the condition of each bridge in the Bridge Program and provided recommendations of either repair or replacement over the next 10 years. The report also established a priority for projects along freight routes of statewide significance.

In addition to the EBOR, ODOT conducted a Statewide Bridge Assessment (SBA) to begin the planning and design process for the Bridge Program. The purpose of this study was to collect environmental and engineering baseline data at each bridge, verify repair or replacement recommendations, refine cost estimates, and develop regulatory compliance strategies for the Bridge Program. The environmental and engineering baseline data and reports from the SBA are available on ODOT’s FTP site.

In order to meet the aggressive construction schedule of the Bridge Program, one of the principal requirements identified by ODOT is the timely completion of environmental regulatory permitting. To facilitate this, ODOT and FHWA began working with a number of Federal and State regulatory and resource agencies in late 2002 to develop permitting strategies that meet the dual goals of providing timely review of individual project permit applications and protecting or enhancing the natural and built environments. Through negotiations with USFWS, NOAA Fisheries, and ODFW, a batched BA with programmatic elements (batched-programmatic) was determined to be the most appropriate and efficient ESA consultation process (refer to Section 2 for additional discussion on this process).

A key element of the Bridge Program is the adoption of a program management strategy that emphasizes context sensitive designs with consideration of the landscape, and monitoring at all levels of program administration, including design, construction, and restoration (refer to Section 3 for more discussion on this program management strategy).

A private-sector program management firm (Bridge Program Management Firm [BPM]) will assist ODOT in the development and implementation of a Bridge Program Management Strategy. This management strategy will include the implementation and evaluation of environmental performance standards designed to minimize adverse effects to natural resources, including TEPS species and their habitats (Section 3).

1.2 Location

Program bridges are located in 33 of Oregon's 36 counties, and within every ecoregion in the State (Figure 1.2-1). Fifty two percent of the program bridges occur along the I-5 and I-84 corridors, resulting in a heavy skew of program bridges to the western half of the State. As a result, the Willamette Valley, Klamath Mountains, and Coast Range ecoregions have the greatest density of program bridges, and 62% of construction activity will occur within the Southern Oregon Coastal Basin and Willamette Basin (3rd field HUCs).

1.3 Purpose and Need

Purpose

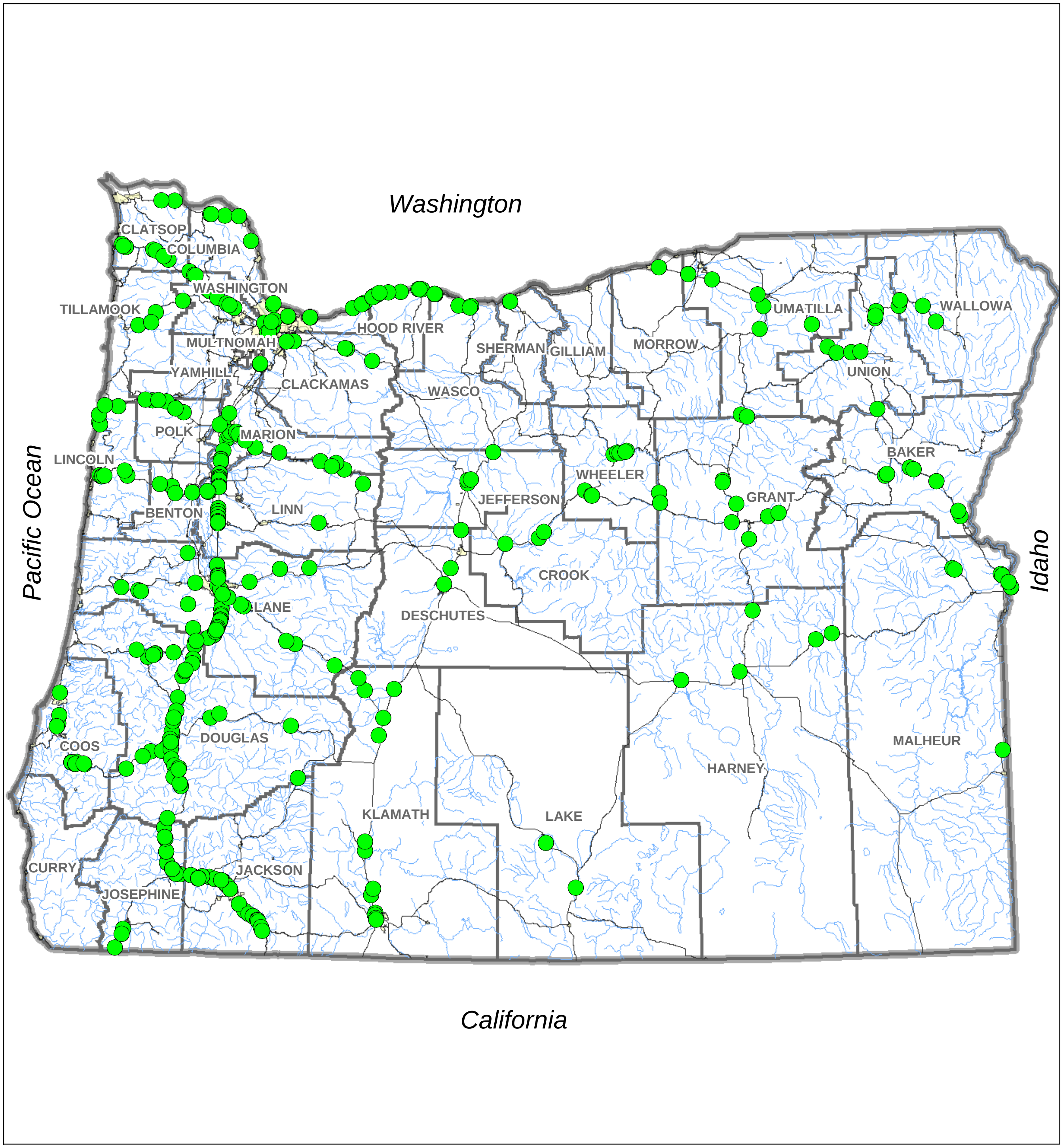
The purpose of the OTIA III Statewide Bridge Program is to ensure the ongoing viability of Oregon's primary commercial ground transportation corridors while meeting FHWA and AASHTO standards for safety and design.

Need

Two-thirds of Oregon bridges were built between 1947 and 1961 using AASHTO specifications. Most of the bridges built at this time are reinforced concrete deck girder (RCDG) design. The RCDG bridges were designed to last about 50 years. As they near the end of their useful life shear (diagonal) cracking has been found on many of the older bridges throughout the State. Shear cracking in bridges reduces the weight that the bridges can safely support.

The shear cracking found on the RCDG bridges is an accelerating problem. In 2001, routine bridge inspections indicated that known shear cracking on several bridges had increased in size. The shear cracking at these bridges had progressed to the point that functionality of the bridges was at risk. Weight restrictions and emergency repairs were implemented to temporarily address the problem. However, weight restrictions on bridges will not stop the deterioration; it will only delay the inevitable structural failure and, in most cases, emergency repairs enable only three to five years of additional use, ultimately requiring a permanent solution.

In 2001, further investigations of the 555 State-owned and 300 locally owned RCDG bridges indicated 487 and 122, respectfully, have varying degrees of cracking problems. The shear cracking is predicted to grow exponentially over the next ten years as more RCDG bridges approach the 50 years threshold. It is predicted that by 2010, 30% of State bridges will require weight restriction to ensure continued safety. These weight restrictions may require detours that could affect the economic health of Oregon and surrounding states.



OTIA III Bridges

- OTIA III Bridges
- City
- Streams and Rivers
- County
- Highway
- State Boundary

This product is for informational purposes, and may not be suitable for legal, engineering or surveying purposes. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user.

Figure 1.2-1

OTIA III: Statewide Bridge Delivery Program Bridges Location Overview

N W E S

0 10 20 40 60 80
Miles

MB&G
Mason, Bruce & Girard, Inc.
Natural Resource Consultants since 1921

Spatial Data Source: See Document Bibliography.
screening\BA_figures\bridge_ov.mxd. Mar 1, 2004

The Oregon bridge problem will increasingly affect the economy in the future if repairs and replacements do not occur. An estimated 75% of the State's economic production relies heavily on I-84 and I-5 for the movement of goods in the Portland and upper Willamette Valley regions. Weight restrictions on highway bridges on these two main arteries would be detrimental to the movement of freight traffic. The remaining 25% of the State's economic production occurs in rural areas. Goods such as timber, minerals, and agricultural products could be land-locked if repairs do not occur. The neglect of bridges in need of repairs has the potential to cost the State economy as much as $123 billion in lost production and 88,000 lost jobs over the next 25 years.

2.0 Evaluation Methods

The potential effects of the proposed action were evaluated by first defining the *effects pathways*, or avenues by which effects to TEPS species may be delivered. Effects may be in the form of habitat altering actions, such as wetland impacts; effects to individuals, e.g., fish injury during work area isolation; or to entire populations, e.g., effects to isolated plant populations. Effects pathways include soil, air, water, vegetation, and chemicals—e.g., because soil can be the medium through which a species is affected, if erosion is problematic to that species. Direct effects and incidental take of individuals of a species may also occur.

Throughout this BA, effects to Federally listed species are considered in the context of the above pathways. Environmental performance standards (Section 3) are essentially barriers to, or constrictions of these pathways with regard to their ability to deliver effects of project actions to Federally listed species. Environmental performance standards were developed with the goal to improve habitat conditions within the action area and to avoid or minimize adverse effects on habitat. The analysis of effects included in this BA evaluated the effects of the proposed action considering both the short-term and long-term beneficial and adverse effects on the baseline conditions necessary to sustain a TEPS species and ultimately lead to recovery.

The evaluation process relied on three key elements: (1) early and on-going communication with regulatory and resources agencies, (2) review and incorporation of existing consultations and strategies, and (3) a Geographic Information System (GIS) database designed to screen for and describe effects.

2.1 Communication

To facilitate the environmental regulatory compliance processes, ODOT and FHWA began working with USFWS and NOAA Fisheries, as well as a number of Federal and State regulatory and resource agencies, to develop permitting strategies that meet the dual goals of providing timely review of individual project permit applications and protecting or enhancing natural resources. Coordination efforts were initiated in late 2002 and are planned to continue until issuance of the Biological Opinion.

The development of three groups with specified roles and responsibilities was the product of a May 30, 2003 workshop involving national and State representatives from FHWA, USFWS, and NOAA Fisheries. As a result of this workshop, a Level 1 Working Group, including representatives from USFWS, NOAA Fisheries, ODFW, and ODOT, was established to meet on a weekly basis through the submittal of the BA. The purpose of this effort was to introduce the Bridge Program to these agencies and to develop the content of the BA. A Level 2 Reviewing Group was identified to meet on an as-needed basis to resolve conflicts and receive progress reports and updates on important issues. The Level 2 Reviewing Group effort also provided feedback and approval of the consultation direction. A Level 3 Executive Group met at significant project milestones to provide approval of the consultation process to the Level 1 and Level 2 Groups.

Products from the Level 1 Working Group include: (1) a consultation approach and outline, (2) an action area definition, (3) species ranges for effects analysis, (4) metrics to calculate potential effects to species and habitats, (5) design- and construction-based environmental performance standards, and (6) a process to administer the Bridge Program, including monitoring strategies, non-conforming activities, and continued communication between the Action Agency and the Services.

2.1.1 Consultation Approach

In cooperation with the USFWS and NOAA Fisheries, it was decided that a batched consultation with programmatic elements (batched-programmatic) would be appropriate since the *proximity, distribution, duration,* and *disturbance frequency* of the proposed action were known (these are the batched elements) and the *timing, nature of the effect,* and *disturbance intensity* and *severity* are controlled through measures administered throughout the program (these are the programmatic elements). This consultation approach has been used in previous Section 7 consultations, such as the Wildland Urban Interface Fuel Treatment batched-programmatic BA prepared by the Southwestern Region of the USDA Forest Service (USFS 2001).

2.1.2 Action Area

The diverse actions involved with the Bridge Program required the Level 1 Working Group to develop a series of definitions for the action area. The resulting definitions address the overall program, the conservation and mitigation strategy (Section 3), and the individual bridge actions. The action area for the overall program could easily encompass the entire State because of the shifting importance and reliance of existing travel corridors. The action area for the conservation and mitigation strategy encompasses all areas within 4^{th} field HUCs populated by program bridges. The limited design detail (e.g., the unknown location of detour routes and staging areas) resulted in the action area being defined as the area encompassed by a 2-mile buffer around each bridge within this Program. As a result, the environmental baseline conditions were presented on an ecoregion scale (Section 4).

2.1.3 Species Range

To facilitate the effects analysis, TEPS species ranges, habitats, and occurrences were entered into a GIS database. The process used to develop the data layer, including the data source and biological justification, is outlined in Effects Screening Layer (ESL) memoranda that were submitted to the Services for review and approval (Appendix 2-A).

2.1.4 Effects Metrics

To facilitate the analysis of the effects of the proposed action, the Level 1 Working Group developed metrics for each TEPS species, as appropriate. These metrics are also important tools for evaluating the success of the environmental performance standards during the administration of the Bridge Program. The metrics and the process to calculate them are outlined in an Evaluation of Effect (EOE) memorandum that was submitted to the Services for review and approval (Appendix 2-B). Calculating the values to populate the metrics for each species was a critical step in analyzing the effects of the proposed action.

2.1.5 Environmental Performance Standards

Specialized working groups were identified to develop design- and construction-based environmental performance standards that target potential effects associated with the proposed action. The intent of the Level 1 Working Group participants is that the environmental performance standards become the Terms and Conditions of the Biological Opinion. A list of the participants involved in these working groups is included in Appendix 2-C. The environmental performance standards are presented in Section 3 of this BA.

The goals of the environmental performance standards are to improve habitat conditions and avoid and minimize adverse effects to TEPS species. The environmental performance standards include a description of the goals, the approach for achieving those goals, and a means of evaluating success, as applicable. In essence, these environmental performance standards provide a design framework– describing desired outcomes, allowing creativity and innovation on the part of the bridge design and construction team. This method uses a "*tell them what you would like to* see" approach rather than the traditional "*tell them what they cannot do*" approach.

2.1.6 Program Administration

The Action Agency (ODOT/FHWA) and the Services have jointly developed a monitoring and reporting program for the administration of the Bridge Program. As described in Section 3, one of the key components of the program administration is to evaluate bridge projects on a project-by-project basis to determine if the proposed design and construction elements are in compliance with the environmental performance standards and within the range of effects analyzed in this BA.

The Services have recognized the need for flexibility in implementation of this consultation; the Bridge Program is a long-term endeavor that encompasses numerous projects in a variety of regions in the State. This flexibility will help to minimize the need for reinitiation of formal consultation for variances of projects unable to comply with an environmental performance standard. Many of these anticipated variances have been addressed in the effects section. A five-tiered categorization was developed to provide flexibility, and projects were divided into the following:

1) Those that have no potential to affect a listed species. The location of these projects relative to species ranges and habitats afford negligible opportunities for effects.
2) Those that have the potential to affect a listed species, but which will comply with the environmental performance standards. These projects would be covered by the biological opinion and will be noted as such in the Pre-Construction Assessment.

3) Those that are amended or have variances in procedure to the environmental performance standards, but for which the effects are the same as addressed in the BA. These projects would be covered by the biological opinion, and the justification for inclusion will be presented in the Pre-Construction Assessment.

4) Those that have greater potential effects than were originally analyzed, but additional conservation actions will result in lesser effects than analyzed in this BA. These projects would be covered by the biological opinion, but will require approval by the Services after reviewing the Pre-Construction Assessment or similar document.

5) Those for which the magnitude or scope of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; those for which new information reveals effects of the action may affect listed species in a way not previously considered; those for which the action is modified in a way that causes an effect to the listed species that was not previously considered (e.g., inclusion of a new bridge); and those for which a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16). These projects may be covered by the biological opinion, but will require additional coordination between the Services and the Action Agency.

Projects that are not identified in this batched consultation will require separate Incidental Take Statements.

2.2 Background Review

This document utilized Service-approved or Service-drafted reports and Biological Opinions as often as possible to ensure consistency of the BA with previous successful ESA consultation processes. Existing Biological Opinions were used to collect relevant information, such as the status of the species, the most up-to-date effects analysis, and the most appropriate conservation measures. Existing programmatic consultations, such as the Corps' Standard Local Operating Procedures for Endangered Species (SLOPES II) (NOAA Fisheries 2003a), were used as the basis for the consultation approach. The outline of this BA followed previous batched-programmatics, such as the Wildland Urban Interface Fuel Treatment batched-programmatic BA prepared by the Southwestern Region of the USDA Forest Service. The MSA portion of this document relied heavily on the recent ODOT Maintenance Activities Programmatic, which received high praise from NOAA Fisheries.

2.3 GIS Analysis

Effects analysis relied on a GIS database to screen, describe, and estimate the effects of the proposed action on TEPS species and their habitats. The database was populated with existing data, while the processes to interpret the data were developed with the Level 1 Working Group participants and other resource and regulatory agency staff. The data received an initial three-step transformation to capitalize on opportunities for the effects analysis.

2.3.1 Transforming the Data

The initial bridge dataset (provided by ODOT) was transformed to facilitate the evaluation process. The first step transformed the bridge point data to account for bridge size. The second step created an area of potential project activities around the transformed bridge data (this is referred to as the Area of Potential Impact, or API). The third step expanded, or buffered the project activities area with an area of detectable effects. These areas of effect (buffers) and data transformations resulted in a greater area of potential effect than would be anticipated under standard bridge construction activities, and thus a greater margin of error. Steps in this process are summarized below.

> Step 1: Larger bridges tend to require greater ground disturbance for activities such as equipment staging and traffic control, and thus have greater potential for adverse effects. To account for bridge size in the evaluation process, the bridge length was rotated to form a circle; therefore, a short bridge would have a smaller area representing the structure than a long bridge.
>
> Step 2: Project activities can be immediately adjacent to existing structures or distributed over a large area. To account for many of the unknowns of the individual project design and construction, an area of potential project activities was buffered around the circular bridge areas. The Area of Potential Impact (API), which was defined by ODOT to provide survey boundaries to the crews collecting data for the environmental baseline reports, was modified to represent the area of potential project activities. A 2,000-foot buffer, representing the API, was placed around the bridge circles from Step 1.
>
> Step 3: The majority of the effects associated with bridge construction activities are not detectable beyond 500 feet (e.g., noise from standard construction equipment, turbidity, hydraulic scour); however some activities, such as pile driving, blasting, large turbidity plumes or accidental chemical spills, may be detectable up to a mile away or more. In addition, not all activities will be limited to the 2,000-foot buffer around the bridge. To account for these effects, a species-specific effect buffer was placed around the API (predominately a 2-mile screening buffer; however, each ESL presents the size of these buffers).

2.3.2 Screening the Effects

All 430 program bridges, including APIs and effects buffers, were mapped and entered into the GIS database. These multi-radius areas were overlaid onto the TEPS species ranges, habitats, and occurrences (from ESL memos; Appendix 2-A). If the effect buffer did not intersect a TEPS species' ESL, then activities at that bridge were determined to have no potential to affect that TEPS species. If the effect buffer did intersect a TEPS species' ESL, then additional GIS analysis was conducted to describe and estimate the effects to the TEPS species and its associated habitat.

2.3.3 Describing the Effects

GIS analysis was used to describe the proximity and distribution of potential effects within a given TEPS species' range or habitat. For example, the GIS analysis could determine the number of bridges crossing a water body within the range of a fish species, thus allowing interpretation of the nature of the effect. In many cases, species-specific distances were used to determine effects from such activities as noise and human activity (i.e., visual disturbance).

2.3.4 Estimating the Effects

The original multi-radius areas, and the species-specific and effect-specific buffers (noise, visual, vegetation) were also overlaid onto the ESLs to estimate the quantities provided by agreed upon metrics used to evaluate the Program effects (from EOE memos; Appendix 2-B). For example, the area of habitat associated with a TEPS species potentially affected by high noise could be determined and presented in relation to ecoregions, watersheds, ESUs, DPSs, or management provinces.

Among the program bridges with the potential to affect species and habitat addressed under this consultation, there are a number of overlapping APIs where program bridges are close to one another (e.g., paired bridges crossing the same feature; Figure 2.3-1). In several instances, the overlapping APIs indicate that some habitat for a given species is common to more than one bridge API, and this common area is often counted more than once. To account for the overlapping APIs, the terms "gross" and "net" are used in this BA to differentiate overlapping vs. non-overlapping habitat area. Both net and gross effects are provided in the individual species evaluations. Discounting the gross area was deemed inappropriate as it is possible to have a time-lag between two projects with overlapping APIs, which would increase disturbance frequency and duration.

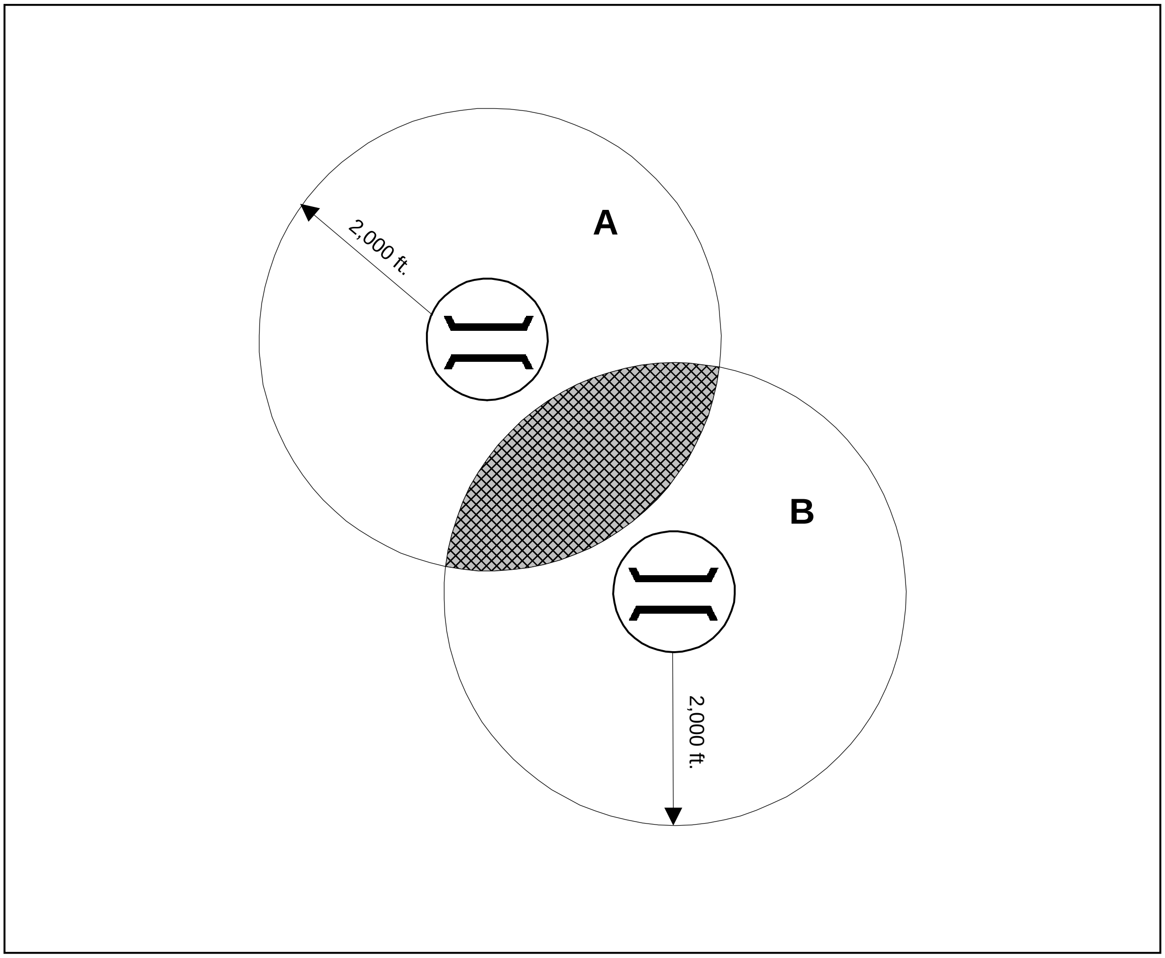


Figure 2.3-1. Illustration of gross and net area estimates within bridge API's. Net area equals A or B only. Gross area equals net area plus overlap area.

3.0 Proposed Action

3.1 Statewide Action

The Bridge Program involves the repair and replacement of 430 bridges throughout Oregon. The Final Economic and Bridge Options Report (EBOR) (ODOT 2003a) summarizes the condition of Oregon bridges and provides recommendations for repairing and replacing State and local bridges over the next ten years. The EBOR indicates that hundreds of Oregon bridges built between 1947 and 1961 using a concrete girder design were designed to last approximately 50 years, and that cracking has been found on many of these older bridges.

The EBOR recommends changing the fundamental bridge repair and replacement system from the current "worst-first" approach to a "corridor-based" strategy. Under the "worst-first" approach, ODOT addressed the bridge with the highest deficiency rating and then moved to the next highest rated bridge. The new "corridor-based" strategy focuses resources on opening and maintaining entire corridors for freight rather than scattering efforts over a large area. The Bridge Program will utilize this "corridor-based" strategy throughout the State, as practicable.

The bridges were examined and an initial designation recommendation for either repair or replacement was made. Currently, 86 bridges have been designated for repair and 344 bridges have been designated for replacement. These designations may change upon closer examination of each bridge; it is assumed that it is likelier for bridges designated for repair to be replaced than for a bridge designated for replacement to be repaired.

The construction contracts will be released over eight to nine construction seasons with the estimated cost of this program at $1.6 billion dollars for the first 365 bridges. As a result of the corridor-based strategy, the construction will tend to occur in clusters.

The dominant corridors involved in the Bridge Program are I-5 and I-84; 52% of all program bridges are in these corridors. The major East-West corridors are I-84, OR-22, OR-42, US-20, and US-26; 32% of all program bridges are in these corridors. The dominant North-South corridors are I-5, OR-99, and OR-97; 48% of all program bridges are in these corridors. The number of bridges within the Bridge Program per highway corridor is provided in Table 3.1-1.

The number of bridges per 3rd field HUC and ecoregion are provided in Table 3.1-2. Information on the 4th field HUCs within each 3rd field HUC is provided as well. The Willamette Valley, Klamath Mountains, and Coast Range ecoregions have the largest number of bridges slated for repair or replacement in the Bridge Program. The Southern Oregon Coastal and Willamette 3rd field HUCs contain the largest number of bridges to be repaired or replaced; 62% of all construction will occur within these basins. The major East-West and North-South corridors are found within these basins and ecoregions.

Table 3.1-1. Number of OTIA III bridges along highways in Oregon.

Highway	Number of Bridges
East-West Corridors	
Interstate 84	57
U.S. 26	22
Oregon 22	20
U.S. 20	19
Oregon 42	18
Oregon 126	11
Oregon 82	8
Oregon 18	5
Oregon 6	4
Oregon 126B	3
Oregon 138	3
U.S. 30	2
Oregon 7	2
Oregon 244	2
Oregon 140	2
Oregon 66	1
Oregon 228	1
North-South Corridors	
Interstate 5	166
Oregon 99	21
U.S. 97	20
Oregon 19	12
U.S. 395	11
U.S. 101	4
U.S. 199	3
Unidentified Corridors	3
Oregon 203	2
Oregon 213	2
Oregon 99E	2
U.S. 95	1
Oregon 78	1
Oregon 99W	1
Oregon 230	1
Grand Total	430

Table 3.1-2. Number of OTIA III bridges within each ecoregion and 3rd field HUC.

	Ecoregion										
Basin Name (3rd Field HUC/4th Field HUC)	Basin & Range	Blue Mountains	Coast Range	Columbia Basin	East Cascades	Klamath Mountains	Lava Plains	Owyhee Uplands	West Cascades	Willamette Valley	Total
Deschutes	0	1	0	0	4	0	9	0	1	0	15
Lower Crooked	0	1	0	0	0	0	3	0	0	0	
Lower Deschutes	0	0	0	0	0	0	3	0	1	0	
Trout	0	0	0	0	0	0	1	0	0	0	
Upper Deschutes	0	0	0	0	4	0	2	0	0	0	
John Day	0	6	0	0	0	0	13	0	0	0	19
Lower John Day	0	0	0	0	0	0	8	0	0	0	
North Fork John Day	0	4	0	0	0	0	0	0	0	0	
Upper John Day	0	2	0	0	0	0	5	0	0	0	
Klamath	0	0	0	0	10	0	0	0	0	0	10
Lost River	0	0	0	0	3	0	0	0	0	0	
Upper Klamath Lake	0	0	0	0	5	0	0	0	0	0	
Williamson	0	0	0	0	2	0	0	0	0	0	
Lower Columbia	0	0	6	0	0	0	0	0	8	5	19
Lower Columbia	0	0	2	0	0	0	0	0	0	0	
Lower Columbia/Clatskanie	0	0	4	0	0	0	0	0	0	1	
Lower Columbia/Sandy	0	0	0	0	0	0	0	0	8	4	
Lower Snake	0	13	0	0	0	0	0	0	0	0	13
Upper Grande Ronde River	0	9	0	0	0	0	0	0	0	0	
Wallowa River	0	4	0	0	0	0	0	0	0	0	
Middle Columbia	0	2	0	12	8	0	0	0	8	0	30
Middle Columbia/Hood	0	0	0	5	8	0	0	0	8	0	
Middle Columbia/Lake Wallula	0	0	0	1	0	0	0	0	0	0	
Umatilla	0	2	0	6	0	0	0	0	0	0	
Middle Snake/Boise	0	0	0	0	0	0	0	11	0	0	11
Jordan	0	0	0	0	0	0	0	1	0	0	
Middle Snake/Payette	0	0	0	0	0	0	0	6	0	0	
Upper Malheur	0	0	0	0	0	0	0	2	0	0	
Willow	0	0	0	0	0	0	0	2	0	0	
Middle Snake/Powder	0	11	0	0	0	0	0	0	0	0	11
Burnt River	0	6	0	0	0	0	0	0	0	0	
Powder River	0	5	0	0	0	0	0	0	0	0	
Northern Oregon Coastal	0	0	28	0	0	0	0	0	0	1	29
Necanicum	0	0	3	0	0	0	0	0	0	0	
Nehalem	0	0	7	0	0	0	0	0	0	0	
Siletz/Yaquina	0	0	11	0	0	0	0	0	0	0	
Suislaw	0	0	3	0	0	0	0	0	0	1	
Wilson/Trask/Nestucca	0	0	4	0	0	0	0	0	0	0	
Oregon Closed Basins	2	1	0	0	2	0	0	0	0	0	5
Lake Abert	0	0	0	0	2	0	0	0	0	0	
Silver	1	0	0	0	0	0	0	0	0	0	
Silvies	1	1	0	0	0	0	0	0	0	0	

Table 3.1-2. (continued).

	Ecoregion										
Basin Name (3rd Field HUC/4th Field HUC)	Basin & Range	Blue Mountains	Coast Range	Columbia Basin	East Cascades	Klamath Mountains	Lava Plains	Owyhee Uplands	West Cascades	Willamette Valley	Total
Southern Oregon Coastal	0	0	18	0	0	88	0	0	3	3	
Coos	0	0	3	0	0	0	0	0	0	0	
Coquille	0	0	10	0	0	1	0	0	0	0	
Illinois	0	0	0	0	0	3	0	0	0	0	
Lower Rogue	0	0	0	0	0	10	0	0	0	0	112
Middle Rogue	0	0	0	0	0	32	0	0	0	0	
North Umpqua	0	0	0	0	0	8	0	0	2	0	
South Umpqua	0	0	0	0	0	25	0	0	0	0	
Umpqua	0	0	5	0	0	9	0	0	0	3	
Upper Rogue	0	0	0	0	0	0	0	0	1	0	
Willamette	0	0	2	0	0	0	0	0	11	141	
Coast Fork Willamette	0	0	0	0	0	0	0	0	0	37	
Lower Willamette	0	0	0	0	0	0	0	0	0	10	
McKenzie	0	0	0	0	0	0	0	0	2	5	
Middle Fork Willamette	0	0	0	0	0	0	0	0	3	2	154
Middle Willamette	0	0	0	0	0	0	0	0	0	20	
Molalla/Pudding	0	0	0	0	0	0	0	0	0	2	
North Santiam	0	0	0	0	0	0	0	0	5	4	
South Santiam	0	0	0	0	0	0	0	0	1	0	
Tualatin	0	0	0	0	0	0	0	0	0	7	
Upper Willamette	0	0	1	0	0	0	0	0	0	48	
Yamhill	0	0	1	0	0	0	0	0	0	6	
Total	2	34	54	12	24	88	22	11	31	152	430

3.2 Compliance and Reporting

ODOT/FHWA is ultimately responsible for environmental compliance of the Bridge Program. OTIA III specifies that ODOT utilize consultants for delivery of the Bridge Program including a Bridge Program Management firm (BPM) to operate the program. The BPM will serve as an extension of ODOT staff and will have virtually all the technical abilities that ODOT uses during the standard project delivery process. The BPM will act under close supervision of ODOT's Bridge Delivery Unit, and will be responsible for managing the Bridge Program. The contract requirements of the Bridge Program Management firm will include ensuring environmental compliance. ODOT will retain a third party audit firm to ensure compliance by the BPM with all terms of the contract including meeting environmental requirements.

The BPM will be responsible for developing a Program Management Plan (PMP) during the summer of 2004 and implementing that plan throughout the life of the Bridge Program. The PMP will, to ensure environmental compliance of the Bridge Program, include pre-design education of designers and construction contractors regarding implementation of the Bridge Program and environmental performance standards (Section 3), specify clear roles and responsibilities for internal and external staff regarding environmental compliance, and include an environmental compliance monitoring and reporting program to ensure and confirm that the program is meeting the objectives of minimizing and avoiding take. The compliance monitoring program will consist of five elements: (1) pre-construction analysis, (2) construction monitoring, (3) post-construction monitoring, (4) annual reporting, and (5) annual coordination between ODOT and the services. Every bridge project will be reviewed for environmental compliance. A summary of each of these program elements is provided below.

Pre-construction monitoring will include development of a Pre-Construction Assessment (PCA) for each bridge project that will identify which environmental performance standards are applicable and demonstrate how the project meets the applicable environmental performance standards. The PCA will include relevant plans (e.g., pollution control plan, fish capture and release plan, site restoration plan, and fluvial analysis). The PCA will also identify any variances from the environmental performance standards. The construction element will consist of monitoring and documenting compliance with environmental performance standards during construction and identification of significant breaches of environmental performance standards. Post-construction monitoring will document the progress of site restoration activities for each bridge project.

ODOT will provide annual monitoring reports for each bridge project undergoing construction or post-construction monitoring, as appropriate. Annual reporting will also include summary reporting of the actions of the Bridge Program and overall compliance with environmental performance standards during the previous year. Annual reporting will support annual coordination efforts in which ODOT and the services will conduct annual meetings to evaluate the adequacy of the program and the monitoring efforts and make changes to the program as necessary. Pre-Construction notifications, construction, and post-construction monitoring documentation will be available for review and audit by the Services on a project web page.

3.3 Environmental Performance Standards

Developed through close coordination between ODOT and the Services, the environmental performance standards represent the criteria that individual bridge replacement and repair projects must meet in order to be included in this consultation and receive coverage for incidental take. The proposed action (predominately bridge construction activities) was divided into dominant construction activities, which were further divided into construction elements (Table 3.5-1). The potential effects of each construction element were identified, and this list was used to identify needed environmental performance standards (Table 3.3-1). The Bridge Repair/Replacement Activities section (Section 3.5) references these standards to illustrate which criteria apply to which construction activities and elements. Table 3.3-1 presents a matrix showing the application of the various environmental performance standards to construction elements discussed in Chapter 3.4 of this BA.

Table 3.3-1. Matrix of environmental performance standards and bridge repair / replacement elements.

	3.4 Bridge Repair / Replacement Elements:	3.4.1 Preconstruction	3.4.2 Clearing	3.4.3 Equipment Control	3.4.4 Construction Material Containment	3.4.5 Earthwork	3.4.6 Foundations	3.4.7 In-water Work	3.4.8 Roadwork	3.4.9 Stormwater Management	3.4.10 Illumination	3.4.11 Planting and Seeding	3.4.12 Exclusionary Devices
3.3 Performance Standards:													
3.3.1 Program Administration													
3.3.2 Species Avoidance		x		x	x		x	x	x		x		x
3.3.3 Habitat Avoidance		x	x	x		x		x	x			x	
3.3.4 Water Quality		x		x	x	x	x	x	x	x		x	
3.3.5 Site Restoration									x	x			
3.3.6 Compensatory Mitigation													
3.3.7 Fluvial						x	x						

PROGRAM ADMINISTRATION

1. Ensure compliance with all performance standards developed for this program.

   a. Monitor & Reporting. Develop and carry out a monitoring and reporting program to confirm that the performance standards are being properly followed and that the performance standards are achieving the goals of habitat improvement and avoidance or minimization of adverse effects to the ecosystem.

i. Program Elements:

(1) Pre-Construction Assessment (PCA). Review each individual bridge project to ensure that all effects are within the range considered in the biological opinion, quantify project level take estimates or extent of take per established metrics, verify program level exempted take is not likely to be exceeded, and that all appropriate environmental performance standards are being properly followed. Submit the PCA to the Services and the appropriate Regulatory Authorities at least 30 days prior to starting construction activities.

(2) Construction Monitoring. Monitor active projects during environmentally sensitive work activities and at a frequency adequate to detect compliance with the appropriate environmental performance standards. Provide environmental monitor with appropriate authority and professional experience to ensure compliance with relevant environmental performance standards and other applicable environmental rules and regulations.

(3) Post-Construction Monitoring. Monitor relevant project features to ensure compliance with long-term beneficial effects goals outlined in the biological assessment. Report on success, failures, and remedial actions for site restoration and compensatory mitigation sites. Evaluate achievement of each relevant conservation measure outlined in the environmental performance standards.

(4) Annual Program Reporting. Submit an annual monitoring report by February 28 of each year that describes the efforts and actions of the preceding year and the anticipated efforts and actions of the following year. Summarize relevant project reports, such as pre-construction assessment reports, construction and post-construction monitoring reports, fish capture and release effort reports. Include summaries of observed and estimated take and established effects metrics accumulated over the year, including area of riparian disturbance, length of linear streambank disturbance, net fill volumes in jurisdictional wetlands, net fill removed from the functional floodplain, and net area of impervious surfaces treated for detention and contamination.

(5) Annual Program Coordination. Discuss the annual monitoring report with the Services and the appropriate

Regulatory Authorities by March 31 of each year. Pursue means of refining and improving program clarity and effectiveness.

ii. Report Contents. Include relevant project information in all reports prepared for this program.

(1) General Report Contents. Include the following, and other data as appropriate:

(a) Bridge identification (e.g., number, highway, crossing)

(b) Bridge location (e.g., county, legal description, ecoregion, species range, drainage)

(c) Project schedule (e.g., construction start and end dates, timing of environmentally sensitive work activities)

(d) Project team contact information (e.g., ODOT, BPM, and contractor contacts)

(e) Photo documentation of habitat conditions within the project area. Label each photo with date, time, project name, photographer's name, and subject comment.

(2) PCA Report Contents. Include the following, and other data as appropriate:

(a) List of project actions.

(b) List of applicable environmental performance standards and how they will be followed.

(c) List of plans prepared.

(d) List of variances requested with supporting documentation.

(e) Date, time, and location of pre-construction meeting.

(f) Estimate of exempted take and established effects metrics required for the project

(3) Monitoring Report Contents. Monitoring reports shall be available within 30 days of the monitoring visit and shall include the following, and other data as appropriate:

(a) Site conditions at time of monitoring visit.

(b) Evaluation of compliance for each relevant environmental performance standard.

(c) Remedial actions suggested and required.

(4) Annual Program Monitoring Report Contents. Include the following, and other data as appropriate:

(a) Summary of work completed.

(b) Summary of variances requested, denied, and approved.

(c) Summary of monitoring dates and efforts.

(d) Summary of relevant reports.

(e) Comparison of annual observed take and effects metrics to remaining exempted take and effects metrics.

(f) Summary of fills/removals within waters of the State.

(g) Number and location of program bridges in design, construction, or restoration stage.

(h) Summary of mitigation/conservation credits/debits created and used that year.

(i) Summary of non-compliance situations and actions taken to remediate.

(j) Identification of anticipated variances for following year.

(k) Recommendations for program improvements.

iii. Program Oversight. Retain a third party oversight firm to ensure the Bridge Program Management firm is maintaining compliance with all terms of the contract, including meeting environmental requirements.

b. Variance Protocol.

i. Request a variance for actions not clearly addressed in the environmental performance standards. Requests may be included in the PCA report or other appropriate means and should include the following:

(1) Justification for the proposed variance.

(2) Description of additional actions necessary to offset potential effects, as appropriate.

(3) Demonstration of how the resulting effects are within the range considered in the biological opinion.

(4) Reevaluation of take and established effects metrics if different than identified in the PCA.

ii. Services will respond with an approval, approval with additional conservation measures, or disapproval within 30 calendar days of receipt of the variance request.

iii. Variances of the environmental performance standards that result in greater effects or greater take than provided in the biological opinion will not be granted and will require separate take statements.

c. Communication Protocol.

i. Communication Plan. Develop and carry out a communication plan to ensure appropriate, efficient, and timely coordination between Action Agency, the Services, the appropriate Regulatory Authorities, and other parties. The communication plan will define lines of communication to address concerns that arise during project design and construction.

ii. Electronic Format. Store all reports in an electronic format easily accessible by the Services and the appropriate Regulatory Authorities.

iii. Project Changes. Notify the Services and the appropriate Regulatory Authorities of any significant project changes[1] as soon as possible.

SPECIES AVOIDANCE

1. Fish Avoidance. Minimize incidental take of listed fish and adverse effects to fish species from in-water work activities.

a. Timing of In-water Work. Complete work below the bankfull elevation[2] during the preferred in-water work period included in Appendix 3-A of

[1] For purposes of this project, "significant project changes" encompass actions or designs that affect the take statement and include, but are not limited to, design elements or construction activities not described in the project description that result in effects not discussed in the biological opinion, changes to the scope or magnitude of project effects that exceed the range of those described in the biological opinion or approved variances, and activities that exceed the quantification or extent of take identified in the project PCA or other appropriate reports. Significant project changes may also include project changes in magnitude appropriate for documentation in the Services' or appropriate Regulatory Authorities' administrative record(s).

[2] For the purposes of this project, "bankfull elevation" means the bank height inundated by a 1.5 to 2-year average recurrence interval and may be estimated by morphological features such as average bank height, scour lines, and vegetation limits. Bankfull elevation may be interchanged with Ordinary High Water (OHW). Bankfull elevation will be field surveyed and marked by a qualified professional.

this BA, unless otherwise approved in writing by the Services and the appropriate Regulatory Authorities[3].

b. Cessation of Work. Cease project operations under high flow conditions that may result in inundation of the project area, except for efforts to avoid or minimize resource damage.

c. Fish Screens. Have a fish screen installed, operated, and maintained according to NOAA Fisheries' fish screen criteria[4] on each water intake used for project construction, including pumps used to isolate an in-water work area. Screens for water diversions or intakes that will be used for irrigation, municipal or industrial purposes, or any use besides project construction are not authorized.

d. Fish Passage. Provide passage for any adult or juvenile fish species present in the project area during and after construction, for the life of the project, unless otherwise approved in writing by the Services and the appropriate Regulatory Authorities[5]. Upstream passage is not required during construction if it did not previously exist.

e. Hydro-Acoustic. Prepare and implement a Noise Attenuation Plan (NAP) for steel piles driven with an impact pile driving hammer through water when listed fish may be present.

   i. The NAP will illustrate how sound pressure levels will be maintained below 150 dB rms (re: 1 micro Pascal) for a minimum of 50% of the impacts and peak sound pressure levels will be maintained below 180 dB (re: 1 micro Pascal) for all impacts in areas of potential fish presence.

   ii. ODOT/FHWA will review and approve the NAP prior to steel pile driving activities in the water column.

   iii. During hydroacoustic measurements, the hydrophone(s) shall be positioned at mid-depths, 30 feet from the pile being driven or following the most recent NOAA Fisheries guidance, as directed by contract with ODOT.

   iv. Acoustic measurements (monitoring) are not necessary assuming at least one of the following conditions are met:

      (1) The pile is driven with a vibratory pile driving hammer.

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[3] For purposes of this Project, "Regulatory Authorities" include the ODEQ, ODSL, ODFW, ODA, Corps, and other agencies with project-specific or activity-specific jurisdiction.

[4] National Marine Fisheries Service, Juvenile Fish Screen Criteria (revised February 16, 1995) and Addendum: Juvenile Fish Screen Criteria for Pump Intakes (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (http://www.nwr.noaa.gov/ 1hydrop/hydroweb/ ferc.htm).

[5] Ensure compliance with Oregon Revised Statutes (ORS) 509.585 regarding fish passage.

(2) The pile is acoustically isolated from the water using measures including, but not limited to; dewatering, flow diversion, confined bubble curtains[6] (unconfined bubble curtains may be used if contractor demonstrates that currents are less than 1.7 miles per hour), and other means, as approved by ODOT/FHWA.

(3) The best available science shows that sound pressure levels will not reach the impact thresholds identified above under the stream conditions at the time of pile driving (e.g., channel substrate, water velocity and depth).

f. Isolation of In-water Work Area. If adult or juvenile fish are reasonably certain to be present, or if the work area is within 300 feet upstream of reasonably likely spawning habitats, completely isolate the work area from the active flowing stream using inflatable bags, sandbags, sheet pilings, or similar materials, unless otherwise approved in writing by the Services and the appropriate Regulatory Authorities. Prepare a Work Area Isolation Plan for all work below the bankfull elevation requiring flow diversion or isolation. Include the sequencing and schedule of dewatering and re-watering activities, plan view of all isolation elements, as well as a list of materials to adequately provide appropriate redundancy of key plan functions (e.g., an operational, properly sized backup generator). Pile driving may occur without isolation during the in-water work period, providing compliance has been achieved with all other relevant performance standards.

g. Capture and Release. Before, intermittently during, and immediately after isolation and dewatering to isolate an in-water work area, attempt to capture and release fish from the isolated area using trapping, seining, electrofishing, or other methods as are prudent to minimize risk of injury.

i. The entire capture and release operation must be conducted or supervised by a fishery biologist experienced with work area isolation and competent to ensure the safe handling of all fish.

ii. Do not use electrofishing if water temperatures exceed 64°F, unless no other fish capture method is feasible or successful.

iii. If electrofishing equipment is used to capture fish, comply with NOAA Fisheries' electrofishing guidelines.[7]

iv. Handle all fish with extreme care, keeping fish in water to the maximum extent possible during seining and transfer procedures to prevent the added stress of out-of-water handling.

[6] See, Longmuir C. and T. Lively. 2001. Bubble curtain systems for use during marine pile driving. Fraser River Pile & Dredge Ltd., New Westminster, British Columbia, Canada. 9 pp.

[7] National Marine Fisheries Service, Backpack Electrofishing Guidelines (December 1998) (http://www.nwr.noaa.gov/1salmon/salmesa/pubs/electrog.pdf).

v. Ensure water quality conditions, including dissolved oxygen levels, within fish transport systems (e.g., buckets) are sufficient to promote fish recovery. Brief holding times; clean, cold, and circulated water; and aerators may be used to maintain water quality conditions.

vi. Release fish into a safe release site as quickly as possible, and as near as possible to capture sites.

vii. In the event of mortalities, do not transfer Federally listed fish to anyone except the Services, unless otherwise approved in writing by the Services and the appropriate Regulatory Authorities.

viii. Obtain all other Federal, State, and local permits necessary to conduct the capture and release activity, such as an ODFW Incidental Take Permits and/or a Scientific Taking Permits.

ix. Allow the Services and the appropriate Regulatory Authorities to accompany the capture team during the capture and release activity, and to inspect the team's capture and release records and facilities.

x. Report salvage effort results, as called for in relevant permits, including the name and address of the supervisory fish biologist, methods used to isolate the work area and minimize disturbances to fish, stream conditions before and following placement and removal of barriers, the means of fish removal, the number and species of fish removed, the condition of all fish released, and any incidence of observed injury or death.

2. Wildlife Avoidance/Harassment (High Noise). Minimize incidental take of listed wildlife species and adverse effects to wildlife species from high-noise producing activities[8].

a. Marbled Murrelet. For high-noise producing activities within one mile of suitable nesting habitat and non-blasting high-noise producing activities within 300 feet of suitable nesting habitat:

i. Inventory. Identify areas of suitable nesting habitat within one mile of the construction site.

ii. Avoidance. All blasting activities within one mile of suitable nesting habitat will be conducted from September 15 to March 30. All non-blasting high-noise producing construction activities will be conducted outside the critical nesting period of April 1 to August 5. Non-blasting high noise producing construction activities conducted from August 6 to September 15 shall

[8] For purposes of this project, “high noise” is defined as sound pressure levels greater than 10 dBA above the ambient as measured by the L_{AFmax} and L_{AFeq} at sensitive receptors (e.g., nests, roosting, nesting, foraging habitat).

implement a daily limited operating period (LOP) of daytime work being conducted from two hours after sunrise[9] to two hours before sunset[4]. If night construction is needed, then activity will be conducted one hour after sunset to one hour before sunrise.

iii. Minimization. High-noise producing construction activities may be conducted between April 1 and August 5, following the LOP with a variance from the USFWS.

b. Bald Eagle. For blasting activities within one mile of known nest sites[10] or communal roosts[11] and non-blasting construction activities within 0.25 mile or 0.5 mile visually (i.e., line-of-site), of a known nest or communal roost:

i. Inventory. Review the most recent Isaacs and Anthony bald eagle nesting survey database for nest locations.

ii. Avoidance. High-noise producing activities, including blasting, will be confined to between September 1 and October 30.

iii. Minimization. Construction activity, other than blasting, within the harassment threshold distances (0.25 mile for noise, 0.5 mile for visual, and 1 mile for blasting) or during October 31 to December 31 shall follow the daily LOP and will require a variance from the USFWS.

iv. Minimization. Staging areas and detour routes will be kept as far from a nest as practicable. If closer than 0.5 mile, then a variance from the USFWS is needed.

c. Northern Spotted Owl. For blasting activities within one mile of suitable nesting and roosting habitat and non-blasting construction activity within 300 feet of nesting and roosting habitat:

i. Inventory. Inventory the area of potential harassment for nesting and roosting (NR) habitat[12].

ii. Avoidance. If NR habitat is present, then prohibit high-noise producing activities during the following critical nesting periods:

(1) March 1 to July 7 for the North Coast Province.[13]

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[9] Official sunrise and sunset will be determined using the U.S. Naval Observatory which may be obtained at the following website URL: http://aa.usno .navy. mil / data/ docs/RS_OneYear.html.

[10] Nest sites identified by the most recent Bald Eagle Nest Locations and History of Use in Oregon and the Washington Portion of the Columbia River Recovery Zone database (Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Corvallis Oregon, Isaacs and Anthony) shall be assumed active unless surveyed following approved protocol.

[11] Communal roost sites are defined in the Biological Assessment.

[12] Nesting and roosting habitat are defined in the Biological Assessment.

(2) March 1 to June 30 for the Rogue/Siskiyou NF and Medford District of BLM in the Southwest Province.

(3) March 1 to July 15 for the Umpqua NF in the Southwest Province.

(4) March 1 to July 15 for the Willamette Province.

(5) March 1 to September 30 for the Deschutes NF.

iii. Minimization. Daytime construction activity within the provincial critical nesting periods may be conducted with a variance from the USFWS.

d. Peregrine Falcon. Obtain an Individual Take Permit from ODFW, as appropriate, for projects that may affect peregrine falcons. Refer to the Biological Assessment to identify those project areas that may affect peregrine falcons.

3. Marine Mammals Avoidance. Avoid disturbance to marine mammals.

a. Noise Disturbance. Avoid disturbance to marine mammals from high-noise producing activities that are within 1,640 feet of areas capable of supporting marine mammals[14] or known seal or sea lion haulouts[15] or rookeries[16,17].

i. Air. Maintain sound pressure levels below 85 dB at occupied marine mammal habitats. Monitoring of marine mammals is required when sound pressure levels are expected to exceed 85 dB at occupied marine mammal habitats.

ii. Water. Follow the hydroacoustic environmental performance standard for fish species avoidance for waters occupied by marine mammals.

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[13] Province boundaries are shown on page E-19 of the 1994 Record of Decision for the Northwest Forest Plan.

[14] Marine Mammal habitat includes identified Coastal Dune and Beaches, Coastal Headlands and Islets, Bays and Estuaries, Marine Nearshore, Marine Shelf, and Oceanic habitat types (Kiilsgaard and Charley 1999), heads of tide for coastal stream and rivers (ODSL 1989), and bridges within 1,640 feet of the Columbia and Willamette Rivers in the Grays/Elokoman, Lower Columbia/Clatskanie, Lower Willamette, and Lower Columbia/Sandy 4th field HUCs (REO 2003).

[15] A haulout will be considered occupied if at least one individual is observed at the time of monitoring.

[16] Seal and sea lion rookeries and haulouts are areas that are known to be regularly occupied by two or more individuals for two consecutive days, identified as an existing haulout (ODFW 2003), or identified by local biologists.

[17] For purposes of this project, areas capable of supporting marine mammals, haulouts, and rookeries will be defined as marine mammal habitat, unless stated otherwise.

b. Visual Disturbance. Avoid visual disturbance to Steller sea lions from construction activities that are within 3,000 feet of Steller sea lion haulouts or rookeries.

   i. Prevent aircraft or boats associated with the project from coming into line-of-sight within 3,000 feet of an occupied Steller sea lion haulout or rookery.

   ii. If an aircraft or boat associated with the Bridge Program will be in line-of-sight within 3,000 feet of Steller sea lion haulout, then monitor, as directed, to ensure the haulout is not occupied.

   iii. Aircraft or boats associated with the Bridge Program will not be allowed to be in line-of-sight within 3,000 feet of a Steller sea lion rookery during the breeding season.

c. Monitoring.

   i. Conditions. Monitor during daylight hours[18] during weather conditions that allow the observer a constant line-of-sight to marine mammal habitats.

   ii. Effort. The number of observers[19] required to monitor an area will be sufficient to observe all marine mammal habitat within 1,640 feet of the construction activity and all haulouts and rookeries within 3,000 feet line-of-site of the construction activity.

   iii. Duration. Monitor at least 30 minutes prior to the disturbance-causing activity, during the activity, and least 15 minutes after the completion of the activity.

   iv. Haulouts. Monitor identified haulouts within 1,640 feet of a noise disturbance activity or 3,000 feet line-of-site to a visual disturbance for occupancy[20]. If the haulout is occupied, then the disturbance causing activity will be suspended until no marine mammals have been observed for at least 15 minutes at the haulout site.

   v. Species. Monitor for marine mammals within 1,640 feet of the construction activity and within 3,000 feet line-of-site of the construction activity. If a marine mammal is observed, then the

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[18] Daylight hours will be 1 hour before official sunrise and 1 hour after official sunset. Official sunrise and sunset time will be determined using U.S. Naval Observatory which may be obtained at the following website URL: http://aa.usno.navy.mil/data/docs/RS_OneYear.html

[19] Observers will be biologists capable of identifying marine mammal species, size class, and sex; and be able to interpret and describe marine mammal behavior and responses to disturbance activity.

[20] A haulout will be considered occupied if at least one individual is observed at the time of monitoring.

disturbing activity will be suspended until no marine mammals have been observed for at least 15 minutes.

vi. Reporting. Each monitor will record:

(1) General Data. Date of monitoring, location, proximity to activity, time of arrival and departure, weather[21] at time of arrival and departure.

(2) Species Data. Species, age class, sex, numbers, behavior, time of observation, location, proximity to activity, and reaction to disturbance for each marine mammal observation.

4. Wildlife Avoidance (Bridge Demolition). Minimize injury and death to wildlife species from bridge demolition activities.

a. Migratory Birds. Avoid destruction of occupied nests (i.e., containing eggs or young) of birds protected by the Migratory Bird Treaty Act (MBTA).

i. Prevent nesting by native birds[22] on structures to be removed.

(1) Inspect bridge for signs of nesting.

(2) Apply exclusionary methods prior to nest building (approximately March 15). Exclusionary methods may include noise cannons, power-washing (i.e., physical removal), netting (ensure proper mesh size and maintain the netting).

ii. Remove existing nests only if no eggs or young are found.

iii. If eggs have been laid and nest cannot be avoided, then consult with USFWS for compliance with the Migratory Bird Treaty Act.

b. Bats. Avoid destruction of bat maternity colonies.

i. Inspect bridge for signs of a maternity colony.

ii. Apply exclusionary methods, prior to maternity roost activity, that prohibit access to colony space.

c. Wildlife Passage and Migration. Maintain existing and re-establish connectivity between aquatic habitats that were severed during the previous or current placement of roadway prism fills.

i. For aquatic habitat (e.g., wetlands as defined by Cowardin 1979) within the construction project footprint, install an adequately

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[21] Weather should include temperature, precipitation, wind, visibility, and cloud cover

[22] Exotic birds, such as European starling, rock pigeons, and house sparrows are not protected by the MBTA.

sized crossing (36-inch pipe or larger) in the roadfill 1/3 below the soil surface.

ii. Design bridges and approach fills to provide wildlife passage.[23]

iii. Replace existing fencing with “wildlife friendly” livestock fencing in areas where native ungulate crossing is likely.[24]

iv. Refer to the “Critter Crossing” guidance provided by the Federal Highway Administration to identify potential problem situations and solutions.[25]

5. Plant Avoidance. Avoid disturbance to State and Federally listed plants and their occupied habitat[26].

   a. Survey project areas during appropriate flowering period within the range of listed plants. Refer to the BA and the relevant Environmental Baseline Reports for plant ranges. A survey is not required if the area has had a documented survey[27] within the last 10 years.

   b. Flag and map occupied habitat necessary to sustain the identified population within the area of potential disturbance, prior to construction.

   c. Ensure construction personnel, equipment, and associated pollutants (e.g., sediments, chemical contaminants, discharge water, non-native grass or weed seed) do not enter the occupied habitat. Delineation as a no work zone or fence the occupied habitat.

   d. Maintain the hydrologic and microclimatic conditions necessary for the continued existence of the identified population within the project area.

   e. If plants are found, then a management buffer will be developed to protect plants from indirect effects such as herbicide drift.

6. Invertebrate Avoidance. Avoid removal of State and Federally listed invertebrate occupied habitat and designated critical habitat.

   a. For project within the range of listed invertebrates, follow protocol surveys for individuals or habitat, as appropriate. Refer to the BA and the relevant Environmental Baseline Report to identify areas likely to support listed butterfly and vernal pool fairy shrimp habitat.

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[23] Refer to ODFW-ODOT liaison biologists for appropriate passage designs.

[24] Project design criteria are available from the U.S. Fish and Wildlife Service, Oregon State Office, 2600 SE 98th Ave., Suite 100, Portland, OR 97266.

[25] Federal Highway Administration (FHWA). (2000). Critter Crossings: Linking Habitats and Reducing Roadkill. Available URL: http://www.fhwa.dot.gov/environment/ wildlifecrossings.

[26] Occupied habitat will be delineated by a qualified professional.

[27] Documented site evaluations by a qualified botanist may be considered a documented survey.

b. Flag and map occupied and critical habitat within the area of potential disturbance, prior to construction.

c. Ensure construction personnel, equipment, and associated pollutants (e.g., sediments, chemical contaminants[28], discharge water, non-native grass or weed seed) do not enter the identified habitats. Delineate as a no work zone or fence the occupied or critical habitat.

d. Maintain the hydrologic and microclimatic conditions necessary for the continued existence of the identified habitats.

e. If occupied habitats are found, then a management buffer will be developed to protect plants from indirect effects such as herbicide drift.

HABITAT AVOIDANCE

1. Streambank Protection. Avoid and minimize adverse effects to natural stream and floodplain function by limiting streambank protection actions to those that are not expected to have long-term adverse effects on aquatic habitats. Whether these actions will also be adequate to meet other streambank protection objectives depends on the mechanisms of streambank failure operating at site- and reach-scale.[29]

   a. Choice of Techniques. The following bank protection techniques are approved for use individually or in combination:

      i. Woody plantings and variations (e.g., live stakes, brush layering, facines, brush mattresses).

      ii. Herbaceous cover, where analysis of available records (e.g., historical accounts and photographs) shows that trees or shrubs did not exist on the site within historic times, primarily for use on small streams or adjacent wetlands.

      iii. Deformable soil reinforcement, consisting of soil layers or lifts strengthened with fabric and vegetation that are mobile (‘deformable’) at approximately two- to five-year recurrence flows.

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[28] For purposes of this performance standard, chemical contaminants include, but are not limited to aerial drift of abrasives, grindings, paint, and other similar materials.

[29] For guidance on how to evaluate streambank failure mechanisms, streambank protection measures presented here, and use of an ecological approach to management of eroding streambanks, see, e.g., Washington Department of Fish and Wildlife, Washington Department of Transportation, and Washington Department of Ecology, Integrated Streambank Protection Guidelines, various pagination (April 2003) (http://www.wa.gov/wdfw/hab/ahg/ispgdoc.htm), and Federal Interagency Stream Restoration Working Group, Stream Corridor Restoration: Principles, Processes, and Practices, various pagination (October, 1998) (http://www.usda.gov/stream_restoration/).

iv. Coir logs (long bundles of coconut fiber), straw bales, and straw logs used individually or in stacks to trap sediment and provide growth medium for riparian plants.

v. Bank reshaping and slope grading, when used to reduce a bank slope angle without changing the location of its toe, increase roughness and cross-section, and provide more favorable planting surfaces.

vi. Floodplain roughness (e.g., floodplain tree and large woody debris rows, live siltation fences, brush traverses, brush rows, and live brush sills) used to reduce the likelihood of avulsion in areas where natural floodplain roughness is poorly developed or has been removed.

vii. Floodplain flow spreaders, consisting of one or more rows of trees and accumulated debris used to spread flow across the floodplain.

viii. Flow-redirection structures known as barbs, vanes, or bendway weirs, when designed as follows, and as otherwise approved in writing by the Services and the appropriate Regulatory Authorities.

(1) No part of the flow-redirection structure may exceed bank full elevation, including all rock buried in the bank key.

(2) Build the flow-redirection structure primarily of wood or otherwise incorporate large wood at a suitable elevation in an exposed portion of the structure or the bank key. Placing the large woody debris near streambanks in the depositional area between flow direction structures to satisfy this requirement is not approved, unless those areas are likely to be greater than 3 feet in depth, sufficient for target-species rearing habitats.

(3) Fill the trench excavated for the bank key above bankfull elevation with soil and topped with native vegetation.

(4) The maximum flow-redirection structure length will not exceed 1/4 of the bankfull channel width.

(5) Place rock individually without end dumping, unless approved in writing by the Services and the appropriate Regulatory Authorities.

(6) If two or more flow-redirection structures are built in a series, place the flow-redirection structure farthest upstream within 150 feet or 2.5 bankfull channel widths, from the flow-redirection structure farthest downstream.

(7) Include woody riparian planting as a project component.

b. Use of Large Wood and Rock. Whenever possible, use large wood as an integral component of streambank protection treatments.[30] Avoid or minimize the use of rock, stone, and similar materials.

i. Large wood will be intact, hard, and undecayed to partly decaying with untrimmed root wads to provide functional refugia habitat for fish. Use of decayed or fragmented wood found lying on the ground or partially sunken in the ground is not acceptable.

ii. Rock may be used instead of wood for the following purposes and structures. The rock may not impair natural stream flows into or out of secondary channels or riparian wetlands. Whenever feasible, place topsoil over the rock and plant with woody vegetation.

(1) As ballast to anchor or stabilize large woody debris components of an approved bank treatment.

(2) To fill scour holes, as necessary to protect the integrity of the project, if the rock is limited to the depth of the scour hole and does not extend above the channel bed.

(3) To construct a footing, facing, head wall, or other protection necessary to prevent scouring or downcutting of, or fill slope erosion or failure at, an existing structure (e.g., culvert, utility line, or bridge support) to be repaired. New and replacement structures shall comply with the Fluvial Performance Standard.

(4) To construct a flow-redirection structure as described above.

2. Habitat Removal. Avoid or minimize habitat modification that will impair the ability of threatened, endangered, proposed, or selected sensitive species to complete essential biological behaviors, such as breeding, spawning, rearing, migrating, feeding, and sheltering.

a. Designated Critical Habitat. Maintain designated critical habitat within the project footprint.

i. Review appropriate sources (e.g., Biological Assessment, Federal Registers) to determine if designated critical habitat is present or likely present within the project area.

ii. Flag and survey the boundary of designated critical habitat, as appropriate.

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[30] See, e.g., Washington Department of Fish and Wildlife, Washington Department of Transportation, and Washington Department of Ecology, Integrated Streambank Protection Guidelines, Appendix I: Anchoring and placement of large woody debris (April 2003) (http://www.wa.gov/wdfw/hab/ahg/ispgdoc.htm); Oregon Department of Forestry and Oregon Department of Fish and Wildlife, A Guide to Placing Large Wood in Streams, May 1995 (http://www.odf.state.or.us/FP/RefLibrary/RefsList.htm).

iii. Do not degrade any primary constituent elements within the boundary of designated critical habitat.

b. Listed Species Nest Trees. Do not remove documented nest trees for bald eagle, marbled murrelet, or northern spotted owl.

c. Non-listed Species Nest Trees. Whenever possible, do not remove documented nest trees of great blue herons and other non-listed bird species.

d. Breeding Habitat. Do not remove potential nesting, breeding, or alter reasonably likely spawning habitat during the breeding season[31] of listed species, unless protocol surveys show the area is not occupied.

e. Functional Habitat. Whenever possible, do not modify or degrade functional[32] habitats for listed species in the project area. If functional habitats for listed species cannot be avoided, then provide the justification(s), such as:

i. Social: public safety, right-of-way

ii. Physical: geomorphologic, built environment

iii. Ecological: conflicting resources

(1) Conserve habitat with the highest value relative to the listed species that will be affected, given the likelihood and timing of mitigation success.

(2) Use ecological value (uniqueness, rarity, resource utilization) and ease of replacement (probability of success, recovery time lags) to evaluate and justify the decision.

f. Replacement. Mitigation must be functionally equivalent to the habitat modified or degraded.

WATER QUALITY

1. Pollution & Erosion Control. Prevent delivery of contaminants to soils and waters of the State caused by surveying and construction operations. Prepare and carry out a Pollution and Erosion Control Plan that contains the elements outlined in Sections 280.00 and 290.30 of ODOT's *Standard Specifications for Highway* Construction (2002), meets requirements of all applicable laws and regulations, and includes the following:

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[31] Breeding season restrictions are identified in the Biological Assessment.

[32] Functional habitat is synonymous with suitable habitat such that it is capable of supporting a protected species either presently or within the future.

a. The name and address of the party(s) responsible for accomplishment of the pollution and erosion control plan.

b. Practices to prevent erosion and sedimentation associated with access roads, stream crossings, drilling sites, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations, staging areas, and roads being decommissioned.

c. Practices to confine, remove, and dispose of excess concrete, cement, grout, and other mortars or bonding agents, including measures for washout facilities.

d. A description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring.

e. A spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

f. Practices to prevent construction debris from dropping into any waters of the State, and to remove any material that does drop with a minimum disturbance to the aquatic habitat and water quality. Include complete and detailed plans for removing any structure and constructing new structures. Outline specific containment measures necessary to keep bridge removal and construction debris out of waters of the State.

g. Inspection of erosion and sediment controls. During construction, monitor in-stream turbidity and inspect all erosion controls daily during the rainy season and weekly during the dry season, or more often as necessary, to ensure the erosion controls are working adequately.[33]

   i. If monitoring or inspection shows that the erosion and sediment controls are ineffective, mobilize work crews immediately to make repairs, install replacements, or install additional controls as necessary.

   ii. Remove sediment from erosion and sediment controls once it has reached 1/3 of the exposed height of the control.

2. Staging Activities. Fuel, operate, maintain, and store vehicles and construction materials in areas that minimize disturbance to habitat and prevent adverse effects from potential fuel spills.

   a. Limit staging areas to the minimum size necessary to complete the project. To reduce the staging area and potential for contamination, ensure that

[33] For purposes of this performance standard, “working adequately” means that project activities do not increase ambient stream turbidity by more than 10% above background 100 feet below the discharge, when measured relative to a control point immediately upstream of the turbidity-causing activity.

only enough supplies and equipment to complete a specific task will be stored on-site.

b. Complete vehicle staging, cleaning, maintenance, refueling, and fuel storage in a vehicle staging area placed 150 feet or more from any waters of the State, unless this distance is not appropriate because of the following site conditions:

   i. Physical constraints that make this distance not feasible (e.g., steep slopes, rock outcroppings).

   ii. Natural resource features would be degraded as a result of this setback.

   iii. Equal or greater spill containment and effect avoidance if staging area is less than 150 feet of any waters of the State.

c. If staging areas are within 150 feet of any waters of the State, full containment of potential contaminants shall be provided to prevent soil and water contamination, as appropriate.

d. Inspect all vehicles operated within 150 feet of any waters of the State daily for fluid leaks before leaving the vehicle staging area. Repair any leaks detected in the vehicle staging area before the vehicle resumes operation. Document inspections in a record that is available for review on request by the Services and the appropriate Regulatory Authorities.

e. Before operations begin and as often as necessary during operation, steam clean (or an approved equal) all equipment that will be used below bankfull elevation until all visible external oil, grease, mud, and other visible contaminates are removed.

f. Diaper all stationary power equipment (e.g., generators, cranes, stationary drilling equipment) operated within 150 feet of any waters of the State to prevent leaks, unless other suitable containment is provided to prevent potential spills from entering any waters of the State.

3. <u>Construction Discharge Water</u>. Avoid adverse affects to water quality from construction discharge water (e.g., concrete washout, hydromilling, pumping for work area isolation, vehicle wash water, drilling fluids).

   a. <u>Discharge Containment</u>. Design, build, and maintain facilities to collect and treat all construction discharge water, including any contaminated water produced by drilling, using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals, and other pollutants likely to be present. An alternate to treatment is collection and proper disposal offsite.

   b. <u>Discharge Velocity</u>. If construction discharge water is released using an outfall or diffuser port, velocities may not exceed 4 feet per second, and the maximum size of any aperture may not exceed one inch.

c. Pollutant Containment. Do not allow pollutants including petroleum products, contaminated water, silt, welding slag, sandblasting abrasive, green concrete, or grout cured less than 24 hours to contact any area within 150 feet of waters of the State, unless approved by the Services and the appropriate Regulatory Authorities.

d. Drilling Discharge. All drilling equipment, drill recovery and recycling pits, and any waste or spoil produced, will be completely isolated, recovered, then recycled or disposed of to prevent entry into waters of the State.

   i. Drilling fluids will be recycled using a tank instead of drill recovery/recycling pits, whenever feasible.

   ii. When drilling is completed, attempts will be made to remove the remaining drilling fluid from the sleeve (e.g., by pumping) to reduce turbidity when the sleeve is removed.

   iii. Follow the necessary terms and conditions of ODOT's most recent drilling programmatic biological opinion.

4. Piling Removal. Avoid adverse affects to aquatic habitats during removal of temporary or permanent piling.

   a. Immediately place removed piling onto the appropriate dry storage site.

   b. Attempt to remove the entire temporary or permanent piling unless otherwise approved in writing by the Services and the appropriate Regulatory Authorities.

   c. Ensure remaining treated wood piling is broken, cut, or pushed at least 3 feet below the sediment surface and covered with a cap of clean, native substrates that match surrounding streambed materials.

   d. Fill the holes left by each treated timber piling with clean, native substrates that match surrounding streambed materials, whenever feasible.

5. Treated Wood. Avoid adverse affects to aquatic habitats during handling of treated wood.

   a. Ensure that no treated wood debris falls into waters of the State. If treated wood debris does fall into waters of the State, remove it immediately.

   b. Dispose of all treated wood debris removed during a project, including treated wood pilings, at an upland facility approved for hazardous materials of this classification. Do not leave a treated wood piling in the water or stacked on the streambank.

   c. Projects using treated wood that may contact flowing water or that will be placed over water where it will be exposed to mechanical abrasion are not authorized, except for pilings installed following NOAA Fisheries' guidelines[34].

6. Site Stabilization. Stabilize all disturbed areas following any break in work unless construction will resume within four days.

7. Stormwater Management. Avoid or minimize adverse effects resulting from changes to the quality and quantity of stormwater runoff for the life of the project by improving or maintaining natural runoff conditions within project watersheds.

   a. Plan. Prepare and carry out a Stormwater Management Plan for any project that will produce a new impervious surface or a land cover conversion that slows the entry of water into the soil. Include the following:

      i. Logic and science (e.g., engineering equations and models or scientific literature and findings) supporting the selected stormwater management option. For projects that require engineered facilities to meet stormwater requirements, use a continuous rainfall/runoff model, if available for the project area, to calculate stormwater facility water quality and flow control rates.

      ii. Schedule to inspect and clean each facility as necessary to ensure that the design capacity is not exceeded and whether improvements in operation and maintenance are needed. Make improvements as needed.

   b. Water Quality. Improve long-term water quality conditions associated with pollutant loading from the road network within the project watershed[35].

      i. Drains. Eliminate direct discharge from the bridge deck to waters of the State[36].

      ii. Treatment Level. Increase treatment of stormwater runoff discharged to waters of the State. Reduce the annual pollutant

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[34] Letter from Steve Morris, National Marine Fisheries Service, to W.B. Paynter, Portland District, U.S. Army Corps of Engineers (December 9, 1998) (transmitting a document titled *Position Document for the Use of Treated Wood in Areas within Oregon Occupied by Endangered Species Act Proposed and Listed Anadromous Fish Species, National Marine Fisheries Service, December, 1998*).

[35] For purposes of this project, "project watershed" refers to the 6th Field Hydrologic Unit Code.

[36] For purposes of this project, "waters" includes any natural waterway, including all bays, intermittent streams, constantly flowing streams, lakes, wetlands, and other bodies of water, any part of which are located within the State of Oregon.

loading[37] to waters of the State, relative to pre-project conditions by providing treatment for the water quality event[38].

iii. Groundwater. Protect groundwater from pollutant loading.

(1) Pretreat the water quality event stormwater runoff from pollution generating surfaces before infiltration to groundwater or discharge into waters of the State, as necessary to minimize any pollutant load likely to be present.

(2) Pretreatment may include, but is not limited to, biofiltration (filtration, adsorption, and biological decomposition from soils that have sufficient organic content and sorption capacity to remove pollutants), filtration (engineered filtration systems), settling/sediment ponds (engineered stormwater facilities), or any combination treatment train thereof.

iv. Placement. Avoid sensitive natural resource areas (riparian and wetland areas, unstable hill slopes, ESA-listed species habitat) during placement of stormwater treatment facilities.

v. Erosion. Prevent erosion caused by the conveyance of stormwater runoff. Consider the following:

(1) Maintain natural drainage patterns and, whenever possible, ensure that discharges from the project site occur at the natural location.

(2) Use a conveyance system comprised entirely of manufactured elements (e.g., pipes, ditches, outfall protection) that extends to the ordinary high water line of the receiving water, where risk of erosion precludes conveyance through sheet flow.

(3) Stabilize any erodible elements of the conveyance system as necessary to prevent erosion.

(4) Do not divert surface water from, or increase discharge to, an existing wetland if that will cause a significant adverse effect to wetland hydrology, soils, or vegetation.

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[37] For purposes of this project, “pollutant loading” includes, but is not limited to debris, sediment, nutrients, petroleum hydrocarbons, and metals.

[38] For purposes of this project, “water quality event” refers to the volume of runoff predicted from a 6-month, 24-hour storm, which may be assumed to be 72% of the 2-year, 24-hour amount (See, Washington State Department of Ecology (2001), Appendix I-B-1), unless another storm size is more appropriate for the local climate and hydrology and provides equivalent conservation benefit (less than or equal adverse effects provided by the defined storm size) and is approved in writing by the Services and the appropriate Regulatory Authorities.

(5) The velocity of discharge water released from an outfall or diffuser port may not exceed 4 feet per second (attraction flow for fish).

c. Water Quantity. Increase the annual site infiltration potential of the project watershed, with emphasis on the project area.

i. Urbanized. For urbanized watersheds[39], reduce the post-project frequency, magnitude, and duration of the peak flow from ½ of the 2-year storm event up to the 50-year storm event as measured against pre-project frequency, magnitude and duration of peak flow from the same range of storm events.

ii. Wildland. For wildland (forest, rangeland) watersheds, reduce the post-project or maintain the pre-project frequency, magnitude, and duration of the peak flow from ½ of the 2-year storm event up to the 50-year storm event as measured against pre-project frequency, magnitude and duration of peak flow from the same range of storm events.

iii. Infiltration. Provide infiltration opportunities for stormwater runoff derived from the project area.

(1) Infiltration opportunities may include, but are not limited to; adequate soils, non-concentrated overland flow, vegetation management, land cover conversions, permeable bedded detention basins, and infiltration swales.

(2) Minimize, disperse, and infiltrate stormwater runoff onsite using sheet flow across permeable vegetated areas to the maximum extent possible without causing flooding, erosion impacts, or long-term adverse effects to groundwater.

iv. Discharge. Ensure that the post-project discharge is less than the pre-project discharge rates from 50% of the 2-year peak flow up to the 50-year peak flow.

SITE RESTORATION

1. Renew habitat access, water quality, production of habitat elements, channel conditions, flows, watershed conditions, and other ecosystem processes that form and maintain productive habitats. Prepare and carry out a site restoration plan as necessary to ensure that all habitats and accesses (e.g., streambanks, soils, large

[39] For purposes of this project, "urbanized watersheds" are determined by a low percentage of natural vegetation and a high percentage of impervious surface within the project watershed (5th Field HUC). Other methods may include FEMA mapping, land management, land cover types, or land ownership. The hydrology of these watersheds has been significantly altered by land development.

woody material, and vegetation) disturbed by the project are cleaned up and restored as follows:

a. General Considerations:

i. Streambank shaping. Restore damaged streambanks to a natural slope, pattern and profile suitable for establishment of permanent woody vegetation, unless precluded by pre-project conditions (e.g., a natural rock wall).

ii. Revegetation. Replant or reseed each area requiring revegetation before the end of the first planting season following construction. Use a diverse assemblage of species native to the project area or region, unless approved in writing by the Services and the appropriate Regulatory Authorities.

iii. Pesticides. No pesticides, including herbicides, will be allowed within 150 feet of waters of the State. Mechanical, hand, or other methods may be used to control weeds and unwanted vegetation.

iv. Fertilizer. Do not apply surface fertilizer within 50 feet of any stream channel, unless approved in writing by the Services and the appropriate Regulatory Authorities.

v. Fencing. Install wildlife-friendly fencing as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

vi. Source of Materials. Obtain boulders, rock, woody materials and other natural construction materials used for the project outside the bankfull elevation and at least 150 feet from any waters of the State, except for native materials obtained from within the project footprint to be stockpiled and reused on site.

(1) If possible, leave native materials where they are found.

(2) If native materials (e.g., downed wood) are damaged or destroyed, replace them with a functional equivalent during site restoration.

(3) Stockpile all large wood[40], native vegetation, weed-free topsoil, and native channel material displaced by construction for use during site restoration in-channel, in the riparian area, or in adjacent uplands, as appropriate.

b. Plan Contents. Include each of the following elements:

[40] For purposes of this project, "large wood" means a tree, log, or rootwad big enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull channel width of the stream in or near which the wood occurs. See, Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (www.odf.state.or.us/FP/RefLibrary/LargeWoodPlacemntGuide5-95.doc).

i. Responsible Party. The name and address of the party(s) responsible for meeting each component of the site restoration requirements, including providing and managing any financial assurances and monitoring necessary to ensure restoration success;

ii. Baseline Information. Include the location and extent of resources surrounding the restoration site (i.e., historic and existing conditions). This information may be obtained from existing sources (e.g., land use plans, watershed analyses, subbasin plans, and ODOT's Environmental Baseline Reports), where available;

iii. Goals and Objectives. Restoration goals and objectives that describe the extent of site restoration necessary to restore lost function, by resource type;

iv. Design Criteria. Use these criteria to help design the plan and to assess whether the restoration goal is met. While no single criterion is sufficient to measure success, the intent is that these features should be present within reasonable limits of natural and management variation:

(1) Bare soil spaces that approximate the size and dispersal pattern of pre-existing conditions;

(2) Soil movement, such as active rills or gullies and soil deposition around plants or in small basins, is absent or slight and local;

(3) If areas with past erosion are present, they are completely stabilized and healed;

(4) Plant litter is well distributed and effective in protecting the soil with few or no litter dams present;

(5) Native woody and herbaceous vegetation, and germination microsites, are present and well distributed across the site;

(6) Vegetation structure is resulting in rooting throughout the pre-existing, available soil profile;

(7) Plants have normal, vigorous growth form, and a high probability of remaining vigorous, healthy and dominant over undesired competing vegetation;

(8) High impact conditions are confined to small areas that are necessary for access or other special management situations;

(9) Streambanks have less than 5% exposed soils with margins anchored by deeply rooted vegetation or coarse-grained alluvial debris.

v. Work Plan. Develop a work plan with sufficient detail to include a description of the following elements, as applicable:

(1) Boundaries for the restoration area;

(2) Restoration methods, timing, and sequence;

(3) Irrigation plan, including water supply source, if necessary;

(4) Woody native vegetation appropriate to the restoration site. This must be a diverse assemblage of species that are native to the project area or region, including grasses;

(5) Forbs, shrubs and trees. This may include allowances for natural regeneration from an existing seed bank or planting;

(6) A plan to control exotic invasive vegetation;

(7) Elevation(s) and slope(s) of the restoration area to ensure they conform with required elevation and hydrologic requirements of target plant species;

(8) Geomorphology and habitat features of stream or other open waters;

(9) Site management and maintenance requirements.

vi. Five-year monitoring and maintenance plan:

(1) A schedule to visit the restoration site annually for 5 years or longer as necessary to confirm that the design standards are achieved. Revise the restoration plan if design standards are not achieved after initial 5-year period. Continue annual monitoring until restoration performance criteria are met;

(2) During each visit, inspect for and make plans to correct any factors that may prevent attainment of design criteria (e.g., low plant survival, invasive species, wildlife damage, and drought);

(3) Keep a written record to document the date of each visit, site conditions and any corrective actions taken.

COMPENSATORY MITIGATION

1. Ensure the proposed action meets the goal of ‘no net loss’ habitat functions by offsetting unavoidable long-term adverse effects to habitats. Activities that prevent development of properly functioning condition of natural habitat processes require a Compensatory Mitigation Plan to offset long-term adverse effects. General considerations:

a. Make mitigation plans compatible with adjacent land uses or, if necessary, use an appropriate buffer to separate mitigation areas from developed areas or agricultural lands.

b. Base the level of required mitigation on a functional assessment of adverse effects of the proposed project, and functional replacement (i.e., 'no net loss of function'), whenever feasible, or a minimum one-to-one linear foot or acreage replacement ratio shall be applied.

c. Acceptable mitigation must be consistent with all program-specific environmental performance standards and may include:

   i. Re-establishment or rehabilitation of natural or historic habitat functions when self-sustaining, natural processes are used to provide the functions.

   ii. Participation in ODOT's conservation banks, as approved in writing by the Services and the appropriate Regulatory Authorities.

d. Actions that require construction of permanent structures, active maintenance, creation of habitat functions where they did not historically exist, or that simply preserve existing functions are not authorized, unless otherwise approved in writing by the Services and the appropriate Regulatory Authorities.

e. Whenever feasible, complete mitigation before, or concurrent with, project construction to reduce temporal loss of ecosystem functions and simplify compliance.

f. When project construction begins before mitigation is completed, show the Services that a mitigation project site has been secured and appropriate financial assurances are in place.

   i. Complete all work necessary to carry out the mitigation plan no later than the first full growing season following the start of project construction, whenever feasible.

   ii. If beginning the initial mitigation actions within that time is infeasible, then include other measures that mitigate for the consequences of temporal losses in the mitigation plan.

g. Include all pertinent elements of a site restoration plan, outlined above, and the following elements.

   i. Consideration of the following factors during mitigation site selection and plan development.

      (1) Watershed considerations related to specific resource needs of the affected area.

      (2) Existing technology and logistical concerns.

   ii. A description of the legal means for protecting mitigation areas, and a copy of any legal instrument relied on to secure that protection.

FLUVIAL

1. Fluvial. Allow normative physical processes[41] within the stream-floodplain corridor.

   a. Channel Processes. Design water crossings other than overflow crossings[42] that (1) promote natural sediment transport patterns for the reach, (2) provide unaltered fluvial debris movement, and (3) allow for longitudinal continuity and connectivity of the stream-floodplain system. If one of the three objectives cannot be restored at the project site, then locate an alternate, non-Bridge Program project within the same project watershed that will achieve an equal or greater function. Temporary fill below the bankfull elevation that results in embedded streambed material is not allowed, unless approved in writing by the Services and the appropriate Regulatory Authorities.

      i. Ensure the functional floodplain is absent of roadway, embankment, or approach fills.

         (1) For purposes of this project, the functional floodplain will be determined using the following process, unless another process (e.g., channel migration zone) is more appropriate for site conditions and is approved in writing by the Services and the appropriate Regulatory Authorities :

            (a) Step 1: Determine the bankfull width, depth, and elevation.

            (b) Step 2: Determine the floodprone elevation and width.[43]

            (c) Step 3: Determine the Entrenchment Ratio (E).[44]

               (i) If E < 2.2, then the floodprone area is considered the functional floodplain.

               (ii) If E > 2.2, then 2.2 times the bankfull width is considered the functional floodplain.

            (d) Process Considerations:

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[41]If existing conditions, exclusive of highway structures (e.g., built environment, hydrologic control), will likely preclude normative physical processes during the life of the proposed crossing (e.g., 100 years), then design crossing to existing conditions.

[42]Overflow crossings will be designed to pass the 50-year flood event or ODOT's most up-to-date design standards.

[43] Floodprone Width (FPW) is defined as the width at the elevation of twice the maximum bankfull depth or three times the average bankfull depth.

[44] Entrenchment (E) is defined as the ratio between the floodprone width and bankfull width (E = FPW/BFW). Values of less than 1.4 indicate a stream with a relatively small floodplain, while values over 2.2 indicate a system with high floodplain connectivity.

(i) The bankfull discharge level (elevation)[45] can be located using field indicators as defined by Dunne and Leopold (1978). Bankfull indicators include: (1) topographic break from vertical bank to flat floodplain, (2) topographic break from steep slope to gentle slope, (3) change in vegetation from bare to grass, moss to grass, grass to sage, grass to trees, or from no trees to trees, (4) textural change of depositional sediment, (5) elevation below which no fine debris (needles, leaves, cones, seeds) occurs, and (6) textural change of matrix material between cobbles or rocks (Dunne and Leopold 1978).

(ii) Surveys of the bankfull discharge elevation should be conducted upstream and/or downstream of the bridge, outside of the area influenced by the bridge. Five to seven channel widths (one average meander wavelength; 10 widths is preferred) is often used as a minimum distance to survey upstream and downstream, however, site conditions will dictate the appropriate distance for surveying.

(iii) Bankfull width (BFW) is the active channel width at the bankfull discharge elevation as defined above. Averaging several width measurements (taken at riffle sections, if available) are preferable to a single measurement. Comparing upstream and downstream measurements is valuable for determining various physical processes in operation at specific sites. Avoid measuring widths where bank stabilization structures are located. Vast disparities in upstream and downstream bankfull widths may indicate stream instability and should be further investigated.

(iv) Average bankfull depth can be determined by either averaging the measured depths across the stream channel at the bankfull

[45] As general consideration, in western Oregon, bankfull discharge is approximately a 1.1 to 1.2-year flow event, while in eastern Oregon it more closely corresponds to a 1.5-year event (Janine Castro, Pers. Comm. 2003).

width level, or by dividing the cross-sectional area by the bankfull width.

(v) The floodprone width (FPW) is determined by finding the elevation at twice the maximum bankfull depth at a riffle or three times the average bankfull depth. The width of the floodplain, or floodprone area, is then measured at this elevation. Using three times the average depth is a more robust approach because it is not as sensitive to the exact location of the cross-section.

(2) As a means of evaluating bridge placement, appropriate span length, and overall program goals, perform scour analysis to:

(a) Evaluate the bridge length so that there is equivalent contraction scour at the bridge crossing as in the area upstream of the bridge crossing or would be expected under natural conditions up to the 10-year flood event.

(b) Ensure that the discharge at which incipient motion[46] begins under the bridge is similar to the discharge at which incipient motion begins upstream of the bridge.

(c) Ensure scour through the bridge opening is equivalent to reach conditions outside of the influence of the bridge structure and road prism.

ii. Remove man-made constrictions within the functional floodplain of the project area.

(1) Reduce existing fill volumes in the functional floodplain: Possible measures to reduce fill volumes could include removing existing approach fills, installing relief conduits through existing fill, or removing other floodplain fill volumes located within the project area.

(2) Avoid increases and decrease, as feasible, net fill volumes[47] within the floodprone area.

(3) Remove vacant[48] bridge support structures in the functional floodplain: Possible measures may include removing

[46] Incipient motion is defined as the velocity at which bed material becomes mobile.

[47] Fill volumes will be calculated from the existing soil surface to the floodprone elevation.

structures to below the modeled scour depth[49] or removing structures located within debris transportation corridors.

iii. Design and locate bridge support structures with the following considerations:

(1) Avoid inducing localized scour of streambanks and reasonably likely spawning areas.

(2) Bridge supports will avoid supplemental[50] scour prevention (e.g., riprap) and incorporate scour protection (e.g., drilled shafts, piles driven below critical scour depth).

(3) Bridge supports will allow the fluvial transport of large wood through the project area.

(a) Avoid the need for removal or modification (e.g., cutting, limbing) of large wood resting against bridge support structures.

(b) Design span length to facilitate potential large wood movement through the project area with the following considerations:

(i) The site-potential tree height[51] and the large wood transport capacity[52] of the project watershed upstream of the bridge.

(ii) The orientation of the bridge crossing and bent locations relative to stream flow in order to capitalize on the orientation of drift material relative to the bridge structure.

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[48] For purposes of this project, "vacant structures" include unused, unnecessary, or abandoned structures that are no longer fulfilling their intended purpose, except for those structures that are potentially eligible for, eligible for, or listed on the National Register of Historical Places.

[49] For purposes of this performance standard, the scour analysis shall be performed according to methodology developed by the Federal Highway Administration: Hydraulic Circular No. 18, Evaluating Scour at Bridges, Third Edition (FHWA-IP-90-017, November 1995) or equivalent. The focus of this fluvial scour review is to ensure that the new bridge will have a sufficient span over the waterway and functional floodplain area to prevent scour from occurring differentially at the bridge site than would occur in natural stream reference sections up to the 10-year flood event.

[50] For purposes of this project, "supplemental scour protection" can also be referred to as "active scour protection"

[51] For purposes of this project, the site potential tree height can be obtained in the county-specific Natural Resource Conservation Service (NRCS) soil surveys.

[52] For purposes of this project, the "large wood transport capacity" is the maximum capability of the stream to move large wood under historic, current, and future land use activities and is a product of the channel morphology, stream power, and site potential tree height.

b. Floodway Processes. Design crossings that allow lateral connectivity between the stream and floodplain.

i. Bridge the functional floodplain.

ii. Accommodate potential flow pathways at multiple flood stages by:

(1) Locating bridge opening to maximize floodplain function;

(2) Providing flood-relief conduits (bottomless arch and embedded culvert design only) within existing road fill at potential flood flow pathways based on analysis of flow patterns (or floodplain topography) at multiple flood stages, as necessary;

(3) Locating bridge abutments with consideration of channel migration patterns over the designed lifetime of the bridge.

3.4 Bridge Repair/Replacement Elements

This section describes the constituents of Bridge Program construction activities. These *elements* are referenced throughout the Bridge Repair/Replacement Activities section (Section 3.5) to eliminate repetition of detailed descriptions of common construction practices and methods. For the same reason, some elements are referenced within the descriptions for other elements. References to the various construction elements are printed in *italics* and include the appropriate section number as it appears in this BA (e.g., *pre-construction*, Section 3.4.1) to direct the reader to the detailed descriptions of the construction element being discussed.

3.4.1 Pre-Construction

For the purposes of the proposed action, the pre-construction phase of the project is defined as consisting of all surveying activities necessary to plan the work required to construct the project to the lines and grades as shown, specified, or established as described in ODOT's Standard Specifications for Highway Construction (ODOT 2002a). Pre-construction activities may involve environmental surveys, flagging, geotechnical investigations, and hydraulic investigations. Geotechnical drilling and surveying activities will follow the Terms and Conditions presented in the biological opinion issued by NOAA Fisheries (2003c). Pre-construction activities will follow the environmental performance standards for Species Avoidance, Habitat Avoidance, and Water Quality (Section 3.3).

Surveys

Surveying involves demarcating and flagging boundaries within the project action area that are important to construction. Some of these areas include environmentally sensitive areas such as streams or other waterbodies, riparian and wetland areas, and species habitat areas. Construction activities in these areas are limited in order to minimize and avoid adverse effects, and are restricted to seasonal periods. Other environmentally important areas that require surveying and flagging include but are not limited to the limits of construction, "no-work zones", clearing and grubbing limits (*earthwork*, Section 3.4.5), erosion control limits, environmental impact mitigation features, settling basins, waters of the State, ordinary high water elevations, and other drainage and water quality structures and facilities (*in-water work*, Section 3.4.7) (ODOT 2002a).

Geotechnical Investigations

Geotechnical investigations are necessary for any type of construction work that requires a level of underground stability. For bridge work, geotechnical investigations are normally needed to determine appropriate designs for bridge foundations. ODOT has prepared a statewide programmatic biological assessment entitled Programmatic Consultation for Statewide Drilling, Surveying, and Hydraulic Engineering Activities in Oregon (ODOT 2002b). Minimization and avoidance of adverse effects from geotechnical drilling will be accomplished through application of the Terms and Conditions included in the programmatic Biological Opinion (NOAA Fisheries 2003b) and environmental performance standards developed to minimize and avoid these effects.

Hydraulic Surveys

Hydraulic surveys are critical to a determination of the safety, stability, and long-term function of any water crossing. Hydraulic measurements that require access to the wetted channel will be completed outside of spawning seasons, or a fisheries biologist will confirm that no spawning redds are present within the project area. If dye must be used, surveyors will only use non-toxic vegetable dyes to determine flow patterns; short pieces of plastic ribbon are prohibited (NOAA Fisheries 2003a).

Potential Effects

The nature and extent of the potential effects of pre-construction activities depend on the type of activity being performed. Effects associated with ground survey work would typically be limited to minor vegetation clearing. Geotechnical surveys (drilling) may contribute sediment-laden fluids to receiving waters, if not properly contained. In-water surveys, such as hydraulic surveys, could result in physical damage to salmonid redds (i.e., incidental take) if they are within a project action area and adequate care is not taken to avoid them or to prevent sedimentation. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.2 Clearing

The purpose of clearing is to prepare the project action area for construction activities. Clearing consists of cutting and removing above-ground vegetation such as weeds, grasses, crops, brush, and trees; removing down timber and other vegetative debris; preserving trees and other vegetation designated to remain in place; and salvaging marketable timber (when required by the ODOT Standard Specifications and Special Provisions) (ODOT 2002a). Clearing is often followed by grubbing (*earthwork*, Section 3.4.5) operations to remove any remaining surface vegetation and buried debris. Clearing typically requires less ground disturbance than grubbing.

Clearing generally takes place within pre-marked areas in the project action area necessary for construction purposes. Clearing activities typically take place during construction staging (*equipment control*, Section 3.4.3), *roadwork* (Section 3.4.8), and other bridge work. In sensitive areas, clearing would be conducted by hand rather than with heavy equipment.

Clearing Operations

The contractor is required to cut trees and brush so that they fall into the areas intended to be cleared (ODOT 2002a). Removal of all evidence of clearing matter and debris is the responsibility of the contractor. This includes removal of:

- Sod, weeds, and dead vegetation
- Downed timber, brush, and other vegetation
- Sticks and branches with diameters greater than 1/2 inch

- Dead trees, downed timber, stumps, and specified trimmings from areas where live trees and other vegetation are designated to remain

Potential Effects

The potential effects associated with clearing activities carried out during bridge replacement and repair are various. Clearing activities are likely to result in some degree of ground disturbance and compaction, generating the potential for soil erosion, and consequently, temporary turbidity and sedimentation. Additionally, adverse effects may result from the loss of large woody material (LWM) recruitment potential. LWM in channels creates channel complexity and provides refuge habitat for fish, as well as habitat for macroinvertebrates. Tree loss may allow increased penetration of solar radiation into streams, potentially increasing water temperatures. Tree removal may also decrease the amount of available nesting/denning, foraging, and roosting habitat available to birds and mammals. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.3 Equipment Control

For the purposes of the proposed action, equipment control includes the proper maintenance and control of construction equipment in order to minimize the potential for pollutant leaks and spills. Additionally, equipment control involves the minimization and avoidance of physical disturbance to the environment resulting from operation of equipment in sensitive areas such as streams, wetlands, riparian areas, and steep slopes.

Potential Effects

The primary effect associated with the storage and maintenance of construction equipment on construction sites is the potential for leaks and spills of fuel, hydraulic fluids, lubricants, and other chemicals from equipment and storage containers. Additional effects could include soil compaction, ground disturbance, and vegetation loss in construction staging areas. Discharge of vehicle and equipment wash water, concrete wash-out, etc. can also add pollutants to the soil that are then delivered to waterways. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.4 Construction Material Containment

Construction activities such as bridge demolition, construction, sandblasting, and painting will inadvertently cause falling debris (such as lead paint chips, sandblasting grit, treated wood, structural debris, and concrete) that requires containment. The safe storage, handling, and disposal of hazardous wastes will be conducted as required in ODOT's Standard Specifications for Highway Construction (ODOT 2002a).

<u>Debris Containment</u>

Prior to bridge removal, bridge painting, or other activities with the potential for chemical contamination, debris containment measures will be employed in accordance with the environmental performance standards for Water Quality (Section 3.3). The purpose of debris containment is to prevent falling material generated during these processes from entering sensitive environments. Containment measures may include the use of a flexible or rigid material. When stripping paint from an existing bridge the use of vacuum shrouded tools, in addition to other containment systems, is normally required under ODOT Standard Specifications for Highway Construction (ODOT 2002a).

<u>Lead Paint</u>

If the existing paint coating contains a lead component (considered hazardous), the contractor will take special precautions to contain, recover, and properly dispose of all waste, including hazardous waste, generated during bridge removal (ODOT 2002a). No spent abrasive will be allowed to contaminate the aquatic or terrestrial environment. The contractor will contain and collect waste material in an approved area in the same manner as if it were a hazardous material (ODOT 2002a). Simple debris containment, as described above, may be adequate to prevent lead-based paint debris from entering the aquatic or terrestrial environment. All onsite temporary storage, handling, and labeling will be in accordance with 40 CFR Parts 262 and 265. The contractor will prevent the escape of dust or paint, which may create a nuisance or hazard in the vicinity of the structure. At no time will any debris be allowed to escape into the environment.

<u>Potential Effects</u>

Possible effects associated with contamination by construction materials and debris stem primarily from the contamination of water and substrate by toxic materials or by debris falling into water. Debris such as lead-based paint chips and treated wood poses the threat of chemical contamination, and the improper disposal of waste material is a potential vector of effects to listed species and habitat. The potential effects of contamination increase if species occurrence is high. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.5 Earthwork

For the purposes of the Bridge Program, earthwork is defined as work consisting of excavation, ditching, backfilling, embankment construction, augering discing, ripping, grading, leveling, borrow, and other earth-moving work required in the construction of the project (ODOT 2002a). Blasting is also a form of earthwork and as such, it is addressed in this section.

Earthwork may be conducted as part of the preparation of staging areas, bridge approaches, alignments, embankments, fills, backfills, foundations, toe trenches, road grades, utility relocation, falsework, stormwater treatment, ditch construction, bank stabilization, landscaping, restoration, and mitigation. Earthwork normally requires the use of mechanical equipment such as tracked excavators, backhoes, bulldozers, and grading equipment.

Earthwork may also include grubbing, which is the removal of: brush stems remaining above the ground surface after the *clearing* work, tree stumps, roots, and other vegetation found below ground surface, as well as partially buried natural objects (ODOT 2002a). *Clearing* and grubbing are often required prior to earthwork in order to remove vegetative and other debris from work areas so that design specifications (e.g., for compaction) can be met. Within excavation and embankment limits, contractors will remove tree stumps, roots, and other vegetation. The contractor will remove all extraneous matter and will dispose of this matter and debris on- or off-site by chipping, burying, or other methods of proper disposal, excluding burning (ODOT 2002a).

Potential Effects

The effects associated with earthwork activities vary. Turbidity and sedimentation may result from ground disturbance and soil erosion. Hydraulic effects may result from instream excavation and fill, potentially altering the hydraulic opening under bridges. Chemical contamination may occur as a result of fluid spills from mechanized equipment conducting earthwork activities near waterways and from the time lag between when a stormwater treatment system is constructed and is operational. Riparian habitat may be impacted during *clearing* and grubbing activities that remove vegetation. Although unlikely, direct effects on listed species may occur as a result of excessive turbidity or sedimentation during earthwork activities. Indirect effects are more likely to occur, due to habitat loss. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

Blasting

Blasting consists of excavating in rock to achieve smooth, unfractured backslopes and produce a free surface in the rock along the specified excavation backslope; it can also involve production blasting to facilitate excavation (ODOT 2002a). Blasting may be an option during roadwork and bridgework activities. *Roadwork* may use blasting techniques to clear obstructions and provide access for new roadways or road realignments. Bridgework may require blasting during the construction or removal of bridge abutments.

The effects of blasting include those described for *earthwork*. Additionally, high noise levels may affect both terrestrial and aquatic species. Blasting noise may displace birds, fish, and mammals. Sound pressure waves produced by blasting can damage or even kill adult and juvenile fish and damage incubating eggs.

A blasting plan that details the drilling and blasting patterns, the controls the contractor proposes to use, the timing, and the anticipated noise effects will be prepared. As specified in ODOT's Standard Specifications for Construction (2002a), blasting is prohibited underwater.

The contractor will follow the Species Avoidance Environmental Performance Standard to minimize or avoid noise effects and disturbances to wildlife species during blasting. In addition, ground vibrations will be controlled by using properly designed delay sequences and allowable charge weights per delay (ODOT 2002a). Additional measures, as appropriate, will include dampening measures such as blasting mats, or alternatives to blasting such as expanding compounds. The contractor will monitor each blast with an approved seismograph and airblast monitoring system according to ODOT Standard Specifications for Highway Construction (ODOT 2002a).

3.4.6 Foundations

Foundations are required elements of every bridge construction and replacement project. Bridge foundations consist of three general types: 1) drilled shafts, 2) columns on spread footings, 3) driven piles and pile-supported caps or walls. Driven piles by themselves are normally used to support temporary structures such as detour bridges and work bridges. However, driven piles are also often used to provide additional support to spread footings.

<u>Drilled Shafts</u>

Drilled shafts are used where the underlying substrate will provide the necessary end-bearing or friction-bearing capacity. Drilled shaft columns are constructed on land or in water. Shaft drilling is accomplished by placing drilling equipment adjacent to the column location and drilling through underlying substrates. This may require the construction of a drill pad using fill materials (placed on the ground) or a work platform (constructed above ground or over water). Impacts associated with drill pad construction are described under *in-water work* (3.4.7). Shaft drilling generates a slurry mixture of water and substrate that can create turbid stream conditions if released to flowing waters. Containment of drilling spoils will utilize a variety of methods (e.g., multiple drill casings) to meet the environmental performance standard for Water Quality (Section 3.3). Following shaft drilling, concrete is poured to form the column. Containment of concrete methods would meet or exceed measures described under *equipment control* (Section 3.4.3) and *construction material containment* (Section 3.4.4) and the Water Quality Environmental Performance Standard.

<u>Columns on Spread Footings</u>

Spread footings are constructed where substrates are not firm enough to support a bridge column. Spread footing construction requires excavation (*earthwork,* Section 3.4.5) of the footing location. If this occurs below the ordinary high water mark (OHW) where fish are present, then work area isolation, dewatering, and fish capture and release are required (*in-water work*, Section 3.4.7). Driven piles are often used to provide additional support for spread footings. Normally, these are driven within an isolation or containment area, following excavation for the footing. Concrete forms are constructed and concrete is poured. Containment of green concrete is accomplished according to *equipment control* (Section 3.4.3) and *construction material containment* (Section 3.4.4) and the Water Quality Environmental Performance Standard.

Driven Piles and Pile Supported Structures

Pile driving is accomplished using one of two methods: impact hammer or vibratory hammer (NOAA Fisheries 2003a). Typically, harder substrates require the use of impact hammers, and bearing capacity can only be determined with impact hammers. Pile driving requires the application of environmental performance standards for Species Avoidance (Section 3.3) which include noise dampening measures and/or timing restrictions (for wildlife avoidance).

Pile-supported caps or retaining walls can be incorporated into bridge design as abutments (end bents) or as interior bents. These structures will not be constructed within aquatic habitats where floodplain and fluvial functions would be inhibited as a result (Fluvial Environmental Performance Standard [Section 3.3]). Bent construction of this nature would require pile driving and concrete work. For some program bridges, blasting may also be required where foundations must rest on bedrock. Bank stabilization measures such as riprap may be employed in bridge repair projects conducted as part of the proposed action. Pile driving and the construction of pile-supported structures will incorporate construction methods and standards for *earthwork* (Section 3.4.5), *equipment control* (Section 3.4.3), and *construction material containment* (Section 3.4.4).

Potential Effects

The effects associated with bridge foundations can be either temporary (when effects stemming from the construction process) or permanent (when effects stem from hydraulic effects and the loss of stream, floodplain, and wetland habitat).

Temporary effects are those associated with *in-water work* (Section 3.4.7) activities necessary to demolish existing structures and construct new ones. These effects are primarily related to the displacement of streambed materials, which generates turbidity and sedimentation. Chemical contamination may result from concrete pouring in or near streams. Noise effects to fish and wildlife species may occur due to pile driving.

Long-term effects may result when there is direct habitat loss due to the footprint of foundation structures; e.g., if the footprint of the new bridge is larger than that of the one that it is replacing. Hydraulic effects result when foundation structures alter the flow dynamics of streams and/or floodplains. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.7 In-water Work

In-water work may take place during many activities associated with bridge replacement and repair projects. *In-water work* refers to any project-related action occurring within aquatic habitat—i.e., below the OHW or bankfull elevation. The bankfull for any bridge project is demarcated by one of several reference points or areas, but typically refers to the annually inundated portions of streams, lakes, or wetlands. Bankfull boundaries may be defined by channel morphology (e.g., break in slope or bankfull width), which is readily detectable in the field. This boundary is defined specifically for each bridge project.

Typical in-water work activities include but are not limited to the following:

- work area isolation
- flow diversion
- concrete/spread footing removal
- fish rescue and salvage
- streambank protection
- excavation of streambed materials
- pile driving and removal
- shaft drilling
- habitat restoration/creation (streambed construction)
- geotechnical exploration (drilling)
- water pumping and discharge

The timing of all work within the aquatic habitat will generally correspond with the in-water work timing guidelines established for specific watersheds incurring Bridge Program activities. ODOT construction activities will follow timing guidelines established in this consultation to help minimize potential effects to fish, wildlife, and habitat resources. In-water work periods are established to avoid the vulnerable life stages (spawning, rearing, and migration) of fish and other aquatic species. Alterations to these in-water work periods require approval by the Services, because activities conducted outside of these periods may result in changes of the magnitude or scope of effects that exceed the effects allowed within the corresponding Biological Opinion.

Under the Bridge Program consultation, the following activities are prohibited.

- Underwater blasting
- Water jetting
- Releasing petroleum products or toxic chemicals in the water
- Disturbing spawning beds
- Obstructing stream channels
- Blocking adult and juvenile fish passage

<u>In-Water Work Area Isolation</u>

The contractor will isolate in-water bridge structures (e.g., bents and abutments) from the waterbody prior to removal and reconstruction. Work area isolation is normally accomplished by surrounding in-water work zones with materials that will prevent the entry of water and that are sturdy enough to withstand the flows likely to be encountered. Typical materials include sandbags, straw bales, concrete barriers, heavy tarp, sheet piling, and specially constructed devices such as water-filled bladders or solid barriers like the Porta Dam.

Flow Diversion

Streamflow may be diverted in situations where complete isolation is not necessary to achieve effective isolation from flowing water. This diversion may be accomplished by placing barrier materials in the channel, encompassing two or more sides of an in-water work activity. If water is shallow and flows can be sufficiently deflected from the work area, it can be effectively dewatered without the need for complete isolation, pumping, and fish capture and release. Sediment control measures must be implemented to prevent a release of turbid water into downstream areas which would exceed regulated allowances.

Fish Capture and Release

Before (and sometimes during) the dewatering of an isolated in-water work area, an attempt will be made to capture and release fish from the isolated area using trapping, seining, electrofishing, or other methods that minimize the risk of injury to fish. A fisheries biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish will conduct or supervise the fish capture and release operation. If electrofishing equipment is used to capture fish, the capture team will comply with the most recent NOAA Fisheries-approved electrofishing guidelines (NOAA Fisheries 2000a), and will handle ESA-listed fish with extreme care, keeping fish in oxygenated water to the maximum extent possible during seining and transfer procedures to prevent the added stress of out-of-water handling. Captured fish will be released in a location that will promote their safe recovery. ESA-listed fish will not be transferred to anyone except NOAA Fisheries or USFWS personnel, unless otherwise approved in writing by the Services.

Streambank Protection

Riprap is often used for streambank and stormwater treatment outfall protection where water velocities or safety considerations prevent the use of natural vegetation or seeding. Riprap may be used as ballast to anchor or stabilize large woody material (LWM), to construct flow-redirection structures to fill scour holes, and to protect *existing* structures that will be repaired. Riprap provides an erosion-resistant cover for protecting slopes and basins. ODOT Standard Specifications for Construction (2002a) detail techniques for the preparation of slopes prior to placing riprap. Retaining walls provide another form of streambank protection. These are typically concrete and/or mechanically stabilized earth. Permanent replacement structures will not incorporate riprap or retaining walls. Only activities at existing retaining walls associated with repair bridges will be allowed under this consultation.

Streambank protection may also be achieved by bioengineering techniques that utilize live vegetative material to provide stability. Additionally, habitat elements such as root wads and logs may be incorporated into streambank protection designs. The Habitat Avoidance Environmental Performance Standard (Section 3.3) will be applied to minimize and avoid adverse effects associated with riprap.

Streambed Excavation

Heavy equipment may be used to excavate and remove streambed material (e.g., for the placement of spread footings or the addition of riprap). Work area isolation will be implemented prior to any streambed excavation.

Pile Driving and Removal

See *Foundations* (Section 3.4.6).

Shaft Drilling

See *Foundations* (Section 3.4.6)

Geotechnical Drilling

The methods, minimization and avoidance measures, and effects associated with geotechnical drilling are incorporated by reference to the Programmatic Biological Opinion entitled Federal Highway Administrations' Programmatic Consultation for Statewide Drilling, Surveying, and Hydraulic Engineering Activities in Oregon (NOAA Fisheries 2003b).

Pumping and Discharge

The pumping and discharge of sediment-laden water or fluids is often required during *in-water work* area isolation and *earthwork* where groundwater may be encountered. Sediment-laden water must be allowed to clear before it can re-enter any waters of the State. Normally, turbid water is pumped to upland settling ponds where it may infiltrate through the soil prior to reentry to waterways. Alternatively, sediment-laden water may be allowed to sheet flow over vegetated ground, or may be pumped into tanks and hauled off-site for proper disposal.

Pumps may be required to dewater the work isolation area. When the pumps are required, the intake will be screened, operated, and installed following NOAA Fisheries screening criteria. The pump system will be monitored during periods of operation and an operational backup pump will be available on site for rapid deployment.

Potential Effects

By its nature, in-*water work* can have a wide variety of effects. Ground-disturbing work below the ordinary high water level (and outside the wetted channel) may still contribute to turbidity and sedimentation, chemical contamination, vegetation loss, and soil compaction. Equipment operating in or near the water increases the potential for fluid leaks and spills, potentially contaminating soils and water. Work within the wetted channel often requires work area isolation and containment, fish capture and release, the pumping and discharge of sediment-laden water, and the return of pumped water.

Streambank protection hardens and simplifies stream channels, sometimes creating conditions more conducive to non-native piscivorous fish than to native species. It also can result in a long-term loss of riparian vegetation and habitat development. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.8 Roadwork

Roadwork may include temporary access or maintenance roads, detour routes, roadway removal and construction for bridge approaches, and the replacement or installation of guardrails and barriers. Elements such as *clearing* (Section 3.4.2), *earthwork* (Section 3.4.5), and wearing surfaces would be incorporated into *roadwork*. Blasting may be required at certain bridge sites.

Temporary Access Roads

Temporary access roads within riparian areas are constructed by *clearing* (Section 3.4.2) vegetation, grading as described under *earthwork* (Section 3.4.5), and placing aggregate rock as specified in ODOT's Standard Specifications and Special Provisions (ODOT 2002a).

Roadway Removal

Culverts, sewers, siphons, and other conduits will be removed according to ODOT's Standard Specifications and Special Provisions (ODOT 2002a). Roadway excavations include, but are not limited to bridge approaches. Roadway removal also follows similar practices as *earthwork*.

Roadway Alterations

Within the roadbed cross section, the contractor will trim, shape, and finish the sub-grade, ditches, slopes, and other graded surface areas to the lines, grades, cross sections, and condition specified. Outside the new roadbed cross section, the contractor will obliterate existing roadway surfaces by removing existing paved surfaces, and then will loosen, break up, and spread the existing bases and blend them into the adjacent terrain (ODOT 2002a).

Wearing Surfaces

Different wearing surfaces may be laid as the last step to finalizing roadway surfaces. Depending on the function or purpose of the roadway, wearing surfaces such as gravel may be used for temporary roads (e.g., detour and access routes), whereas an asphalt surface will be laid for permanent roadways and bridge approaches.

Guardrail Installation

Guardrail construction may require augering (*earthwork* [Section 3.4.5]), hydraulic punching, or impact/vibratory hammers for installation of posts. This activity will occur outside flood-prone areas, but may occur at the top of embankments adjacent to waterways and wetlands.

Potential Effects

The effects of roadwork vary. Roadway removal and roadbed preparation generally require ground disturbance, which can cause erosion, turbidity, and sedimentation in receiving streams. If the project includes new road construction or roadway widening, vegetation removal (*clearing*) may be required. New and wider roads also generate new impervious surfaces, which increase stormwater runoff, which subsequently affects the hydrologic regimes and water quality in receiving waterways. Wider roadways located near waterways may require additional bank armoring or scour protection, which can lead to channel simplification and loss of habitat. Paving can introduce toxic substances to waterways. Construction of temporary access roads can result in soil compaction and reduced permeability. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.9 Stormwater Management

All program bridges will require *stormwater management.* Existing bridges are often equipped with deck drains to convey stormwater from the structures; deck drains (i.e., scuppers) usually allow stormwater runoff to fall directly onto streambanks and waterways. Replacement bridge designs will eliminate the use of deck drains, in favor of systems that promote some level of stormwater treatment prior to discharge to waterways. Favored systems will be those that require minimal maintenance, such as bioswales and wide-bottomed ditches. These systems tend to promote infiltration of pre-treated stormwater, which allows pollutant treatment via biological activity and runoff retention. Other possible systems include engineered facilities such as detention ponds and water quality manholes. Engineered facilities will be designed to meet the Stormwater Management Environmental Performance Standard.

Stormwater treatment systems will convey such large volumes of runoff that complete infiltration may not be possible. In such cases, stormwater must be conveyed to ditches or streams. Outfalls must be constructed so that they do not create erosion problems at the point of discharge. Stormwater outfalls will be constructed above the OHW, but scour protection may be required below the OHW, where unavoidable. Construction methods presented under *clearing* (Section 3.4.2), *earthwork* (Section 3.4.5), and sometimes *in-water work* (Section 3.4.7) may be necessary to construct adequate drainage ways, ditches, and engineered facilities for sufficient *stormwater management*.

Potential Effects

The effects of stormwater treatment are primarily beneficial, though there may be some adverse short-term effects resulting from the necessary *earthwork* (Section 3.4.5) and *in-water-work* (Section 3.4.7) activities. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

The long-term objective of stormwater management is an improvement in water quality and quantity, with possible reduction in peak flows (where detention is also a function of the facility) and enhanced summer base flow (where infiltration is also a function of the facility). This can aid in a return to more natural water quality conditions and channel-forming processes in watersheds where the new facilities occur.

3.4.10 Illumination

The use of lighting to illuminate project work involves activities related to furnishing and installing highway illumination and traffic signal projects. In the case of low light situations, lighting may be required in order to conduct construction activities, especially during the evening and nighttime hours.

Potential Effects

Lighting is typically staged on the roadway and/or at other staging areas. It may interfere with the normal patterns of fish and wildlife species, especially during the nighttime hours. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects (e.g., limited operating periods).

3.4.11 Planting and Seeding

Planting will include area preparation; the selection and application of topsoil, soil conditioners, bio-amendments, and mulch; plant selection and placement; and watering. Planting typically takes place to offset project effects, to stabilize slopes and control erosion, and/or to provide aesthetics. Planting usually takes place at the project action area—or in the case of certain projects, at a planned offsite location. After planting, *exclusionary devices* (Section 3.4.12) such as browse protectors, tree stakes and ties, or trunk wrap may be used to protect plants (ODOT 2002a). Planting occurs when the following *earthwork* (Section 3.4.5) measures are complete:

- The tops of cutbanks are blended with the adjacent terrain.
- All roadbeds, ditches, waterway channels, and other excavations and embankments are trimmed and finished to the lines, grades, and cross sections established.
- Debris and foreign matter of all kinds are cleaned up on the entire right-of-way area, and disposed of as directed.
- Sub-grade is finished to a tolerance of plus or minus 3/4 inch and is free of ruts, depressions, and irregularities.
- Rocks, boulders, and vegetative matter are removed as needed in planting and seeding areas.

Seeding includes all associated tasks to develop plant growth for erosion control, environmental mitigation, and roadside development. Affected areas can encompass the area within construction limits, including the *in-water work* (Section 3.4.7) area (e.g., wetland and riparian areas) and staging areas.

<u>Potential Effects</u>

Planting activities require ground disturbance (*earthwork* [Section 3.4.5]). Ground preparation for planting and seeding can affect water quality by generating turbidity and sedimentation. The importation of soil and other material can introduce seeds of non-native plant species that could compete with native plants. Fertilizers will not be applied within 50 feet of any stream channel and herbicides will not be applied within 150 feet of any stream channel. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.4.12 Exclusionary Devices

Exclusionary devices are intended to prevent fish, wildlife, and domestic livestock from entering active construction areas or restoration and mitigation areas. Such devices include fences, netting, hazing devices (such as those designed to prevent bird nesting on bridge structures), and management plans, such as the continuous removal of unfinished nests. Exclusionary devices are normally used during the staging, restoration, or maintenance phases of a construction project, but may also be used in the spring, prior to any construction activity, to prevent migratory bird nesting or bat colonizing on bridges. Hazing devices such as propane cannons may be used to prevent bird nesting where netting is not feasible. During staging, fences may be erected to increase public safety on site, as a means of erosion and sediment control, to exclude “no-work” areas, and/or to protect vegetation. During the restoration or maintenance phases of construction, fences may be constructed to protect seeding or planting areas in the early stages of plant establishment.

<u>Potential Effects</u>

Fence installation requires minor ground disturbance, which may contribute loose soil to waterways, thus generating temporary turbidity and possible sedimentation. Wildlife and fish passage may be hindered if improperly installed fences or other exclusionary devices block migratory corridors. The use of hazing devices could generate noise-related effects to nesting birds. Environmental performance standards were developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation to minimize and avoid these effects.

3.5 Bridge Repair/Replacement Activities

Bridge repair and replacement activities are grouped under four primary phases common to most bridge repair and replacement projects: (1) design, (2) pre-construction, (3) construction, and (4) post-construction site restoration and maintenance[1]. Bridge repair projects may not always include the fourth phase if the repair work involved no ground-disturbing activities. The design phase occurs prior to any on-the-ground pre-construction or construction activity. Decisions made in the design phase strongly influence the long-term effects of a bridge replacement or repair project. The activities that constitute the latter three (construction) phases primarily

[1] This does not include maintenance of the structure, rather of the vegetation plantings and other habitat elements.

account for short-term or acute effects of the bridge replacement and repair process. The construction phases are made up of the various *elements* described in Section 3.4 which will be referenced (in *italics*) in this discussion to provide the necessary detail regarding construction methods, potential effects, and the applicable environmental performance standards presented in Section 3.3. Table 3.5-1 presents a matrix showing which bridge repair/replacement elements are included in the various bridge repair/replacement activities discussed in this section. This table is intended to give the reader an "at-a-glance" indication of the prevalence of various construction methods and procedures (i.e., *elements*). The environmental performance standards are referenced in the *Bridge Repair/Replacement Elements* section (Section 3.4) to illustrate the "realized effect" of the various construction elements.

There are typically a variety of methods and materials available for completing any given project element. The following is an outline of the aforementioned phases and activities of a bridge replacement project, along with a brief discussion of the biologically significant elements (i.e., those with the potential to affect species or habitat in the short- or long-term) and/or available options. Bridge repair projects are not discussed individually because nearly any repair activity, with some exceptions, could also be carried out during a bridge replacement. Therefore, repair activities are primarily addressed in the discussion of bridge replacement.

Table 3.5-1. Matrix of Bridge Repair / Replacement Activities and Elements

3.4 Bridge Repair / Replacement Elements:	3.5 Bridge Repair / Replacement Activities:	3.5.1 Design	3.5.2 Preconstruction	3.5.3 Construction	3.5.3.1 Construction and Traffic Staging	3.5.3.2 Bridge Removal	3.5.3.3 Bridge Construction	3.5.4 Site Restoration	3.5.4.1 Maintenance
3.4.1 Preconstruction			x						
3.4.2 Clearing			x		x		X		
3.4.3 Equipment Control			x		x	x	X		
3.4.4 Construction Material Containment						x	X		
3.4.5 Earthwork			x		x	x	X	x	x
3.4.6 Foundations							X		
3.4.7 In-water Work			x			x	X		x
3.4.8 Roadwork					x		X		
3.4.9 Stormwater Management							X		
3.4.10 Illumination							X		
3.4.11 Planting and Seeding								x	x
3.4.12 Exclusionary Devices			x					x	

There are some activities that will occur during bridge repair that will not be allowed as part of any bridge replacement project. Therefore, some bridge repair activities will have greater adverse effects on habitat than would be allowed for a bridge replacement. Such an activity may include scour protection in the form of riprap placed in proximity to an existing bridge structure. This may require *in-water work* and placement of temporary structures in aquatic habitat. Most the time, bridge repair activities will consist of repairs to parts of the structure that will not require access via sensitive habitat areas, and thus the potential for temporary effects is low with most repair activities. Long-term effects may be realized from repair activities because the overall configuration of repaired bridges will not change. For instance, the number of bents located in flowing water will not be reduced as part of a bridge repair project, as it may be for a replacement project. Therefore, the long-term effect of bridge repair may be the maintenance of the *status quo*, which may prolong or intensify a habitat-limiting condition until replacement is necessary.

3.5.1 Design

The design phase determines the overall configuration (i.e., number of spans, alignment, hydraulic opening, etc.) of a bridge and thus has the greatest implications regarding its long-term effects. The environmental performance standards will act as guiding principles in the design phase of the Bridge Program (Section 3.3) in order to avoid adverse effects on listed species. Where complete avoidance of adverse effects is not possible, the standards will be applied in such a way as to minimize potential effects, with the goal of no long-term adverse effects to listed species and their habitat.

3.5.2 Pre-construction

The on-site pre-construction phase of a project consists of two primary activities: project development surveys and geotechnical investigations. Project development surveys may include hydraulic investigations, environmental surveys (e.g., wetland delineations), and boundary and topographic surveys. These activities are necessary for project design, right-of-way acquisition, and permitting, and therefore must be completed in advance of any construction activity. Elements of pre-construction that may influence the type and degree of the project’s effects on listed species and habitat include *earthwork*, *in-water work,* and *equipment control*. Some bridge replacement projects may also require that *exclusionary devices* be employed to prevent nesting on bridges by migratory birds. Pre-construction activities will be conducted in accordance with the environmental performance standards (Section 3.3) which have been developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation.

3.5.3 Construction

The construction phase of a project typically involves four major activities: 1) construction and traffic staging, 2) bridge removal, 3) bridge construction, and 4) site restoration. Each activity contains essential elements specific to each project. Under each activity, various available options may be implemented as directed by project plans and specifications.

3.5.3.1 Construction and Traffic Staging

Construction staging consists of site preparation in advance of primary construction activities. This includes the movement of materials and equipment to the project site and the establishment of areas to be used for construction management, equipment and material storage, and maintenance and refueling. Staging activities also include the preparation and installation of environmental controls (e.g., erosion control measures), access road construction, and utility relocation. In addition, detour routes and/or structures will be constructed during the staging phase. Staging areas will be located so as to minimize effects to, and prevent delivery of sediment and other pollutants to, sensitive resources (e.g., water, wetlands, and riparian areas).

Detour routes, where necessary, will consist of either temporary bridges and roads or the use of existing roadway. Temporary bridges are normally constructed alongside existing structures to minimize the amount of new roadway that must be constructed. Temporary bridges are usually constructed of timber or steel pile substructures and timber decks or concrete beams overlaid with asphalt. Temporary roadway realignment is necessary to route traffic from existing roadway to the detour bridge and will typically require *clearing*, *earthwork*, and *roadwork*. Use of existing roadways as detours will sometimes require upgrades such as widening and/or resurfacing.

These activities will occur before initiation of primary construction activities. The elements of construction staging that influence the type and degree of the project’s effects on listed species and habitat include *clearing*, *earthwork*, *roadwork*, and *equipment control*. Construction and traffic staging activities will be conducted in accordance with the environmental performance standards (Section 3.3) which have been developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation.

3.5.3.2 Bridge Removal

Bridge removal (demolition) occurs prior to construction on most bridge replacement projects; it involves removal and disposal of the existing superstructure and substructure (foundations and supports). Elements of bridge removal that influence the type and degree of the project’s effects on listed species and habitat include *in-water work, construction material containment, earthwork*, and *equipment control*.

In-water work (Section 3.4.7) is one of the main activities during bridge removal that requires conservation measures to limit adverse effects. Various types of *in-water work* include flow diversion, work area isolation, fish capture and handling, pile driving, pile removal, shaft drilling, excavation, and backfill. Fish passage will always be maintained during *in-water work* activities. *Construction material containment* is a critical precursor to bridge removal, particularly if the debris will potentially include treated wood or lead-based paint, both of which must be handled in accordance with the Pollution & Erosion Control Environmental Performance Standard (Section 3.3). *Equipment control* is essential during bridge removal due to the frequent need to operate heavy equipment near or in a waterbody while excavating substructure components or demolishing the superstructure. *Earthwork* is required during excavation of bridge approaches, abutments, and piers where their location might conflict with the new structure or with normative fluvial processes. All bridge removal activities described above will be conducted in accordance with the environmental performance standards (Section 3.3) which have been developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation.

3.5.3.3 Bridge Construction

Bridges constructed under the proposed action will be built using a wide variety of configurations, methods, and standards (Section 3.3). For the purposes of this consultation, the bridge construction process is divided into four major categories. These include (1) substructure construction, (2) superstructure construction, (3) approach construction (*roadwork*), (4) and site restoration.

Elements common to all aspects of bridge construction include *clearing*, *earthwork*, *roadwork*, *foundation*, *in-water work, equipment control,* and *construction material containment*. *Clearing, earthwork,* and *roadwork* may be required to create work space and to construct access roads as well as for bridge and roadway widening for safety upgrades. *Earthwork* is also normally required in order to excavate abutment and footing locations. Blasting, a component of earthwork, may be required for substructure and roadway construction in bedrock substrates. No underwater blasting will occur as part of the proposed action. Falsework or temporary work bridges may be required during substructure and superstructure construction. *In-water work* will be required for nearly all multi-span bridges over water and for single-span bridges with substructures located within the aquatic environment. *In-water work* activities include flow diversion, work area isolation, water pumping, fish rescue/salvage, shaft drilling, pile driving, bank stabilization (e.g., riprap placement). A method of handling and treating waste water generated during construction (e.g., during pile driving, shaft drilling, and work area isolation and dewatering) will be necessary and is outlined under *in-water work*. In the case of low-light situations, the project will require *illumination* in order to facilitate construction activities, especially during the evening and nighttime hours.

<u>Substructure</u>

Bridge substructure configurations are among the most variable components of the overall project. The number of spans and support structures a bridge will have largely determines its potential for effects on aquatic species and their habitat. An objective of the bridge program is to reduce the influence of the structure on normative fluvial processes, which is commonly achieved via a reduction in the number of spans on a given bridge, thereby reducing the number of in-water support structures. The type of support structures designed for a bridge is also a major factor in the level of short-term effects as well as in the long-term influence the structure will exert on fluvial dynamics. For example, drilled shaft columns are preferred to spread footings because they require a smaller overall footprint. However, bridges included in the proposed action will be designed using various combinations of the configurations described above, so long as they are in compliance with the goals and objectives outlined in the environmental performance standards.

Bridge foundations are of four general types: drilled shafts, spread footings, driven piles, and pile-supported caps or walls. Driven piles by themselves are typically used to support temporary structures such as detour bridges, work bridges, and falsework. However, in some systems, driven piles are used to support spread footings, and are always tied together with a pile cap or beam. Permanent bridges will most often employ either spread footings or drilled shafts as their means of support. Construction of the various substructure types involves a variety of elements including *in-water work, foundations, equipment control* (particularly noise attenuation for protection of fish and wildlife), *earthwork, and construction material containment.* All bridge substructure construction activities will be conducted in accordance with the environmental performance standards (Section 3.3) which have been developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation.

<u>Superstructure</u>

The bridge superstructure consists primarily of the horizontal structural members and deck. Additionally, the superstructure will include the wearing surface (including striping), guardrails, illumination (deck lighting), and a drainage system.

Bridge superstructures are typically one of two possible designs: box beam or solid beam girders. Both systems are often pre-cast or steel, thus avoiding the need to pour large quantities of concrete on site. With each of these systems, the structural members often constitute the deck. However, in some cases, long beams and bridge decks are cast-in-place, requiring that green concrete be hauled to the site, then poured and cured in place, often over water, but always with containment systems. Therefore, *construction material containment*, and *equipment control* are key elements of superstructure construction.

Construction of bridge superstructures often requires the use of temporary work bridges and falsework. Temporary work bridges are needed to support construction equipment, while falsework provides direct support to the structure while under construction. Both systems require construction prior to superstructure construction, and are often constructed during staging. Typical elements of this work are *in-water work*, *pile driving*, *equipment control*, and *construction material containment.*

Bridge plans require an approved method of *stormwater management*. Stormwater treatment systems often must be able to convey such large volumes of runoff that complete infiltration is not possible. In such cases, stormwater must be conveyed to ditches or streams. Outfalls must be constructed so that they do not create erosion problems at the point of discharge. Stormwater outfalls are usually constructed above the OHW, but scour protection may be required below the OHW. Construction processes presented under *clearing*, *earthwork*, *streambank protection*, and sometimes *in-water work* will be necessary to construct adequate drainage ways, ditches, and engineered facilities for sufficient *stormwater treatment*.

The final element of superstructure construction is normally signing, striping, and guardrail construction. Striping requires the application of paint to bridge and roadway surfaces. *Construction material containment* measures are commonly required to prevent delivery of hazardous materials to waterways. Guardrails are typically constructed of steel which is bolted onto the structure, or concrete which may consist of pre-fabricated barriers set in place or cast-in-place barriers. Attachment of steel rails or construction of cast-in-place concrete rails may generate dust and/or green concrete which must be contained as described under *construction material containment*. Guardrails constructed along bridge approaches often consist of driven guardrail posts which may require noise control measures described under *equipment control*.

All superstructure construction activities will be conducted in accordance with the environmental performance standards (Section 3.3) which have been developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation.

3.5.4 Site Restoration

A site restoration plan will be developed and implemented as necessary to ensure that all streambanks, soils, and vegetation disturbed by project activities are cleaned up and restored in accordance with the environmental performance standards for Site Restoration (Section 3.3). The goal of the restoration plan is to renew habitat and to enhance water quality and the production of habitat elements, including ecosystem processes that form and maintain productive ecosystems. Activities in the plan may include streambank shaping (*earthwork*), revegetation (*seeding* and *planting*), and fencing (*exclusionary devices*). As with other aspects of bridge construction projects, *equipment control* will be important to prevent contamination of sensitive resources (e.g., water, wetlands, and riparian areas) by construction equipment.

The prepared plan will designate the managing party, and will contain baseline information (e.g., watershed analysis, land-use planning), goals and objectives, performance standards, work plan, and a five-year monitoring and maintenance plan. Environmental performance standards will require the establishment of vigorous native plant growth (capable of competing with non-native species), plant community diversity (e.g., wetland v. upland species), minimal bare soil, and soil stabilization. In addition to the five-year monitoring plan, annual monitoring will take place until the Agency has certified that environmental performance standards have been reached. All planting plans prepared for construction activities conducted under this consultation will be approved by a Landscape Architect registered in the State of Oregon.

Disturbed areas will be seeded and mulched with a permanent erosion control mix. Disturbed riparian areas will be replanted with a diverse assemblage of native shrubs and trees, as appropriate to the site conditions. No herbicide application will be allowed within 150 feet of waters of the State and no surface applied fertilizer (i.e., fertilizer tablets may be approved) will be applied within 50 feet of streams.

Site restoration activities will be conducted in accordance with the environmental performance standards (Section 3.3) which have been developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation.

3.5.4.1 Site Restoration Maintenance

During the life of a construction contract, which normally includes a period of time following the completion of primary construction activities, contractors will be responsible for the maintenance of project features and site restoration measures. Contractors will replace failed plantings in site restoration areas, and may be required to modify the grading of the mitigation area to ensure that a properly functioning condition is achieved. Erosion problems will also be corrected where necessary. Any damage to facilities due to construction-related actions or natural events such as flooding will also be corrected by construction contractors. Maintenance of project areas will normally require *earthwork* and *planting and seeding* to regrade and stabilize areas of localized erosion. *In-water work* may also be required if structures become susceptible to scour[2]. The ongoing maintenance activities of the structures are not addressed in this consultation.

All maintenance activities addressed under the Bridge Program consultation will be conducted in accordance with the environmental performance standards (Section 3.3) which have been developed with the assistance of the Services during the pre-consultation and technical assistance phases of this consultation.

3.6 Conservation and Mitigation Actions

ODOT is currently developing a comprehensive set of environmental performance standards for the Bridge Program. These standards will facilitate the avoidance and minimization of adverse effects; however, some projects will nevertheless have effects on listed species and/or their habitat. To address compensatory obligations and stewardship issues arising from those effects and to meet ODOT/FHWA's section 7(a)(2) responsibilities under the ESA, ODOT/FHWA has committed to developing an Integrated Resource Management Program (IRMP). The IRMP will also address ODOT/FHWA's section 7(a)(1) responsibility to assist in species conservation and recovery.

In addition to implementation of the IRMP, ODOT/FHWA has identified other actions that will assist in species conservation in furtherance of its responsibilities under section 7(a)(1) of the ESA. These actions are expected to further minimize or avoid the adverse effects of the proposed action on listed species and critical habitat and aid in recovery of the species. The actions are also anticipated to aid in the conservation of unlisted species.

3.6.1 Integrated Resource Management Program Summary

The IRMP will address conservation efforts associated with the ESA, wildlife-habitat issues (e.g., Fish and Wildlife Coordination Act), and ecosystem services. It will also address compensatory obligations associated with effects on wetlands and water resources (CWA, State Removal/Fill). The IRMP will be developed in conjunction with agency representatives from the Corps, DSL, USFWS, NOAA Fisheries, EPA, ODFW, DEQ, DLCD, and FHWA, who will serve as the Comprehensive Mitigation/Conservation Strategy Team (CMCS).

3.6.1.1 The Proposed Integrated Resource Management Program:

The IRMP provides the vision, goals, objectives, overall structure, methods, and adaptive management program for ODOT's stewardship and compensatory mitigation projects. The focus

[2] This refers predominately to repaired facilities because the fluvial performance standards allow no supplemental scour protection for new or replaced structures.

will be on resource function, value, and ecosystem services. Compensatory obligations (wetlands/waters, ESA, wildlife-habitat) and stewardship issues (on-site restoration, habitat protection/enhancement) will be addressed.

The framework will be designed to accommodate Bridge Program needs as well as other future ODOT resource management and mitigation/conservation needs. The methods will be documented and reproducible, enabling future entities to adopt program methods and goals. This will enable other agencies and jurisdictions to benefit from development of the streamlined system and focus their mitigation/conservation efforts toward the identified regional ecological goals.

Stewardship templates and conceptual mitigation design plans will be included. Compensatory mitigation criteria (function- and value-based) will be defined in the IRMP and will form the basis for the Comprehensive Mitigation/Conservation Framework (CMCF), to be developed in conjunction with the CMCS team. The CMCF will set the overall structure, objectives, goals, criteria, and adaptive management protocols for future projects.

Detailed compensatory mitigation site design work (Final Mitigation Plans) will be completed upon approval of the CMCF by the resource agencies. The Final Mitigation Plans will result in identification of regional ecological needs/goals and a comprehensive mitigation/conservation strategy (created by the CMCS) that allows development of a coordinated method for effect assessment and mitigation planning/tracking and development of a combined mitigation/conservation credit and accounting method to provide the greatest resource benefit and streamline regulatory processes.

3.6.1.2 Schedule

ODOT proposes to submit the draft CMCS strategy (with conceptual mitigation plans) to the resource agencies in October of 2004. The goal is to obtain approval of the conceptual plans by the end of the 2004 calendar year, enabling final plans to be developed in advance of the 2005 construction season.

3.6.2 Section 7(a)(1) Actions

This consultation will implement many conservation measures that will allow ODOT/FHWA to meet its section 7(a)(1) obligations. The implementation of a landscape-level analysis will enable conservation benefits to be targeted to the areas where the greatest benefits would be realized. The regional mitigation will provide more benefit at the watershed scale, with priority watersheds targeted for conservation actions. Implementing conservation measures in these watersheds would benefit the targeted species and other non-listed species the most and benefit the recovery of the species the greatest.

<u>Aggregate Sources</u>

ODOT has changed the manner in which it addresses aggregate sources. The exemption for commercial, continuously-operated sources is no longer available. This exemption allowed commercial operators to obtain aggregate material from these sources. These sources were not required to provide documentation that the collection of the aggregate was legally permitted. Additionally, the batched nature of this program allows a greater amount of recycling. All aggregate sources will now be required to show proof of environmental compliance and all appropriate permits. Transportation of aggregate to landfills will be minimized; thus decreasing inputs to landfills and reducing fossil fuel use.

Unlisted Species

The FWCA and MBTA are addressed by several performance standards. For example, the Fluvial Environmental Performance Standard (Section 3.3) will provide enhanced or restored wildlife passage at many bridge sites. The Fluvial Environmental Performance Standard will also allow the channel to meander more naturally in many systems, and reestablishment of the natural meander will benefit fish and wildlife. The Fluvial Environmental Performance Standard will also negate many long-term adverse effects associated with channel constriction. The overall objective of the Fluvial Environmental Performance Standard is to protect habitat-forming processes, (i.e., normative physical processes) such as natural sediment transport patterns, fluvial debris movement, and longitudinal continuity and connectivity of the stream-floodplain system.

Monitoring

ODOT/FHWA can meet much of its Section 7(a)(1) responsibilities by involving the USFWS and NOAA Fisheries in project monitoring that will occur at all program bridges. Their participation augments other discussions that ODOT/FHWA has had with the Services regarding conservation of protected species. Examples of such activities include:

- Involving Service officials in annual review of the effectiveness of the environmental performance standards. They will be involved in field demonstrations, if needed, to observe how the conservation planning process is conducted and how conservation practices are implemented.

- Discussions with the USFWS and NOAA Fisheries regarding the potential to modify conservation practices to better address the needs of protected species and ways to provide technical assistance in a manner that furthers the conservation of threatened and endangered species.

- Identification of priority areas that benefit listed species or designated critical habitat.

- On a site-specific basis, ODOT/FHWA can also use its authority to support Section 7(a)(1) requirements by implementing conservation recommendations the Service makes during Section 7(a)(2) consultation process. Conservation recommendations are non-binding suggestions the USFWS or NOAA Fisheries make during formal or informal consultation.

3.7 Interrelated & Interdependent Activities

Interrelated actions are defined as actions that are part of a larger action and depend on the larger action for justification (50 CFR section 402.2). Interdependent actions are defined as actions having no independent utility apart from the proposed action (50 CFR section 402.2). The actions described above do not represent a new level of service, or require new roads. Actions that could be considered either interrelated or interdependent to the proposed action include aggregate extraction and utility relocation. Induced development is not anticipated to be an interrelated or interdependent action resulting from the Bridge Program.

New aggregate sources may need to be identified as a result of the Bridge Program. In addition, existing operations may need to be expanded to address the increased demand for quality aggregate materials. ODOT/FHWA has attempted to minimize and avoid potential adverse effects as a result of this increased aggregate extraction through three distinct approaches: (1) minimizing the ultimate Program aggregate demand, (2) evaluating quarry management practices at ODOT/FHWA-controlled sources, and (3) expanding the ODOT Standard Specifications language to require proof of permits (DOGAMI, DSL, local government authorities) to all commercial sources. The first approach involves the development and implementation of a Recycling Goal Performance Standard (Appendix 3-B). The second approach involves an internal agency review of existing practices and consultation, if necessary, with the appropriate regulatory and resource agencies to ensure that Agency actions do not adversely affect listed and proposed species. The final approach involves removing the statement "except for continuously-operated commercial sources" from Section 00160.60(c) of ODOT's Standard Specifications (ODOT 2002a); thereby requiring proof of permits or that permits are not required from all commercial sources.

Road and bridge work commonly require the temporary relocation of utilities located with ODOT right-of-way. The elements of activities involved in utility relocation actions are similar to those described above in Section 3.4. Utility relocation requires right-of-entry permits from ODOT. These permits commonly carry terms and conditions that limit the actions of the utility company. In addition to the regular permitting process that these utility companies may need to follow, ODOT/FHWA has the ability to apply the environmental performance standards presented in Section 3.3 of this BA to the right-of-entry permit.

Induced development is not an anticipated result of the Bridge Program because no new bridges, travel lanes, interchanges, or off-ramps will be added; thus the capacity will not increase as a result of the proposed action. The program bridges are repair and replacement projects of existing structures. No new bridges will be built and no new travel lanes will be added to the existing bridges. Some bridges will be expanded for projected growth; however, these additional lanes will not be striped for expansion at this time. Future expansion of travel lanes and additional structures will undergo a separate ESA section 7 consultation and possibly a NEPA consultation.

4.0 Assessment of Ecosystem Condition

Oregon comprises ten ecoregions, each of which contains multiple habitat types. Section 4.2 provides a complete description of these habitat types. Ecoregions are relatively uniform geographic areas that respond in a similar manner to physical activities (i.e., rainfall, fire, human land use activities, etc.) (SOER 2000) (Figure 4.0-1). These ecoregions are based on similarity of important environmental variables such as climate, geology, physiography, vegetation, soils, land use, wildlife, and hydrology. The ecoregion descriptions provide an overview to the current conditions of the regional environment.

The ecoregions used in this analysis were the U.S. Environmental Protection Agency (EPA) Level III ecoregion descriptions used by the State of the Environment Report (SOER) Science Panel in the Oregon State of the Environment Report (SOER 2000), the EPA Level IV ecoregion descriptions used in the Oregon Watershed Enhancement Board's Oregon Watershed Assessment Manual (Watershed Professionals Network 2001), and the ODFW and ONRHP Level III ecoregion characterizations of patterns within a watershed (Bryce and Woods 2000). Because watersheds within an ecoregion have common attributes, the ecoregion descriptions assist with the effects analysis. Table 4.0-1 provides the acreage of the various habitat types within each ecoregion.

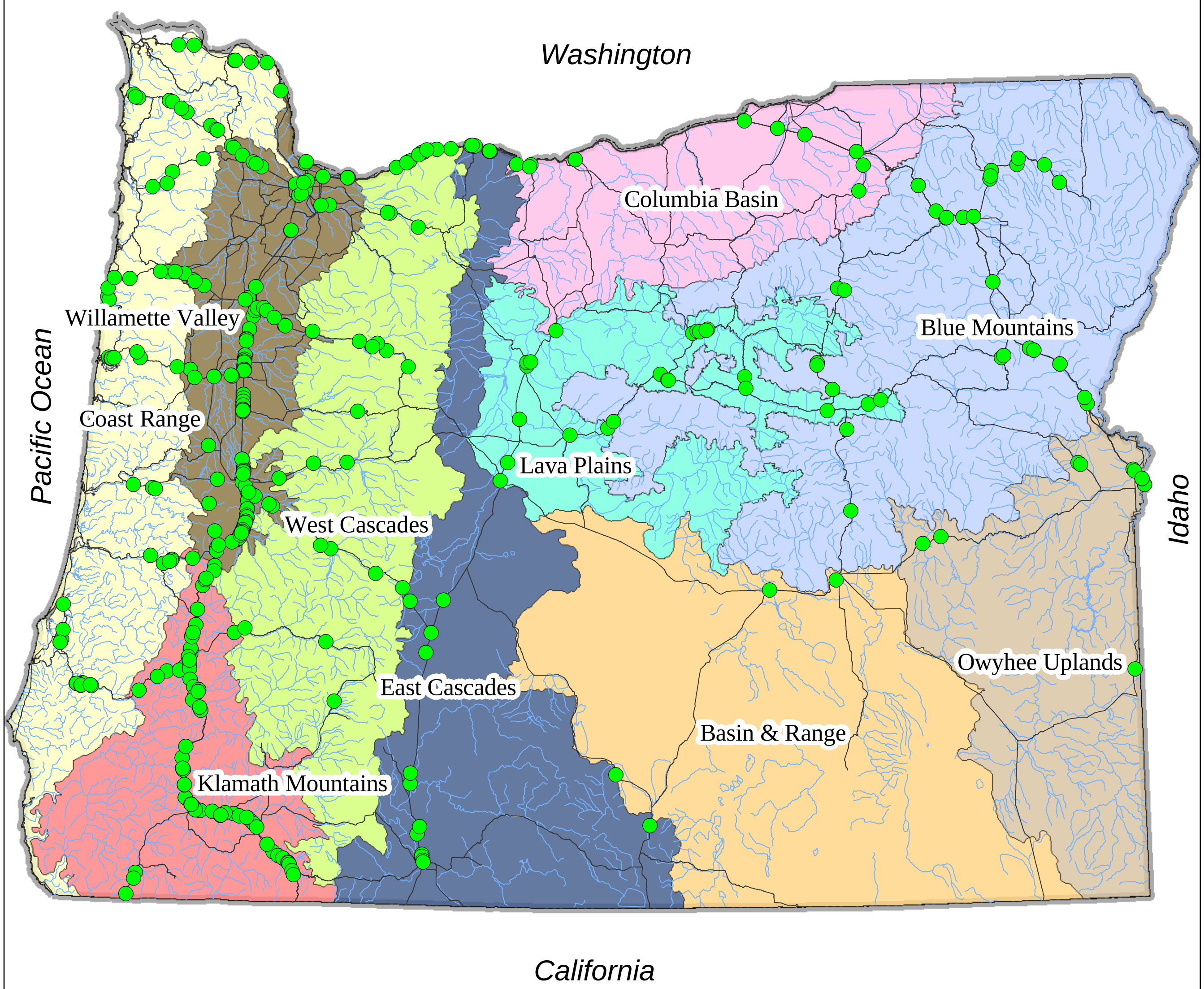
4.1 Ecoregions

4.1.1 Basin & Range

The Basin and Range ecoregion includes a large portion of southeastern Oregon and is the least populated area of the State (SOER 2000). This ecoregion is Oregon's high desert, and contains numerous flat basins separated by isolated, generally north-south mountain ranges. Malheur Lake is the major drainage basin in this arid ecoregion (Watershed Professionals Network 2001). Runoff from precipitation and mountain snowpacks and basins often flows into flat, alkaline playas, where it forms seasonal shallow lakes and marshes (Bryce and Woods 2000). In addition, the terrestrial landscape is open and treeless, plants are widely spaced, and soils are exposed to the elements. The Basin and Range ecoregion contains many diverse habitats.

The most significant are the sagebrush (*Artemisia* spp.) steppe types, salt desert scrub (Bryce and Woods 2000), and riparian and wetland types, as well as mountain mahogany (*Cercocarpus* spp.) and aspen (*Populus* spp.) woodlands (SOER 2000).

Many of the major wetland complexes within this arid ecoregion are managed for waterfowl production by State, Federal, or private agencies, although most wetlands are privately owned (SOER 2000). The large wildlife refuges here support some of the largest populations of pronghorn antelope, white pelicans, and sage waterfowl, and are well known for their wildlife diversity (Bryce and Woods 2000). Flooding and drying now occur sooner in the year than they did historically. Historically, playa lakes were wet during winter and spring, and then dried as summer approached. Some playa lakes have been altered for livestock watering, and in drier years water is concentrated in deep pools, thus affecting a smaller area (SOER 2000).



Ecoregion

- Basin & Range
- Blue Mountains
- Coast Range
- Columbia Basin
- East Cascades
- Klamath Mountains
- Lava Plains
- Owyhee Uplands
- West Cascades
- Willamette Valley

OTIA III Bridges

- OTIA III Bridges
- Highway
- Streams and Rivers
- State Boundary

This product is for informational purposes, and may not be suitable for legal, engineering or surveying purposes. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user.

Figure 4.0-1

OTIA III: Statewide Bridge Delivery Program Ecoregion Overview

N W E S

0 10 20 40 60 80
Miles

MB&G
Mason, Bruce & Girard, Inc.
Natural Resource Consultants since 1921

Spatial Data Source: See Document Bibliography.
screening\BA_figures\ecoregion.mxd. Mar 1, 2004

Table 4.0-1. Total acreage of Johnson and O'Neil habitat type within each ecoregion.

Habitat Type	Acreage of Habitat Type within Each Ecoregion									
	Basin and Range	Blue Mountains	Coast Range	Columbia Basin	East Cascades Slopes and Foothills	Klamath Mountains	High Lava Plains	Owyhee Uplands	West Cascade Mountains	Willamette Valley
Agriculture, Pasture, and Mixed Environments	250,430	550,910	164,950	1,740,960	459,780	609,980	299,810	250,250	83,900	1,779,280
Alpine Grasslands and Shrublands	1,180	214,120	0	0	8,920	960	0	0	66,250	0
Bays and Estuaries	0	0	22,450	0	0	0	0	0	860	8,940
Ceanothus-Manzanita Shrublands	0	0	0	0	2,970	48,530	0	0	590	0
Coastal Dunes & Beaches	0	0	42,710	0	0	0	0	0	0	0
Coastal Headlands & Islets	0	0	8,460	0	0	0	0	0	0	0
Desert Playa & Salt Scrub	707,880	0	0	0	90	0	0	11,370	0	0
Dwarf Shrub-steppe	408,120	110	0	0	61,090	0	21,700	22,760	0	0
Eastside (Interior) Canyon Shrublands	0	0	0	239,970	0	0	7570	110,600	0	0
Eastside (Interior) Grasslands	0	1,366,980	12,180	497,510	45,090	0	5,530	0	0	0

Table 4.0-1. (continued)

Habitat Type	Acreage of Habitat Type within Each Ecoregion									
	Basin and Range	Blue Mountains	Coast Range	Columbia Basin	East Cascades Slopes and Foothills	Klamath Mountains	High Lava Plains	Owyhee Uplands	West Cascade Mountains	Willamette Valley
Eastside (Interior) Mixed Conifer Forest	3,630	3,038,490	0	4,990	905,830	0	42,280	0	131,220	0
Eastside (Interior) Riparian-Wetlands	21,280	560	0	4,410	200	0	870	3,550	0	0
Herbaceous Wetlands	397,240	1,273,780	59,040	4,980	329,230	4,860	36,030	50,650	9,270	10,780
Lakes, Rivers, Ponds, & Reservoirs	322,520	25,050	24,800	13,540	158,690	16,080	14,540	36,280	76,550	44,050
Lodgepole Pine Forest and Woodlands	20	2,260	0	0	507,590	0	0	0	22,340	0
Marine Nearshore	0	0	3,610	0	0	0	0	0	0	0
Montane Coniferous Wetlands	0	5,400	0	0	41,350	90	130	0	8,930	190
Montane Mixed Conifer Forest	280	485,720	0	0	190,740	39,710	0	0	2,234,840	0
Ponderosa Pine and Eastside White Oak Forest and Woodlands	13,790	2,890,730	0	37,820	2,919,020	79,220	213,630	10	72,420	0
Shrub-steppe	7,093,000	1,986,120	0	1,641,770	457,950	0	1,327,670	4,911,800	0	0

Table 4.0-1. (continued)

Habitat Type	Acreage of Habitat Type within Each Ecoregion									
	Basin and Range	Blue Mountains	Coast Range	Columbia Basin	East Cascades Slopes and Foothills	Klamath Mountains	High Lava Plains	Owyhee Uplands	West Cascade Mountains	Willamette Valley
Southwest Oregon Mixed Conifer-Hardwood Forest	0	0	369,470	0	3,580	2,649,320	0	0	989,560	8,240
Subalpine Parklands	4600	0	0	0	7,380	5,650	0	0	66,570	0
Upland Aspen Forest	19,480	210	0	0	0	0	0	0	0	0
Urban and Mixed Environments	3,190	16,270	57,810	29,340	22,570	42,170	20,560	6,030	5,960	366,010
Western Juniper and Mountain Mahogany Woodlands	555,940	471,600	0	72,190	642,080	0	2,178,370	116,900	110	0
Westside Lowland Conifer-Hardwood Forest	0	0	4,961,680	0	10,720	256,560	0	0	3,324,250	785,870
Westside Oak and Dry Douglas-fir Forest and Woodlands	0	0	1,430	0	5,890	106,060	0	0	46,290	273,150
Westside Riparian - Wetlands	0	0	29,070	0	0	6,270	0	0	2,470	120,290
Total Acreage in Ecoregion	9,802,580	11,181,910	5,757,660	4,287,480	6,780,760	3,865,460	4,168,.690	5,520,200	7,142,380	3,396,800

Water is the limiting factor in this ecoregion. Declines in riparian condition and water quality occurred during the heavy grazing early in the 20th century. Stream water quality here is the lowest in the State, generally measured as poor or very poor. The trend in water quality shows no improvement, although in some areas, primarily fenced enclosures, riparian conditions have dramatically improved. Surface water is fully allocated. Much of the water is dammed, and releases from dams keep instream flows close to the required minimums (SOER 2000).

Many of the region's historical wetlands and riparian areas have been converted to agriculture or have been degraded through water diversions and grazing. The region has been heavily affected by grazing pressure, which affects different parts of the landscape in different ways. Improper grazing is particularly destructive in wetland and riparian areas. More than 145 species depend on tall sagebrush-bunchgrass communities. In other places, fire suppression has increased the relative density of sagebrush while diminishing bunchgrasses, which has negatively affected many native species. An additional threat to ecological integrity in upland areas as well as in wetland and riparian areas is the encroachment of invasive plant species (SOER 2000).

4.1.2 Blue Mountains

The Blue Mountains ecoregion occupies most of northeastern Oregon and encompasses three major ranges: the Ochoco, Blue, and Wallowa Mountains. Deep, rock-walled canyons, glacially cut gorges, dissected plateaus, and broad alluvial river valleys characterize the landscape. Extreme changes in elevation across the ecoregion result in a broad range of temperature and precipitation, supporting habitat diversity second only to the Klamath Mountains ecoregion (SOER 2000).

Vegetation in the lowland areas consists of bunchgrasses, sagebrush, and juniper (*Juniperus* spp.) (Bryce and Woods 2000). Ponderosa pine (*Pinus ponderosa*) and juniper woodlands are characteristic of mid-elevation areas, with mixed coniferous forests dominating higher altitudes and north- facing slopes at mid-elevations. Extensive grasslands occur in and north of the Wallowa Mountains (SOER 2000).

Riparian areas in valley bottoms are important for aquatic and terrestrial organisms in arid landscapes where streamside vegetation provides shade and refuge. Riparian areas are among the most diverse natural communities in the region, largely concentrated in intermountain basins (SOER 2000). These seasonally flooded wet meadows provide important habitat; the largest remaining blocks of these wetlands, almost all on private lands, are found at Big Summit Prairie, along the upper Silvies River, and in Logan Valley (Watershed Professionals Network 2001).

The diversity of the Blue Mountains landscape provides goods and services long valued by the people of the region. Most of the uplands in the region are Federally owned forest and rangeland. Private land generally follows valleys and water courses, where most of the region's agriculture occurs; however, several parcels of privately-owned timber in uplands are present (SOER 2000). The large, central valleys of the Grande Ronde and Powder Rivers historically contained native riparian forests, wetlands, and grasslands that have been primarily converted to agriculture. Most stream reaches have been simplified by channelization and straightening. Riparian conditions are degraded throughout the region, particularly in the middle and lower reaches of large river valleys such as the Grande Ronde and Umatilla (SOER 2000, OWEB 2001).

Four activities have had profound effects on the landscape of the region: timber harvest, fire suppression, grazing, and agriculture. Fire suppression, in concert with timber harvest, has changed the structure and function of the region's forests; it has also allowed a dense build-up of young trees, creating more biomass than can be supported through times of drought. These dense, over-stocked forests are far more vulnerable to fire and insects (SOER 2000).

Virtually all of the Grande Ronde Valley's historical wetlands have been drained and converted to agriculture. Many wetland sites have been affected, at least temporarily, by water flow alterations as well as by increased sediment and nutrients from agricultural and other activities (SOER 2000). Much of the ecoregion is within a complex of aquatic diversity areas identified by the American Fisheries Society. Much of this complex lies in Federal wilderness areas (SOER 2000, OWEB 2001).

In coordination with regional planning efforts, complex plans for total maximum daily loads of non-point sources of pollution are being developed for stream segments with limited water quality, as identified by the Clean Water Act 303(d) list. Many of the low-lying streams in this ecoregion are listed, primarily as a result of high stream temperatures during the summer. Upland water is of relatively high quality and the conditions of upstream fish habitats are improving (SOER 2000).

4.1.3 Coast Range

The Coast Range ecoregion extends the entire length of the Oregon coastline as a narrow, jumbled mountain range from the edge of the Pacific Ocean to the Willamette Valley and Klamath Mountains. Along the north coast, cliffs and grassy headlands are separated by stretches of flat coastal plain and estuaries. A broad coastal terrace characterizes much of the south coast, punctuated by steep headlands, inland lakes, and rocky offshore islands (SOER 2000). The region's marine climate causes the wettest habitats in the State, including temperate rainforests, which are some of the most productive forests in the world (SOER 2000).

Much of the commercial and residential development in the region is clustered along Highway 101 and around the larger estuaries and streamside riparian areas. The coastal economies are distinctly different from north to south. The northern counties are evolving from a dependence on fishing and timber to a reliance on tourism and retirement. To the south, the coastal economy has been more dependent on the forest products industry (SOER 2000).

Oregon's 22 estuaries are ecological transition zones, integrating features of the watersheds they drain with those of the marine environment. Although protection currently exists, most Oregon estuaries are dramatically smaller than they were historically—mostly, as a result of the conversion of tidal wetlands to diked and drained pastures in the early 1900s, followed by the filling of bayfront lands for urban and port development. In addition, the construction of jetties has disrupted the natural movement of sand along the coast, burying some areas and eroding others. Further inland, residential development has significantly reduced riparian vegetation along streams (SOER 2000).

Streams in the Coast Range are relatively free-flowing, are heavily relied upon by the fishing industry and summer tourism, and are important sources of drinking water. Coastal streams have been disrupted by logging practices. The density of streams in the Coast Range is among the highest in the State; therefore, a high percentage of the landscape falls within riparian buffers. As a result, timber harvests throughout the region have had adverse effects on aquatic organisms such as coho salmon. Removal of large conifers and erosion from logging are the most significant past human effects on riparian areas in the Coast Range (SOER 2000).

Past logging patterns led to dense forests with a high percentage of early successional stages consisting of young trees (less than 40 years old). However, modern logging and silvicultural practices (under the guidance and implementation of new Forest Practice Rules) have greatly minimized effects from recent logging operations. Historically, large fires left a complex matrix of large trees, snags, and downed wood, which provided a diversity of habitats for fish and wildlife. Modern commercial forest management encourages diversity, though not to the same extent as wildfires in unmanaged landscapes.

Almost 40% of the ecoregion is publicly owned, primarily as State and Federal forests. Much of the balance is private timberland, interspersed with the public forest. Timber harvest in the late 1990s was about two-thirds of the levels of the late 1980s, due to a major reduction of harvest on Federal lands. About half of Oregon’s future timber harvest is projected to come from this ecoregion (SOER 2000).

The lowland rivers and wetlands have been altered by agriculture and development more than the forested portions of the ecoregion have. Acquisition of coastal wetlands by private land conservancies and State and Federal fish and wildlife agencies have protected some high quality wetlands and restored many acres of degraded wetlands (SOER 2000).

4.1.4 Columbia Basin

The Columbia Basin ecoregion is semi-arid, with cold winters and hot summers. Farther from the Columbia River, annual precipitation decreases and soil changes from sandy deposits to windblown silts. Most of the ecoregion receives less than 15 inches (38 centimeter) of precipitation per year, mostly in the form of snow.

Much of the ecoregion’s natural vegetation is native bunchgrass prairie. Sandy deposits along the big bend of the Columbia River have created open dunes and areas of shrub-steppe and western juniper. The rivers were once lined with intermountain riparian vegetation, such as black cottonwood (*Populus trichocarpa*), willows, chokecherry (*Prunus* spp.), and aspen, and wetlands were located throughout the plateau. Fire was a natural component of this ecoregion, though the fire recurrence interval is not as clear as in other ecoregions.

The ecoregion has undergone extensive changes over the last 150 years; it is second only to the Willamette Valley in the extent of landscape change. It consists largely of privately-owned agricultural and range land, with over 85% of the former sagebrush steppe, grassland, and riparian communities converted to dry land wheat or irrigated agriculture. Only marginal lands that cannot be farmed, such as the steep canyon grasslands and scablands, retain a semblance of native vegetation. Protected areas and publicly owned lands are very limited in this region.

In the conversion to farmland, much of the natural function of the landscape has been lost. Bottomland forests and wetlands have been replaced by irrigated agriculture and rural residential development. Changes in the upland have occurred as sagebrush steppe has been reduced by over 85%. Invasive plant species are a major threat to native habitats as well as to the productivity of farmlands and pastures.

Dam construction and subsequent inundation has degraded riparian resource conditions along the Columbia River and confluences. Lake habitats have largely replaced riparian and floodplain wetlands. Large rivers such as the Umatilla River have decreased riparian function and water quality.

4.1.5 East Cascades Slope and Foothills Ecoregion

The East Cascades ecoregion is geologically young, with lava flows, volcanic vents, and a mantle of pumice soil. Ponderosa pine forests predominate, with extensive stands of lodgepole pine (*Pinus contorta*) on deep Mazama ash. The ecoregion is a transition zone that extends from below the crest of the Cascade Range east to where the pine forests intersect with sagebrush-juniper steppe. The northern two-thirds of the East Cascades ecoregion is drained by the Deschutes River system, which includes a series of large lakes and reservoirs near its headwaters high in the Cascade Mountains. The southern third is drained by the Klamath River, which rises from a vast interior wetland before it flows south and west into California. Forests, mostly Federally owned, cover most of the region's uplands, with privately-owned agricultural land in the valleys.

The Deschutes River watershed spreads across several ecoregions, with headwaters to the east in the Blue Mountains and to the west in the high Cascades. Several dams have been constructed on the Deschutes River. This has affected flow and sediment, which have influenced the establishment and natural succession of riparian vegetation throughout the downstream river course. Riparian areas have been further altered by dredging, dikes, and flood control activities. Today, all major river systems in the region are dammed, and many of these dams provide no fish passage. Agricultural practices and related water delivery systems remain a significant threat to the recovery of aquatic health in the southern part of the region.

The contrasts of this ecoregion are reflected in its water quality. Clean, cold water flows from perennial springs along the east slope into streams such as the Metolius River and the Little Deschutes, which have some of the highest quality water in the State. The low-lying Klamath Basin, in contrast, has sites such as Klamath Strait and Lost River with some of the poorest water quality in the State. Several of these streams have been placed on the 303(d) list as a result of high temperatures in summer, total dissolved gas, habitat modification, flow modification, pH, sedimentation, turbidity, bacteria, and dissolved oxygen.

Enormous efforts were made in the 1900s to drain vast acreage of wetlands in the Klamath Basin. As a result, the great shallow lake and marsh systems of the upper Klamath Basin have been reduced by an estimated 75%. Reductions in riparian vegetation and associated wetlands have contributed to nutrient loading in the rivers and lakes of the region by decreasing the potential for nutrient filtration and uptake in streamside areas. Similarly, riparian areas throughout the Klamath basin have been highly altered and in many cases eliminated by agricultural activities.

Activities affecting key resource systems in this region include changes in the fire regime, alterations of rivers, streams, and wetlands, and rapid urban development.

4.1.6 Klamath Mountains

Douglas-fir forests, oak woodlands, and ponderosa pine woodlands. Many of these plant communities have changed significantly since fire suppression was widely instituted in the early 20th century, although the plant communities of the Klamath Mountains continue to be among the most diverse in the world. There are pockets of plant communities that occur nowhere else, endemic to a particular condition of the climate or soil type. Of the 4,000 kinds of native plants found in Oregon, about half are found in this ecoregion, and about a quarter of these are found only here.

Nearly a century of fire suppression has dramatically altered the ecology of the forests, savannas, and shrublands in this region. The steep terrain makes the Klamath Mountain ecoregion particularly susceptible to landslides and debris flows, especially in extensively logged basins. Relatively few large conifers remain in the active flood plain, although historic evidence shows that conifers were once abundant in low gradient valley bottoms and were selectively logged in the 1950s and 1960s.

Today the rate of population growth in this region is second only to the Willamette Valley. Most of the population is concentrated in the valleys along Interstate 5, but rapid population growth in the southern and eastern parts of the ecoregion has brought new pressures to the landscape, particularly to the rural areas along rivers such as the Rogue, Umpqua, and Applegate, which were already affected by past development activities. Industrial and rural residential developments are the major threats to ecological health.

4.1.7 High Lava Plains

The High Lava Plains ecoregion is located in the dry foothills that surround the western perimeter of the Blue Mountains, and separates the north-central Blue Mountains from the southern Blue Mountains and Ochoco Mountains. The drainage basins in this ecoregion are the John Day, the Goose and Summer Lakes, the Malheur Lakes, and the Deschutes. The land use in this ecoregion is primarily irrigated pasture, grazing, and recreation.

The geology here is ash beds and the eroded remnants of a mountain chain. The erosion rate is high in ash-dominated areas; most erosion occurs during high intensity runoff events during snow melt periods or during thunderstorms. This ecoregion consists of highly dissected hills, palisades, and ash beds. The steep-sided canyons of the John Day and Crooked Rivers cut deeply through the surrounding terrain. Streams have low to moderate gradient, and the main rivers originate within surrounding ecoregions that have more rain and snow.

This ecoregion has a continental climate with low precipitation (mean annual precipitation is 10 to 20 in [25 to 50 cm]) and wide temperature extremes. This climate is moderated by a marine influence spreading southward from the Columbia River Gorge and eastward through the low passes of the Cascade Mountain range. The marine influence brings more moisture into the region and causes less extreme temperature fluctuations than in other parts of the Blue Mountains. Precipitation falls primarily as rain during the spring and fall months and as light snow in the winter months; most precipitation occurs in the winter months of November, December, and January. Shallow snowpacks can accumulate at higher elevations.

The most frequent natural disturbance in this ecoregion is fire. Fire suppression and grazing have caused an increase in juniper abundance and a decline in grass abundance. The native upland vegetation includes juniper, bluebunch wheatgrass (*Pseudoroegnria spicata*), and Idaho fescue (*Festuca idahoensis*), and the native riparian vegetation includes hardwoods (cottonwood and alder) and shrubs (willows, Douglas spirea [*Spirea douglasii*] and common snowberry [*Symphoricarpos albus*]). Ponderosa pine and juniper are found infrequently in the riparian areas.

4.1.8 Owyhee Uplands

The Owyhee Uplands ecoregion is located in the southeastern section of Oregon. This ecoregion is similar to the adjacent Basin and Range ecoregion in vegetation; however, it differs markedly in terrain, as the landscape is basically a broad, undulating plateau cut by deep riverine canyons. The Owyhee River and the lower basin of the Malheur River generally drain north through these canyons and to the Snake River Basin located at the border of Oregon and Idaho (Bryce and Woods 2000).

An extreme climate characterizes the ecoregion. Moist springs and cold winters bring precipitation primarily in the form of snow, while summers are hot and dry. Vegetative types are consistent with the high deserts of the Intermountain west, with sagebrush steppe communities being the most dominant. Within this ecoregion less extensive vegetative communities include herbaceous wetland and riparian habitats, mountain mahogany woodlands, and a few examples of salt desert scrub (Bryce and Woods 2000).

Like the adjacent Basin and Range ecoregion, presently, the population of the Owyhee Uplands is sparse, with most of the population centered along the major drainages near the towns of Vail and Ontario. These towns border the confluence of the Malheur and Owyhee Rivers with the Snake River. Irrigated agriculture in these fertile lowlands is the foundation of the local economy (Bryce and Woods 2000). In contrast, the remainder of this ecoregion relies almost entirely on local ranching as their source economy (Bryce and Woods 2000). Decades of livestock grazing has degraded the habitat.

4.1.9 West Cascade Mountains Ecoregion

The West Cascade Mountains ecoregion is a mountainous spine of volcanic peaks and dense forests. Relatively few people live in the area, which is geologically composed of two parts. The older western Cascade Mountains feature long ridges with steep sides and wide, glaciated valleys—remnants of long-extinct volcanoes. The younger high Cascades to the east include more than a dozen major peaks formed from more recent volcanic activity. Most of the rivers draining the northern two-thirds of the ecoregion flow into the Willamette Valley and then to the Columbia River system; the southern third drains to the Pacific Ocean through the Umpqua and Rogue River systems.

The drier southern half has a fire regime similar to that of the Klamath Mountains, with frequent, lightning-caused fires. In the northern half, the natural fire regime has historically produced less frequent but more severe fires.

Higher elevations receive heavy winter snows. Dense forests cloak the entire ecoregion. Douglas-fir/western hemlock forests dominate large areas up to elevations of about 3,300 feet. Pacific silver fir and mountain hemlock forests occur at higher elevations. Above 7,000 feet, the montane forests often open into alpine parklands with patches of forest interspersed with a variety of habitats, ranging from dwarf shrubs to wetlands and barren expanses of rock and ice.

The conifer forests of the Cascades have been the foundation of a timber-based economy in the ecoregion and in neighboring communities to the east and west; most of the population in the ecoregion is found in small towns where recreation use increasingly supplements this traditional timber-based economy. A continuous ribbon of national forests at middle and high elevations dominates this ecoregion, with private ownership (especially forest industry) at lower elevations. The USFS manages approximately two-thirds of the forest in this ecoregion. More than two-thirds of the Federal forest land in this ecoregion is managed for biological diversity—as late successional reserves, riparian reserves, and extensive wilderness areas.

The major factors that have influenced patterns of riparian condition in the western Cascades are (1) fire, (2) floods, (3) timber harvest and log transport, (4) road construction and residential development, and (5) flow regulation by dams (SOER 2000). In the absence of human activities, moist riparian forests were not as susceptible as surrounding uplands to disturbance by fire.

Cascade wetland types are highly variable and include snowmelt-fed slope wetland meadows, high elevation lakes with broad fringing wetlands, bogs, and riparian wetlands along streams. Although many of the high-elevation wetlands along the crest of the Cascades are largely intact, some lower-elevation wetlands have been altered by road construction, timber harvest, and the construction of reservoirs as well as by the offsite changes that result from regulated flows. For the most part, these activities have altered, rather than eliminated, the region's wetlands.

The high proportion of streams with good to excellent water quality is a strong indicator of the health of water resources in this region; this area consistently has the highest water quality in the State. Extensive public ownership of the landscape has protected these upstream reaches from some of the disruptions common farther downstream.

4.1.10 Willamette Valley

The Willamette Valley ecoregion is defined by the Willamette River and Oregon's largest river valley. The river's upper reaches and much of its watershed lie in the Cascade Mountains and Coast Range beyond the ecoregion borders. The ecoregion itself is characterized by broad alluvial flats and low basalt hills, with soils of deep alluvial silts from river deposits, and dense heavy clays from fluvial deposits in the valley bottom's numerous oxbow lakes and ponds. This ecoregion has 70% of the State's population, the majority of its industry, and almost half of its farmland. The Willamette Valley ecoregion is largely in private ownership; agriculture, urban areas, and forestland dominate the landscape.

Over the past 150 years, the prairies have been largely converted to farmland, as have most of the riparian forests and wetlands. The rivers have been dammed and channelized to reduce flooding. Open oak savannas and oak-conifer woodlands have been logged to become closed-canopy forests. A growing urban population has replaced agriculture in many areas, and rural residential development continues to encroach on remaining woodlands. Due to the pattern of development, the Willamette Valley is the most altered ecoregion in Oregon, with the most significant natural processes, fire and flooding, almost entirely excluded.

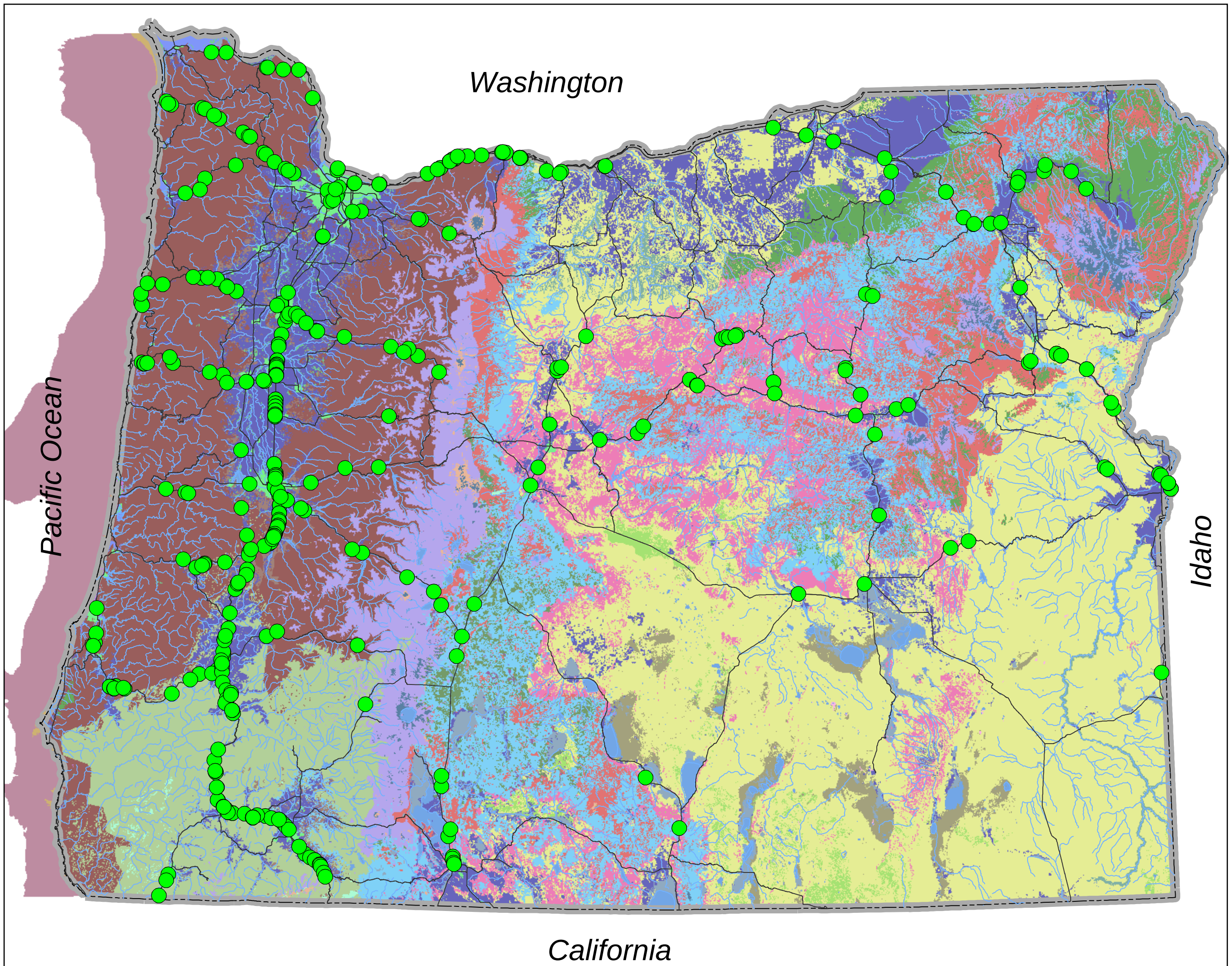
Trends in riparian condition in the Willamette Valley have shown an 80% reduction in total riparian area since the 1850s. An estimated 72% of the original riparian and bottomland forest is gone, as well as an estimated 99% of wet prairies, 88% of upland prairies, and 87% of upland forests at the margins of the valley (SOER 2000). Much of the valley's agricultural development converted native wet prairie; less than one percent of the original wet prairie remains today and several wet prairie plants are rare or endangered.

Water development projects have reduced the frequency of extremely high and low flows, and have moderated the once dynamic hydrologic pattern of floods and dry spells. Flood control modifications have largely disconnected the Willamette River from its braided channels, oxbows and sloughs—wetland types that characterized much of the historical floodplain. This fundamental alteration to the valley's hydrologic regime has changed the character of the valley's wetlands and greatly altered their functions. Today, most of the mainstem Willamette River exceeds standards for bacteria, temperature, and toxics such as mercury.

The encroachment of invasive species has greatly altered the composition of riparian plant communities, with introduced plants increasing from 10% in the headwaters to more than 50% of the number of species in the mainstem Willamette.

4.2 Johnson and O'Neil Habitat Type Descriptions

The Johnson and O'Neil habitat types (Johnson and O'Neil 2001) discussed in the above ecoregion sections are described below in sections 4.2.1 through 4.2.15. Johnson and O'Neil (2001) provided the following information on the habitat types. A map of Johnson and O'Neil habitat types is provided in Figure 4.2-1.



Johnson & O'Neil Habitat Types

- Agriculture, Pasture, and Mixed Environs
- Alpine Grasslands and Shrublands
- Bays and Estuaries
- Ceanothus-Manzanita Shrublands
- Coastal Dunes and Beaches
- Coastal Headlands and Islets
- Desert Playa and Salt Scrub
- Dwarf Shrub-steppe
- Eastside (Interior) Canyon Shrublands
- Eastside (Interior) Grasslands
- Eastside (Interior) Mixed Conifer Forest
- Eastside (Interior) Riparian - Wetlands
- Herbaceous Wetlands
- Lakes, Rivers, Ponds, and Reservoirs
- Lodgepole Pine Forest and Woodlands
- Marine Nearshore
- Marine Shelf
- Montane Coniferous Wetlands
- Montane Mixed Conifer Forest
- Ponderosa Pine and Eastside White Oak Forest and Woodlands
- Shrub-steppe
- Southwest Oregon Mixed Conifer-Hardwood Forest
- Subalpine Parklands
- Upland Aspen Forest
- Urban and Mixed Environs
- Western Juniper and Mountain Mahogany Woodlands
- Westside Lowland Conifer-Hardwood Forest
- Westside Oak and Dry Douglas-fir Forest and Woodlands
- Westside Riparian - Wetlands

OTIA III Bridges

- OTIA III Bridges
- Highway
- Streams and Rivers
- State Boundary

Figure 4.2-1

OTIA III: Statewide Bridge Delivery Program
Johnson & O'Neil Habitat Types in Oregon

This product is for informational purposes, and may not be suitable for legal, engineering or surveying purposes. This information or data is provided with the understanding that conclusions drawn from such information are the responsibility of the user.

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Miles

MB&G
Mason, Bruce & Girard, Inc.
Natural Resource Consultants since 1921

Spatial Data Source: See Document Bibliography.
plants\BA_figures\johab.mxd. Mar 1, 2004

4.2.1 Urban and Mixed Environments

Urban habitat occurs throughout Oregon. Most urban development is located west of the Cascades, but urban growth is occurring in the majority of smaller municipalities throughout the Pacific Northwest.

This habitat type creates a physical setting unique to itself: temperatures are elevated and background lighting is increased; wind velocities are altered by the urban landscape, often reduced except around the tallest structures downtown, where high-velocity winds are funneled around the skyscrapers. Urban development often occurs in areas with little or no slope and frequently includes wetland habitats. Many of these wetlands have been filled and eliminated. Many artificial “wetland” impoundments are created for stormwater management.

The original habitat is altered in urban environments and is replaced by buildings, impermeable surfaces, bridges, dams, and non-native species, although remnant isolated blocks of native vegetation may be present. Urban habitat often replaces habitats that are valuable for wildlife. Often, urban areas are surrounded by agricultural and grazing lands.

Ice, wind, and firestorms can occur. Floods are often more frequent and more violent. Attempts to lessen flooding in urban areas often lead to the channelization, paving, or diking of waterways. Urban growth is predicted to continue to accelerate, and loss of native habitat can be anticipated, which will result in a loss of native habitat.

4.2.2 Agriculture, Pasture, and Mixed Environment

Agricultural habitat occurs within a matrix of other habitat types at low to middle elevations (less then 6,000 ft [1,830 m]), including Eastside grasslands, Shrub-steppe, Westside Lowlands Conifer-Deciduous Forest and other low- to mid-elevation forest and woodland habitats. This habitat often dominates the landscape in flat or gently rolling terrain, on well-developed soils, in broad river valleys, and in areas with access to abundant irrigation water. Unlike other habitat types, agricultural habitat is often characterized by regular landscape patterns, straight borders (because of ownership boundaries), and multiple crops within a region. Edges can be abrupt along the borders between agricultural and adjacent habitats.

The dominant characteristic of agricultural habitat is a regular pattern of management and vegetation disturbance. With the exception of the improved pasture-cover type, most areas classified as agricultural habitat receive regular inputs of fertilizer and herbicides and have some form of vegetation harvest and manipulation.

Natural fires are almost totally suppressed in this habitat, except in unimproved pastures and modified grasslands, where fire-return intervals can resemble those of native grassland habitats. Fires are generally less frequent today than in the past, primarily because of fire suppression, the construction of roads, and the conversion of grass and forests to cropland. Bottomland areas along streams and rivers are subject to periodic floods, which may remove or deposit large amounts of soil.

In the absence of fires or mowing, eastside agricultural habitats may convert to other habitats, primarily grassland and shrub from the surrounding native habitats. Abandoned westside pastures have increasing amounts of hawthorn (*Crataegus* spp.*),* snowberry (*Symphoricarpos albus*), rose (*Rosa* spp*.),* Himalayan blackberry (*Rubus discolor*), spirea, Scot's broom (*Cytisus scoparius*), and poison oak (*Toxicodendron diversilabum*). Douglas-fir (*Pseudotsuga menziesii*) or other trees can be primary invaders in some environments.

4.2.3 Eastside (Interior) Grasslands

In Oregon, this habitat is found primarily in the Columbia Basin at middle to low elevations, and on plateaus in the Blue Mountains, usually within the ponderosa pine zone.

Idaho fescue and bluebunch wheatgrass vegetative habitats are common throughout the Columbia Basin, both as modified native grasslands in deep canyons and the dry Palouse, and as fire-induced representatives in the shrub-steppe. Similar grasslands appear on the High Lava Plains ecoregion, where they occur in a matrix with big sagebrush (*Artemisia tridentata*) or juniper woodlands. They are also found in burned shrub-steppe and canyons in the Basin and Range and Owyhee Uplands. Sand dropseed (*Sporobolus cryptandrus*) and three-awn (*Aristida longiseta*) grassland habitats are restricted to river terraces in the Columbia Basin, Blue Mountains, and Owyhee Uplands of Oregon. The primary location of this habitat extends along the Snake River from Lewiston south to the Owyhee River.

This habitat develops in hot, dry climates in the Pacific Northwest where snow accumulation is low. Soils are variable and vegetation consists of upland vegetation, but may also include riparian bottomlands dominated by non-native grasses. This habitat is found from 500-6,000 feet in elevation.

Eastside grassland habitats can overlap with the Ponderosa Pine Forest and Woodlands or Western Juniper and Mountain Mahogany Woodlands habitat types. Bluebunch wheatgrass and Idaho fescue are the characteristic native bunchgrasses of this habitat and either or both can be dominant.

Large expanses of grasslands are currently used for livestock ranching. Deep soil Palouse sites are mostly converted to agriculture. Drier grasslands and canyon grasslands, as well as those with shallower soils, steeper topography, or hotter, drier environments, were more intensively grazed and for longer periods than were deep-soil grasslands.

Most of the Palouse prairie of Oregon has been converted to agriculture. Remnants still exist in the foothills of the Blue Mountains and in isolated, moist Columbia Basin sites. The Palouse is one of the most endangered ecosystems in the U.S. with only 1 percent of the original habitat remaining; it is highly fragmented, with most sites being less than 10 acres (0.04 km^2) (Noss et al. 1995).

4.2.4 Herbaceous Wetlands

Herbaceous wetlands are found throughout the world and are represented in Oregon wherever local hydrologic conditions promote their development. This habitat includes all wetlands except bogs and those within Subalpine Parkland and Alpine habitats.

Freshwater aquatic bed habitats are found throughout the Pacific Northwest, usually in isolated sites. They are more widespread in valley bottoms and high rainfall areas, but are present in montane and arid climates as well. Habitats are permanently flooded, semi-permanently flooded, or flooded seasonally, and may remain saturated through most of the growing season. This habitat is referred to as palustrine emergent wetlands (Cowardin et al. 1979) and occurs in both lotic and lentic systems. Elevation varies from sea level to 10,000 feet, although it is infrequently found above 6,000 feet.

The herbaceous wetland habitat is generally a mix of emergent herbaceous plants with a grass-like life form (graminoids). These meadows often occur with deep- or shallow-water habitats with floating or rooting aquatic forbs. Shrubs or trees are not a common part of this herbaceous habitat, although willow or other woody plants occasionally occur along margins, in patches, or along streams running through these meadows.

Nationally, herbaceous wetlands have declined; the Pacific Northwest is no exception. Herbaceous wetlands have been filled, drained, grazed, and farmed extensively in the lowlands of Oregon. Herbaceous wetlands have decreased as beavers' influence has diminished. Herbaceous wetlands are susceptible to exotic, noxious plant invasions (Quigley and Arbelbide 1997).

4.2.5 Ponderosa Pine Forest and Woodlands (includes Eastside Oak)

In Oregon, this habitat occurs on the eastern slopes of the Cascades and in the Blue Mountains. This habitat generally occurs on the driest sites supporting conifers and is widespread and variable—appearing on moderate to steep slopes in canyons, foothills, and on plateaus or plains near mountains. In Oregon, this habitat can be maintained by the dry pumice soils. Average annual precipitation ranges from approximately 14-30 inches in ponderosa pine sites in Oregon and Washington, often as snow. This habitat can be found at elevations of 100 feet in the Columbia River Gorge to dry, warm areas over 6,000 feet. Timber harvest, livestock grazing, and pockets of urban development are major land uses.

Ponderosa pine and Douglas-fir are the most common evergreen trees in this habitat type. Other common trees in this habitat type include western larch (*Larix occidentalis*), grand fir (*Abies grandis*), Oregon white oak (*Quercus garryanna*), mallowleaf ninebark (*Physocarpus malvaceus*), common snowberry, and white-leaf manzanita (*Arctostaphylos patula*). Undergrowth in this habitat is usually dominated by herbaceous species such as pinegrass (*Calamagrostis rubescens*), Greyer's sedge (*Carex geyeri*), and blue wildrye (*Elymus glaucus*).

Fire plays an important role in creating vegetation structure and composition in this habitat. Most of the habitat has experienced frequent low-severity fires that maintained woodland or savanna conditions. Soil drought plays a role in maintaining an open tree canopy in part of this dry woodland habitat.

4.2.6 Shrub-Steppe

In Oregon, Shrub-steppe habitats are common across the Columbia Plateau. They extend up into the cold, dry environments of surrounding mountains. Generally, this habitat is associated with hot, dry environments in the Pacific Northwest, although variants occur in cool, moist areas that have some snow accumulation in climatically dry mountains. The elevation range of the shrub-steppe is from 300-9,000 feet. The most common elevations are from 2,000-6,000 feet. Habitat occurs on deep alluvial, loess, silty or sandy-silty soils; and on stony flats, ridges, mountain slopes, and the slopes of lake beds with ash or pumice soils.

Shrub-steppe habitat defines a biogeographic region and is the dominant vegetation type in typical areas in the Columbia Plateau, usually below Ponderosa Pine Forest and Woodland, and Western Juniper and Mountain Mahogany Woodland habitats. Vegetation structure in this habitat is characteristically an open shrub layer over a moderately open to closed bunchgrass layer. The more northern or productive sites generally have a denser grass layer and sparser shrub layer than southern sites.

Predominant vegetation within the shrub-steppe habitat type includes basin sagebrush, Wyoming sagebrush (*Artemisia tridentate wyomingensis*), antelope bitterbrush (*Purshia tridentata*), silver sagebrush (*Artemisia cana*), and three-tip sagebrush (*Artemisia tripartite*). Many sandy areas are shrub-free or are open to patchy shrublands of bitterbrush and/or rabbitbrush (*Chrysothamnus* spp.*)*. Silver sagebrush is the dominant and characteristic shrub along the edges of stream courses, moist meadows, and ponds.

Shrub-steppe habitat still dominates most of southeastern Oregon, although half of its original area in the Columbia Basin has been converted to agriculture. The alteration of fire regimes, habitat fragmentation, livestock grazing, and the addition of more than 800 invasive plant species have changed the character of shrub-steppe habitat.

4.2.7 Western Juniper and Mountain Mahogany Woodlands

In Oregon, this dry woodland habitat appears primarily in the Owyhee Uplands, High Lava Plains, and northern Basin and Range ecoregions. Secondarily, it develops in the foothills of the Blue Mountains and East Cascades ecoregions, and seems to be expanding into the southern Columbia Basin ecoregion, where it was naturally found in outlier stands. The primary land use in this habitat type is livestock grazing.

This habitat is widespread and variable, occurring in basins and canyons and on slopes and valley margins in the southern Columbia Plateau, as well as on fire-protected sites in the northern Basin and Range province. It may be found on benches and foothills. Western juniper and/or mountain mahogany woodlands are often found on shallow soils on flats at middle to high elevations, usually on basalts. Other sites range from deep, loess soils and sandy slopes to very stony canyon slopes. At lower elevations, or in areas outside of shrub-steppe, this habitat occurs on slopes and in areas with shallow soils. Mountain mahogany can occur on steep rimrock slopes, usually in areas of shallow soils or protected slopes. Average annual precipitation ranges from approximately 10-13 inches, with most occurring as winter snow.

Western juniper and/or mountain mahogany dominate these woodlands, either with bunchgrass or shrub-steppe undergrowth. Western juniper is the most common dominant tree in these woodlands. Part of this habitat will have curl-leaf mountain mahogany (*Cercocarpus ledifolius*) as the only dominant tall shrub or small tree; mahogany may be co-dominant with western juniper. Ponderosa pine can grow in this habitat and in rare instances may be an important part of the canopy. Part of this woodland habitat lacks a shrub layer, as various native bunchgrasses dominate.

Over the past 150 years—with fire suppression, overgrazing, and changing climatic factors—western juniper has increased its range into adjacent shrub-steppe, grasslands, and savannas. The increased density of juniper and reduced fine fuels from an interaction of grazing and shading result in high severity fires that eliminate woody plants and promote herbaceous cover, primarily annual grasses.

This habitat is dominated by fire-sensitive species (e.g., mountain mahogany and western juniper), and therefore, the range of western juniper and mountain mahogany has expanded because of an interaction of livestock grazing and fire suppression. In the inland Pacific Northwest, Juniper Woodlands and Mountain Mahogany cover types now cover a significantly wider area than before 1900 (Quigley and Arbelbide 1997). However, this habitat is generally degraded as a result of an increase in exotic plants and a decrease in native bunchgrasses.

4.2.8 Bays and Estuaries

This diverse habitat consists of areas with significant mixing of salt and freshwater, including the lower reaches of rivers, intertidal sand and mud flats, saltwater and brackish marshes, and the open-water portions of associated bays. The habitat is distributed along the marine coast and shoreline of Oregon and is strongly influenced by the daily tides and currents.

Climate is moderated by the Pacific Ocean and is usually mild. Coastal zone topography is characterized by long stretches of sandy beaches broken by steep rocky cliffs, rocky headlands, and the mouths of bays and estuaries. Organics, silt, and sand are the primary substrate components of this habitat, and vary in composition and distribution (Jefferson).

Some of the major uses of bays and estuaries are recreation, tourism, the shellfish industry, and navigation. The terrestrial interface portions of this habitat have been extensively converted to agricultural crop production, livestock grazing, and residential and commercial development. Water channels of many areas have been dredged for ship navigation.

Natural disturbance perpetuates the dynamic, transitional nature of this habitat. Tides, seasonal riverine discharges, winds, storms, erosion, and accretion are the primary natural processes that shape this habitat. Although natural erosion and accretion processes continue, most habitat modification can be attributed to anthropogenic causes (Simenstad 1983). Because of historical diking for crop production and flood control, almost no areas of natural high marsh remain in Oregon (Jefferson 1975). These dikes, and other more recent barriers, prevent natural recovery and the re-establishment of this habitat. Remaining examples of the bay and estuarine habitat exist in various conditions, from the more natural areas and areas undergoing active restoration, to the more prevalent polluted, degraded, or overused areas. With increasing population pressures in coastal areas and the corresponding threats of habitat use and conversion, the future trend will likely be a continued degradation and reduction of remaining bay and estuarine areas.

4.2.9 Westside Lowlands Conifer-Hardwood Forest

This habitat type occurs on the western slopes of the Cascades, around the margins of the Willamette Valley, in the Coast Range, and along the outer coast.

The climate is relatively mild and moist to wet; snowfall ranges from rare to regular, but is transitory; summers are relatively dry, and summer fog is a major factor in the Sitka spruce zone on the outer coast. Elevation ranges from sea level to 3,500 feet in central Oregon (on the western slopes of the Cascades). Soils and geology are very diverse, and topography ranges from relatively flat glacial till plains to steep mountainous terrain.

This is the most extensive lowland habitat on the west side of the Cascades (except in southwestern Oregon), and forms the matrix within which other habitats occur as patches, especially Westside Riparian-Wetlands and, less commonly, Herbaceous Wetlands or Open Water. This habitat is forest, or, rarely, woodland, dominated by evergreen conifers, deciduous broadleaf trees, or both. Western hemlock (*Tsuga heterophylla*) and Douglas-fir are the most characteristic species and one or both are typically present. Most stands are dominated by one or more of the following: Douglas-fir, western hemlock, western red cedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*), red alder (*Alnus rubra*), and big leaf maple (*Acer macrophyllum*).

The natural disturbances most common to the Westside Lowlands Conifer-Hardwood Forest habitat type include fire and wind damage, as well as disease. Fire is the major natural disturbance in all but the wettest climatic area (the Sitka spruce zone), where wind becomes the major source of natural disturbance. Bark beetles and fungi are significant causes of mortality that typically operate on a small scale. Landslides are another natural disturbance that occurs in some areas.

Large areas of this habitat remain, but remaining habitat has been degraded by industrial forest practices at both the stand and landscape scale. Only a fraction of the original old-growth forest remains, mostly in national forests in the Cascade Mountains.

4.2.10 Lodgepole Pine Forest and Woodlands

This habitat is found along the east side of the Cascade Range and in the Blue Mountains. Subalpine lodgepole pine habitat occurs on the broad plateau areas along the crest of the Cascade Range and the Blue Mountains. On pumice soils, this habitat is confined to the eastern slope of the Cascade Range from near Mt. Jefferson south to the vicinity of Crater Lake.

This habitat is located mostly at middle to higher elevations, where the environments can be cold and relatively dry, usually with persistent winter snowpack. A few of these forests occur in low-lying frost pockets, wet areas, or within specific soil types (usually pumice), and are relatively long-lasting features of the landscape. The well-drained, deep Mazama pumice in eastern Oregon encourages the dominance of lodgepole pine.

The lodgepole pine habitat is composed of open to closed evergreen conifer tree canopies, and typically reflects early successional forest vegetation that originated with fires. The tree layer of this habitat is dominated by lodgepole pine, but it is usually associated with other montane conifers (grand fir, western larch, ponderosa pine, Douglas-fir, white fir [*Abies concolor*], California red fir [*A. magnifica var. shastensis*], incense cedar [*Calocedrus decurrens*], sugar pine [*Pinus lambertiana*], and western white pine [*P. monticola*]). Subalpine fir (*Abies lasiocarpa*), mountain hemlock (*Tsuga mertensiana*), Engelmann spruce (*Picea engelmannii*), and whitebark pine (*Pinus albicaulis*), indicators of subalpine environments, are present in colder or higher sites. Quaking aspen (*Populus tremuloides*) may occur in small numbers.

The area of the lodgepole pine cover type in Oregon is the same as prior to 1900 and in some regions it may exceed its historical area (Quigley and Arbelbide 1997), but at a finer scale, these forests have been fragmented by roads and timber harvest, and influenced by periodic livestock grazing and altered fire regimes.

4.2.11 Montane Coniferous Wetlands

This habitat occurs in mountains throughout Oregon, except the Basin and Range of southeastern Oregon, the Klamath Mountains of southwestern Oregon and the Coast Range of Oregon. This includes the Cascade Range, and the Blue and Wallowa Mountains.

This habitat comprises forested wetlands or floodplains with a persistent winter snowpack, ranging from moderately to very deep. Sites typical of the Montane Coniferous Wetland habitat type are seasonally or temporarily flooded. The climate varies from moderately cool and wet to moderately dry and very cold. The topography is generally mountainous, but can also contain nearly flat valley bottoms. Gleyed or mottled mineral soils, organic soils, or alluvial soils are typical. Subsurface water flow within the rooting zone is common on slopes with impermeable soil layers. The flooding regimes include saturated, seasonally flooded, and temporarily flooded. Seeps and springs are common in this habitat.

The habitat is a forest or woodland (greater than 30% tree canopy cover) dominated by evergreen conifer trees. Deciduous broadleaf trees are occasionally co-dominant. The understory is dominated by shrubs (usually deciduous and relatively tall), forbs, or graminoids. The forb layer is usually well developed, even where a shrub layer is dominant. This habitat contains nearly all of the wettest forests within the Pacific silver fir (*Abies amabilis*) and mountain hemlock zones of northwestern Oregon, and most of the wet forests in the western hemlock and subalpine fir zones of eastern Oregon.

The primary land uses here are forestry and watershed protection. The major natural disturbances include flooding, debris flow, fire, and wind. The habitat is naturally limited in its extent and has probably declined little in area over time, though portions have been degraded by the effects of logging, either directly on site or through geohydrologic modifications. This habitat type is probably relatively stable in extent and condition, although its condition may be locally declining because of logging and road building.

4.2.12 Lakes, Rivers, Ponds, and Reservoirs

Lakes in Oregon occur statewide and are found from near sea level to about 10,200 feet above sea level. There are 6,000 lakes, ponds, and reservoirs in Oregon, including almost 1,800 named lakes and over 3,800 named reservoirs, all amounting to 270,641 acres (109,571 ha). Streams and rivers are distributed state-wide, forming a continuous network that connects high mountain areas to lowlands and the Pacific coast. There are 12,000 named rivers and streams in Oregon, totaling 112,640 miles in length; they range from cold, fast moving high-elevation streams to warmer lowland valley rivers. Streams are here defined as flowing water greater than 6 feet wide; narrower water bodies are considered within their respective habitats.

Rivers and streams in southwestern Oregon are fed by rain and are located in an area composed of sheared bedrock, which is thus an unstable terrain. Streams in this area have high suspended-sediment loads. Beds composed of gravel and sand are easily shifted during floods.

Floods occur every year from October through April; more than half of all floods occur during December and January. Floods are initiated by precipitation and snow melts, and thus are short-lived.

Sewage effluents have caused eutrophication. The removal of gravel results in a reduction of spawning areas for anadromous fish. Overgrazing and a loss of vegetation caused by logging increases water temperatures and siltation, harming the invertebrate communities. Flood control measures have contributed to a loss of oxbows, river meanders, and flood plains. Unauthorized or over-appropriated withdrawals of water from the natural drainages have also caused a loss of open water habitat that has been detrimental to fish and wildlife production, particularly in the summer. The construction of dams is associated with changes in water quality, fish passage, competition between species, loss of spawning areas, and declines in native fish populations.

4.2.13 Southwest Oregon Mixed Conifer-Hardwood Forest

This upland forest and woodland habitat occurs in southwestern Oregon. In southern Oregon, this habitat type is found at low and middle elevations in the Klamath Mountains, Cascades, Coast Range, and Eastern Cascade Slopes and Foothills ecoregions. Portions of Curry, Josephine, Jackson, Douglas, Lane, and Klamath counties are included in the range of this habitat. The predominant land use is forestry. Grazing occurs in some areas, especially at lower elevations.

The climate varies from relatively dry and very warm, to moderately moist and cool, to slightly warm and very moist. Snow is uncommon except at the highest elevations, where a winter snow pack occurs for a few months. Summers are hot and dry. Elevation ranges from near sea level to 6,000 feet. The topography is mostly mountainous, but also includes two fairly large valleys and a corresponding variety of terrains. Soils are diverse, as is the bedrock geology. Serpentine soils are common in portions of the Siskiyou Mountains, where they have a major effect on vegetation.

Conifer trees typically dominate this habitat. In some areas, a well developed subcanopy layer of smaller evergreen broadleaf trees is present. Occasionally, deciduous broadleaf trees are co-dominant. Dominant tree species include Douglas-fir, white fir, sugar pine, ponderosa pine, and incense cedar.

Fire is the predominant natural disturbance, although fire regimes vary depending on environmental conditions. This habitat covers most of southwestern Oregon and has declined little in areal extent. Conditions of most communities and stands have been degraded by forestry practices and by fire suppression. The low-elevation, driest communities have been altered by grazing and invasion of exotic species; specifically, Port Orford cedar (*Chamaecyparis lawsoniana*) has declined dramatically (Zobel et al. 1985). Fire suppression and logging-related effects continue to be threats.

4.2.14 Westside Oak and Dry Douglas-fir Forest and Woodlands

This habitat is primarily found in the Willamette Valley and Klamath Mountains ecoregions. In southwestern Oregon, it is now restricted mainly to the valleys of the Rogue and Umpqua Rivers. Minor occurrences can also be found in the western Cascades. Land use in this habitat includes forestry (generally small scale), livestock grazing, and low-density rural residential.

The habitat has several geographic variants: California black oak (*Quercus kelloggii*) and ponderosa pine are important only in southwestern Oregon and the southern Willamette Valley. Dry Douglas-fir forests (without oak or madrone) are found, rarely, in the west Cascades and Willamette Valley. Pacific madrone (*Arbutus menziesii*) and Douglas-fir/Pacific madrone stands without oak are limited to the southern Willamette Valley foothills. Mixed oak-madrone stands occur most often, especially in southwestern Oregon.

This habitat typically occupies dry sites west of the Cascades. Elevation ranges from sea level to about 3,500 feet in the Olympic Mountains, but is mainly below 1,500 feet. The topography ranges from nearly level to very steep slopes, where aspect tends to be southern or western. Soils on dry sites are typically shallow over bedrock, very stony, or very deep and excessively drained. Fire is the major natural disturbance in this habitat.

This habitat type is a forest or woodland dominated by evergreen conifers, deciduous broadleaf trees, evergreen broadleaf trees, or a mixture of conifers and broadleaf trees. Understories vary in structure: grasses, shrubs, ferns, or some combination thereof will typically dominate; deciduous broadleaf shrubs are perhaps most typical

The canopy is typically dominated by one or more of the following species: Douglas-fir, Oregon white oak, Pacific madrone, shore (lodgepole) pine, or California black oak. Ponderosa pine is important in southwestern Oregon and the southern Willamette Valley, as a subordinate or co-dominant with oak.

This habitat type is relatively limited in area and is declining in both extent and condition. With the cessation of regular burning 100-130 years ago, many grasslands and savannas were invaded by a greater density of trees and thus converted to a different habitat. In addition, large areas of this habitat have been converted to Urban or Agriculture habitats. Most of the remaining habitat has been considerably degraded by the invasion of exotic species or by logging and its consequent loss of structural diversity. Ongoing threats include residential development, the increase and spread of exotic species, and fire suppression effects (the latter especially in oak-dominated stands).

4.2.15 Westside Riparian-Wetlands

In Oregon, this habitat is patchily distributed in the lowlands throughout the area west of the Cascade Crest. It can occur less extensively at middle to higher elevations in the Cascade Mountains, where it is limited to more specific environments. The major land use in the forested portions of this habitat is timber harvest. Livestock grazing occurs in some areas, and peat mining occurs in some bogs.

This habitat is characterized by wetland hydrology or soils, periodic riverine flooding, or perennial flowing freshwater. The climate varies from very wet to moderately dry and from mild to cold. This habitat is found at elevations primarily below 3,000 feet, but can extend up to 6,500 feet. The topography is typically flat to gently sloping or undulating, but can include moderate to steep slopes in the mountains. The geology is extremely variable, and flooding regimes include permanently flooded (aquatic portions of small streams), seasonally flooded, saturated, and temporarily flooded.

Most often this habitat is a tall deciduous broadleaf shrubland, woodland, or forest, or some mosaic of these. Short to medium-tall evergreen shrubs or graminoids and mosses dominate portions of bogs. The dominant trees are evergreen conifers or deciduous broadleaf, or a mixture of both. Red alder is the most widespread tree species, but is absent from sphagnum bogs. Water is sometimes present on the surface for a portion of the year. Large woody material is abundant in late seral forests and adjacent stream channels. Small stream channels and small backwater channels on larger streams are included in this habitat. This habitat includes all palustrine, forested wetlands, and scrub-shrub wetlands at lower elevations on the west side as well as a small subset of persistent emergent wetlands, those within sphagnum bogs. They are associated with both lentic and lotic systems.

The primary natural disturbance is flooding, although beavers act as important disturbances by changing the hydrology of a stream system through dams. Grazing by native ungulates (e.g., elk) can have a major effect on vegetation. Intense logging disturbance in conifer or mixed riparian or wetland forests, except bogs, often results in the establishment of red alder, and its ensuing long-term dominance. Salmonberry responds similarly to this disturbance and tends to dominate the understory. Roads and other water diversion/retention structures change watershed hydrology with wide-ranging and diverse effects, including major vegetation changes (Furniss et al. 1991). Increases in nutrients and pollutants are other common anthropogenic effects, the former with particularly acute effects in bogs. Reed canarygrass (*Phalaris arundinacea*) is an abundant non-native species in low-elevation, disturbed settings dominated by shrubs or deciduous trees. Many other exotic species also occur.

This habitat occupies relatively small areas and has declined greatly in extent as a result of its conversion to urban development and agriculture. The remaining habitat is mostly in poor condition, having experienced anthropogenic effects that have degraded the functionality of these ecosystems: channeling, diking, dams, logging, road-building, the invasion of exotic species, changes in hydrology and nutrients, and livestock grazing. Current threats include all of the above as well as development.